3-5 Litter-free Community

South Carolina Aquarium

Overview

Focus Questions
How much litter is on our school grounds? How does it affect the community? What can we do to help reduce, reuse, and recycle litter in our community?

Activity Synopsis
Students will participate in a scientific investigation in which they observe litter in the school community, hypothesize what they will collect, record data as they collect litter around the school, graph data to analyze, and generate solutions to litter pollution.

Time Frame
90 minutes - 2 hours

Objectives
The learner will be able to:

- appreciate the importance of working together as a community through citizen science
- hypothesize what is the most common litter found in the community
- collect litter as a team to investigate their hypothesizes
- sort and group litter to chart their data quantitatively
- graph data collected
- generate solutions to litter pollution
- communicate ways to reduce, reuse, and recycle litter found on the school grounds

Student Key Terms

- community
- ecosystem
- litter
- reduce
- reuse
- recycle

Teacher Key Terms

- abiotic
- citizen science
- hypothesis
- quantitative data

Standards

South Carolina College- and Career-Ready Science Standards 2021

3rd Grade: 3-LS4-3, **3-LS4-4**
4th Grade: 4-LS1-1
5th Grade: **5-ESS3-1**

*** Bold standards are the main standards addressed in this activity**

2014 Academic Standards and Performance Indicators for Science

3rd Grade: **3.S.1A.1**, **3.S.1A.2**, **3.S.1A.3, 3.S.1A.4**, 3.S.1A.5, 3.S.1A.6, **3.S.1A.7**, **3.S.1A.8**, **3.L.5B.1**, 3.L5B.2

4th Grade: 4.S.1A.1, 4.S.1A.2, 4.S.1A.3, 4.S.1A.4, 4.S.1A.5, 4.S.1.A6, **4.S.1A.7, 4.S.1A.8, 4.L.5B.3**
5th Grade: 5.S.1A.1, 5.S.1A.2, 5.S.1A.3, 5.S.1A.4, 5.S.1A.5, 5.S.1A.6**, 5.S.1A.7, 5.S.1A.8, 5.L.4A.1, 5.L.4A.2**

*** Bold standards are the main standards addressed in this activity**

South Carolina College- and Career-Ready Science Standards 2021

Third Grade Performance Expectations
3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can thrive, struggle to survive, or fail to survive.
3-LS4-4 Make a claim about the effectiveness of a solution to a problem caused when the environment changes and affects organisms living there.

Fourth Grade Performance Expectations
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function together in a system to support survival, growth, behavior, and reproduction.

Fifth Grade Performance Expectations
5-ESS3-1 Evaluate potential solutions to problems that individual communities face in protecting the Earth's resources and environment.

2014 Academic Standards and Performance Indicators for Science

Third Grade Performance Indicators
3.S.1A.1 Ask and answer questions that can be (1) answered using scientific investigations or (2) used to refine models, explanations, or designs.
3.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.
3.S.1A.3 Plan and conduct scientific investigations to answer scientific questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.
3.S.1A.4 Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings.
3.S.1A.5 Use mathematical and computational thinking to (1) express quantitative observations using appropriate English or metric units, (2) collect and analyze data, or (3) understand patterns, trends, and meanings.
3.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
3.S.1A.7 Construct scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
3.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using oral and written language.
3.L.5B.1 Obtain and communicate information or explain how changes in habitats (such as those that occur naturally or those caused by organisms) can be beneficial or harmful to the organisms that live there.
3.L5B.2 Develop and use models to explain how changes in a habitat cause plants and animals to respond in different ways (such as hibernating, migrating, responding to light, death, or extinction.)

Fourth Grade Performance Indicators
4.S.1A.1 Ask and answer questions that can be (1) answered using scientific investigations or (2) used to refine models, explanations, or designs.

4.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.
4.S.1A.3 Plan and conduct scientific investigations to answer scientific questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.
4.S.1A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support explanations, claims, or designs.
4.S.1A.5 Use mathematical and computational thinking to (1) express quantitative observations using appropriate English or metric units, (2) collect and analyze data, or (3) understand patterns, trends, and relationships between variables.
4.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
4.S.1A.7 Construct scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
4.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena (3) develop models, or (4) support hypotheses, explanations, claims, or designs. Communicate observations and explanations using conventions and expectations of oral and written language.
4.L.5B.3 Construct explanations for how structural adaptations (such as methods for defense, locomotion, obtaining resources, or camouflage) allow animals to survive in the environment.

Fifth Grade Performance Indicators
5.S.1A.1 Ask questions used to (1) generate hypotheses for scientific investigations or (2) refine models, explanations, or designs.
5.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.
5.S.1A.3 Plan and conduct scientific investigations to answer scientific questions, test hypotheses and predictions, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.
5.S.1A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support explanations, claims, or designs.
5.S.1A.5 Use mathematical and computational thinking to (1) express quantitative observations using appropriate metric units, (2) collect and analyze data, or (3) understand patterns, trends, and relationships between variables.
5.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
5.S.1A.7 Construct scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
5.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena (3) develop models, or (4) support hypotheses, explanations, claims, or designs. Communicate observations and explanations using conventions and expectations of oral and written language.
5.L.4A.1 Analyze and interpret data to summarize the abiotic factors (including quantity of light and water, range of temperature, salinity, and soil composition) of different terrestrial ecosystems and aquatic ecosystems.
5.L.4A.2 Obtain and communicate information to describe and compare the biotic factors (including individual organisms, populations, and communities) of different terrestrial and aquatic ecosystems.

Next Generation Science Standards
3-LS2-1, 3-LS3-2, **3-LS4-3**, 3-LS4-4, **5-LS2, 5-ESS3**

Cross Curricular Standards

South Carolina College and Career Standards for Social Studies
3.3

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South Carolina College and Career Standards for Math
Measurement and Data Analysis (MDA) – **3.MDA.3,** 3.NSBT.1, 3.NSBT.2**,** 4.MDA.4, 4.NSBT.3, 5.MDA.2

South Carolina College and Career Standards for ELA
Inquiry-Based Literacy Standards (I)-**3-1.1, 3-2.1, 3-3.2, 3-4.1, 3-4.2,** 3-4.3, 3-5.1**, 4-1.1, 4-2.1, 4-3.2, 4-4.1, 4-4.2,** 4-4.3, 4-5.1**, 5-1.1, 5-2.1, 5-3.2, 5-4.1, 5-4.2,** 5-4.3, 5-5.1
Meaning, Content, and Craft (MCC) – 3-2.1, 4-2.1, 5-2.1
Meaning and Context (MC) – **3-1.1, 3-1.2, 3-1.4, 3-2.2, 4-1.1, 4-1.2, 4-1.4,** 4-2.1**, 5-1.1, 5-1.2, 5-1.4,** 5-2.1

Common Core ELA Standards
Writing – 3-2b, 3-2.2d, 4-2.b, 4-2.e, 5-2.b, 5-2.e
Speaking/Listening – **3-1, 4-1, 5-1, 3-4, 4-4, 5-4**

Common Core Math Standards
Number and Operations in Base Ten- **3.NBT.A.1,** 3.NBT.A.2, 4.NBT.A.3
Measurement and Data- **3.MD.B.3**

Background

Key Points
Key Points will give you the main information you need to teach the activity.

- **Litter** is trash, debris, and other items discarded in places they don't belong, such as roadsides, waterways, or parks.
- Litter is a widespread problem which is affecting **ecosystems** of all living things. Improperly discarded materials not only ruin the beauty of our **community**, but can be harmful to us as well.
- Three ways to help with the litter problem is to **reduce, reuse** and **recycle**. Think first of reducing waste and if that's not possible, try hard to reuse the waste item. The last option after reducing and reusing should be recycling.
- The South Carolina Aquarium is leading the way to empower citizens to make a positive impact while generating scientifically useful data available to the general community and scientific community though its **citizen science** project, Litter-free Digital Journal.
- The goal of the Litter-free Digital Journal is to promote collaborative solutions by removing and tracking litter, plastics specifically, from habitats throughout South Carolina. Students can clean up an environment and be part of the solution.

Detailed Information
Detailed Information gives more in-depth background to increase your knowledge, in case you want to expand the activity or you are asked detailed questions.

A **community** consists of all of the living things that inhabit a particular area. A community is an assemblage of populations that share an environment. The environment can be as small as a rotted log or as large as a continent. In the Mountain region, a community could consist of river otters, trout, mayflies, mountain laurel, cardinals and flowering dogwood.

An **ecosystem** includes all of the **abiotic** factors as well as the communities that exist in a certain area. Abiotic factors are those factors in an environment that are not living. Important examples of abiotic factors include water, temperature, light, soil and wind. In many ways, the abiotic factors of a particular area define the communities that live there. Litter is an abiotic factor.

Litter is trash, debris, and other items discarded in places they don't belong, such as roadsides, waterways, or parks. Deliberately throwing items on the ground or leaving items outside of a trash bin is littering. Sometimes it can be accidental, such as materials being blown out of a trash can or truck bed.

According to the 2009 KAB National Litter Survey Study, the most common roadside litter articles include tobacco products, unclassified trash, miscellaneous paper, packaging, miscellaneous plastic, and beverage containers. The study also found that the quantity of plastic litter observed has increased over the past 40 years. Plastic does not degrade or does so slowly with time. Also,

being lightweight, plastics tend to be transported by wind and water to other locations, which adds to a growing marine debris issue (trash in the ocean).

Problems of litter include:

- Physical harm or injury to people - Needles, blades, broken glass, cigarette butts causing fires, byproducts from drug packaging

- Spread of disease - Can provide breeding ground for diseases that can be passed to animals that eat it
    - water can be collected on litter which harbor mosquitoes that carry several illnesses
    - toxic chemicals and disease causing microorganisms can leach, which can contaminate our water system

- Aesthetics and quality of environment - Public spaces scattered with litter are typically less inviting. Studies show that once a space is littered, other people are more likely to litter there too. Small amounts of litter can initiate a downward spiral for a communal space, which can affect the overall community.

- Economics - Direct costs of litter cleanup
    - Indirect costs, caused by the negative effects of litter in an environment. Litter in waterways and public areas can negatively affect tourism and property values, resulting in fewer jobs.

- Polluted environments - Litter can be blown or washed into rivers and creeks that lead to the ocean, polluting the watershed and the ocean. The oceans are filled with huge amounts of consumer plastics, metals, rubber, textiles, paper, derelict fishing gear, and other discarded materials, making marine debris one of the biggest problems facing the oceans and waterways.
    - Cigarette butts and other trash contain toxic substances that contaminate soil and water
    - Reduced air quality due to smell and toxic vapor from trash

- Harm to wildlife - Litter, plastic specifically, is often mistaken for food by animals, which can make them sick or die
    - When animals consume litter, it effects the whole food chain. When fish eat plastic in the ocean mistaking it for food, the plastic is passed to humans when the fish is consumed.
    - Animals can get tangled in litter, which can harm them physically or prevent them from finding or catching food

Solutions to litter include citizen science, reducing and reusing waste as well as recycling when reducing and reusing is not an option.

Citizen Science

Defined by the Oxford Dictionary, citizen science is the collection and analysis of data relating to the natural world by members of the general public. Citizen science occurs when ordinary people help to conduct real scientific research. People can share and contribute to data monitoring and collection programs, usually as a volunteer. Participants have varying degrees of expertise. Modern technology makes citizen science accessible to anyone interested in participating, however, the success of the project depends on the creation of a well-devised monitoring program and participant dedication.

Many citizen-science projects have a national or local focus. Some projects are created by scientists, who need widespread data with the help of public observation. There are also projects community-based groups organized to generate ideas and involve scientists for advice and coordination. One of the oldest examples of citizen science in the National Audubon Society's Christmas Bird Count, which began in 1900. From December 14-January 5, birder groups collect information about local bird populations, which can be used for conservation efforts.

The South Carolina Aquarium has a citizen science application and an Anecdata website called the Litter-free Digital Journal for collecting trash data from the people of South Carolina. Community members are urged to collect trash from the environment and log the data on the app. Data is placed into categories and pictures can be downloaded as well as the location in South Carolina. This data is being used to change policy. Folly Beach and Mt. Pleasant, SC are two towns who have already had plastic bag bans put into effect. Aquarium staff have been a part of that change using the data from the app. It's an exciting time to see all people be able to make an impact to better the environment. Get your students involved as well through this activity!

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Reduce and Reuse

The most effective way to prevent litter is to not create it in the first place. Reducing and reusing materials prevents new products from being made and transported. Americans generate over 4 pounds of trash every day, which mostly gets sorted into landfills. These landfills create the second largest source of human-related methane emissions in the country. Reducing and reusing also saves energy, saves money, prevents pollution caused by making new products, and allows products to be used to their fullest purpose.

Approximate Time it takes for Garbage to Decompose in the Environment:

*This data is from *The Educator's Guide to Marine Debris* from SC Sea Grant, DHEC, COSEE and NOAA. The decomposition rates may change over time due to more research. Go here for a printable poster http://www.scdhec.gov/HomeAndEnvironment/Docs/SC_MARINE_DEBRIS_POSTER.pdf

Garbage Item	Decomposition Time
Glass Bottle	Undetermined
Monofilament Fishing Line	600 years
Plastic Beverage Bottle	450 years
Disposable Diapers	450 years
Aluminum can	200 years
Foam plastic cup	50 years
Plastic bag	1-20 years
Waxed milk carton	3 months
Apple core	2 months
Newspaper	6 weeks
Paper towel	2-4 weeks

Plastic never fully biodegrades once it is in water. Instead, it breaks down into smaller and smaller pieces. Microplastics are pieces of plastic that are less than 5mm long. Macroplastics are pieces of plastic that are larger than 5 mm.

Different ways to reduce and reuse:

- Do not use single-use plastics, which include plastic bags, plastic water bottles, take-out containers, take-out cups, eating utensils and straws
- Use reusable products instead, such as a reusable shopping bag, thermos or reusable water bottle, reusable food containers, a personal cup, reusable eating utensils and just don't use a straw or use a stainless steel/reusable/paper straw
- Buy products that use less packaging. Buying in bulk can also reduce packaging and save money
- Borrow, rent, or share items used infrequently
- Maintain and repair products, so they aren't discarded frequently
- Buy used things, which are often less expensive and just as good as new

Recycle

When materials can't be reduced or reused, recycling is a great option. Recycling materials reduces the amount of waste sent to landfills. Natural resources are conserved by turning old products into new products, which prevents pollution by reducing the need to collect new raw materials. Recycling increases economic security by using a domestic source of resources, creating more jobs in manufacturing industries in the United States.

What can be recycled?

Plastic

- Water bottles
- Soda bottles
- Milk jugs
- Liquid containers
- Jars and tubs (yogurt, margarine tubs, etc.)
- Detergent and all-purpose cleaner bottles
- Soap and shampoo bottles
- Plastic cups
- Rigid plastic product packaging, such as clean rigid clamshell containers (Remove any plastic film or aluminum)

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Approximately 300 million tons of plastic is produced globally each year and only 10 percent of it recycled. An estimated 7 million tons of plastic that is trashed ends up in the ocean each year, where it breaks down into microplastics. The smaller the pieces, the easier they are to be swallowed by fish. Plastics are derived from natural, organic materials such as cellulose, coal, natural gas, salt and crude oil.

What do the symbols mean on the bottom of plastic bottles and containers? These symbols were created by plastic manufacturers to help people identify the kind of plastic resin used to make the container. This can help you determine if the container can be accepted by your local recycling program. Plastics #1-7 can be recycled in Charleston County, however plastic bags cannot be included into mainstream recycling bins, but instead must be taken to a store. Check with your county to see which plastics can be recycled.

Paper

- Magazines
- Newspapers
- Catalogs
- Books/textbooks
- Coupons
- Office paper
- Envelopes
- Posters
- Sticky notes
- Paper bags
- Junk mail/envelopes
- Greeting cards
- Wrapping paper

Paperboard and cardboard

- Corrugated cardboard boxes (flattened)
- Soda/beverage boxes
- Shoe boxes
- Gift boxes
- Clean food boxes (cereal boxes, microwave meals, boxes of rice, etc.)
- Paper towel rolls
- Paper egg cartons

Paper typically makes up a third of the trash produced each year in the United States. Recycled paper is used to make new paper products, which saves trees and other natural resources.

Glass

- Jars and caps (labels can be left on containers)
- Bottles and bottle caps (labels can be left on containers)

Glass can be recycled again and again and again. Making new glass from recycled glass is cheaper than using raw materials. Glass is made from a mixture of sand, lime and soda heated together, to form liquid glass. This liquid glass is made into sheets by cooling and flattening. To make objects like vases, craftsmen blow into a glob of liquid glass with the help of a long tube. Typically, at least a quarter of the glass discarded in the United States each year is recycled.

Aluminum and steel cans

- Aluminum cans and caps/lids
- Steel and tin cans
- Empty aerosol (spray) cans
- No foil or trays

Cans are made from aluminum and trace amounts of other metals, including magnesium, iron, and manganese. Aluminum is one of the only materials that can be recycled over and over again! There is no limit to the number of times you can recycle it, making it one of the most valuable recyclables.

Batteries

Look for in-store recycling bins or community collection events to dispose of batteries. According to the EPA, in 2014, about 258 million tons of municipal solid waste (MSW) was generated in the United States. Over 89 million tons of MSW were recycled and composted, equivalent to a 34.6 percent recycling rate.

Other: Plastic bags, ink cartridges, old phones, corks, etc.

There is some waste that can be recycled, but not through mainstream recycling. Materials in this category take more time and effort to be recycled. Lots of grocery stores have plastic bag recycling. Cell phone carriers and electronic stores typically recycle or even buy old phones and tablets. Ink cartridges can be recycled at office supply stores. Lots of health food stores recycle corks. Just looking up an alternative to throwing waste away can make a difference.

Composting

Compost is organic material, including food scrapes and yard waste, which can be added to soil to help plants grow. Making compost keeps these materials out of landfills where they take up space and release methane. The following can be composted:

- Fruits and vegetables
- Eggshells
- Coffee grounds and filters
- Tea bags
- Nut shells
- Shredded newspaper
- Cardboard
- Paper
- Yard trimmings
- Grass clippings
- Houseplants
- Hay and straw
- Leaves
- Sawdust
- Wood chips
- Cotton and Wool Rags
- Dryer and vacuum cleaner lint
- Hair and fur
- Fireplace ashes

How to do Backyard Composting:

- Select a dry, shady spot near a water source for your compost pile or bin.
- Add brown and green materials as they are collected, making sure larger pieces are chopped or shredded.
- Moisten dry materials as they are added.
- Once your compost pile is established, mix grass clippings and green waste into the pile and bury fruit and vegetable waste under 10 inches of compost material.
- When the material at the bottom is dark and rich in color, your compost is ready to use. This usually takes anywhere between two months to two years.

How to do Indoor Composting:
If you do not have space for an outdoor compost pile, you can compost materials indoors using a special type of bin, which you can buy at a local hardware store, gardening supplies store, or make yourself. A properly managed compost bin will not attract pests or rodents and will not smell bad. Your compost should be ready in two to five weeks.

How to make a Worm Bin: https://www.epa.gov/recycle/how-create-and-maintain-indoor-worm-composting-bin

More information: https://www.epa.gov/recycle/composting-home

Procedure

Teacher preparation: Here are the instructions for how to use the Litter-free Digital Journal app and website in order to input your student's data. Either and both data entries can be used depending on if you want to use your smart device or a computer. The website will allow for more options when looking at the data (graphing, lists, downloads,…). The app seems to work easiest for data entry.

To download the Litter-free Digital Journal app on your smart device:

- Search for South Carolina Aquarium in your App store on your smart device
- Open the SC Aquarium Citizen Science App in your App store and download it for free
- Create an account with your email and a password
- Click on the Litter-free Digital Journal
- Add a picture to your profile and include information about yourself if desired
- You are ready to input your student's data!

To use the Litter-free Digital Journal anecdata website:

- Go to: www.anecdata.org
- Set up an account (or use the same information if you set up an account on your smart device)
- You can use either the website or the app to input data.

Materials

- Litter Report
- Chart paper/white board and markers
- Gloves
- 2 Trash bags per group (1 color for trash and 1 color for recycling)
- Recycle label
- Paper
- Color pencils
- Ruler
- Smart phone or computer

Procedure

1. To begin the litter investigation, invite the students to walk around the school grounds to observe and search for things that don't belong…like litter. Is there a lot? A little? How did it get there? Encourage them to record their observations in their Litter Report or science journal.

2. Discuss observations the students made about litter around the school and how the litter could affect the plants and animals. Explain that the plants and animals that live together around the school are known as a community, just like people living in the same town belong to a community. Ask the students to list some living things they observed that make up the community near and around the school. Trees, grass, squirrels, birds, insects, etc…

3. Introduce the concept of an ecosystem, and explain that an ecosystem is made up of all the members of the community (plants and animals) and the nonliving things (abiotic factors). Ask the students to list some of the nonliving things (abiotic factors) they observed around the school. Air, rocks, soil, sunshine, water, etc… Discuss how the nonliving things in the ecosystem affect the living things within the community.

4. Inform the students about the opportunity they have to help the ecosystem around the school, by taking part in a citizen science project! Breakdown citizen science to help the students understand what it means. Ask: What is a citizen? A member of a town, city, state, or community. Are we citizens? YES! We are members of our community in our town/city of _____. Ask: What is science? The study of nature and the way natural things act. So, to put it together, citizen science is the "study of the natural world done by members of the community."

*Oxford definition of citizen science: collection and analysis of data relating to the natural world by members of the general public.

5. Communicate that while the class conducts an experiment finding out **HOW MUCH** (quantitative data) of certain **KINDS** of litter is on their schoolyard, scientists from the South Carolina Aquarium are conducting similar experiments in ecosystems around the state and need help. You can explain that their data will be put into the computer and sent to scientists to analyze through a special Litter-Free Digital Journal app. The information is then used to make positive changes in the community. The information has been used to ban plastic bags in parts on Folly Beach and Mt. Pleasant, SC, and can be used to make more positive change. If desired, display pictures and graphs from the Litter-free Project through the Anecdata website (https://www.anecdata.org/projects/view/122/about) to get the students excited.

6. Discuss what is considered TRASH and what is RECYCABLE. Anything paper, most plastics, glass, or aluminum can be recycled. Food waste, snacks and lunch food left outside, will be put in the trash, however, could be composted. Personal belongings, such as jackets, hats, water bottles, lunchboxes, will go in the trash or the lost and found if salvageable. Trash, such as rope, wrappers, and straws will go into the trash bag. The recorder will record (tally) the types of litter found, with the help of the rest of the group members. Explain which bag is trash and which is recycling. You can put a recycling label on the recycle bag, if it helps the students. NOTE: The categories are listed to begin a discussion about different waste. Even though most of the personal belongings and food waste will be trash, there are alternative ways to dispose of them to reduce and/or reuse.

7. Assign groups of 4 and roles to each student within the group:

Recorder: writes a tally mark each time litter is picked up and sorted
Materials: holds the trash bag and recycling bag with gloves on, helps sort litter
Litter Gatherer: picks up the litter and puts litter in the appropriate bag with gloves on, helps sort
Seeker: on the lookout for litter and decides where to look, helps sort

8. Provide a few minutes for each group to formulate their hypothesis in the Litter Report or science journal. As a group, they should discuss which litter group (plastic, paper, aluminum, glass, trash) they think they will find the most of while collecting.

9. Review how to make tally-marks on the data sheet. *Note-categories can be changed if needed to what works best for the class

10. Review the materials and the procedure written on the lab report or ask students to record them into their science notebook. The following is already in the Litter Report:

Report Materials:

- Litter Report
- Pencil
- Clipboard or hard surface to write on
- Gloves
- 2 Trash bags per group (1 color for trash and 1 color for recycling)
- Litter-Free Graph Analysis

Report Procedure:

Step 1. Choose where the group will be collect litter.

Step 2. Assign roles within the group or understand the role assigned by teacher.

Step 3: Assemble supplies. One bag will be for trash and another bag for recycling. Personal belongings can be recorded and taken to your teacher.

Step 4. Collect litter found on the school grounds in the designated areas.

Step 5. Record each piece of litter on the data sheet with a tally mark.

Step 6. Properly dispose of collected litter.

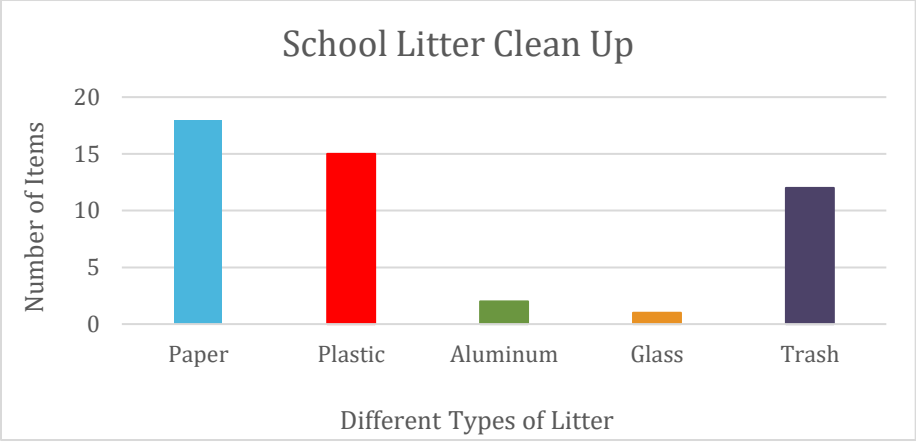
11. GO FOR IT!!! Collect litter on the schoolyard for 10-15 minutes or whatever time is allowed. Help the recorders put tally marks for each litter category. If manageable, take some pictures to upload with your data.

*Note- If classroom management is challenging outside, students can just pick up litter and put it into one bag. Sorting can be done in a more confined place together outside or inside, with gloves. Tally marks can then be done with more direct supervision. Every class is different J

12. Find a place to discard the litter and recycling and invite the students back inside to discuss their findings.

13. Ask each group to report what they found. Make a running tally on the chart paper/board. Remind the students that their findings are super important to finding solutions to litter and that you will put their findings into the computer for the South Carolina Aquarium Scientists to use.

14. To analyze the data, make a bar graph together as a class on the board using the class's data. Example:



15. Provide time for groups to make a bar graph of the data they collected in their group in their Litter Report. The students can look at the data in the graph to explain trends they found. They can also analyze and explain why they got the results they did.

16. Discuss their findings and conclusions using these questions.

- Why are the results of the experiment important?
- What can we do to help with the problem?
- Why is it important to have a litter free schoolyard?

You can discuss how the litter (an abiotic factor) affects the community of the plants and animals that live in the schoolyard. Animals could eat the trash and become sick. The trash could harm the ground making it hard for the plants to grow.

17. Lastly, talk about solutions to the litter that was found: REDUCE, REUSE, and then RECYCLE. Choose certain objects found and talk about ways to reduce and reuse the litter and if it can be recycled. Some examples:

- Plastic bottle- use a thermos/refillable water bottle that can be used over and over again
- Plastic bag- use a canvas or reusable bag
- Straw- don't use a straw, you don't need it
- Sandwich bag- use a reusable, washable container for food

18. Teacher or students: Input the data collected using the Litter-free App (see beginning of Procedure on how to create your account). Share with parents, colleagues, and students!

Follow-Up Questions:

- What can your school do to help with litter?
- What can you do at home to help with litter?

Assessment

Assessment #1:

Grade Litter Report.

Scoring rubric out of 100 points

Observations:	10 points
Hypothesis:	10 points
Data:	20 points
Graph:	20 points
Describe a trend:	10 points
Conclusion and Solution:	20 points
Participation:	10 points

Assessment #2:

Ask the students to analyze the graph of plastics collected and documented on the South Carolina Aquarium Litter-free journal website by filling out the Graph Assessment. The Graph Assessment Answer Key contains the scoring rubric out of 100 points.

Cross Curricular Extensions

STEM Extension
Begin a discussion about ways to reduce food waste. Read *Diary of a Worm* by Doreen Cronin. Make a worm bin for the class to collect food scraps for a month and see the transformation of waste to vermicompost!

Directions on making a worm bin: https://www.epa.gov/recycle/how-create-and-maintain-indoor-worm-composting-bin

STEAM Extension
Create recycled art collages using litter collected outside or "trash" collected in the classroom.

ELA Extension
Read *The Adventures of a Plastic Bottle: A Story About Recycling by Alison Inches,* which tells the story of recycling from the point of view of a funny plastic bottle. Students learn about the journey of the plastic bottle from the refinery plant, to the manufacturing line and beyond by reading diary entries from the bottle's personal journal.

Math Extension
Repeat the litter investigation 3-5 more times during the school year. Have the students create a line graph of the data throughout the school year and interpret the trends.

Field Trip Extension
Take your class to the recycling center. Most centers have tours available for students to visit.

Resources

Teacher Reference Books
Appelhof, Mary Arlene (2003). *Worms Eat My Garbage.* Flower Press.

Carlson, Laurie M (1993). *EcoArt! Earth-friendly Art & Craft Experiences for 3- to 9-year-olds.* Nashville, Tennessee: Williamson Books.

Humes, Edward (2013). *Garbology: Our Dirty Love Affair with Trash.* New York, New York. Penguin Group.

Johnson, Bea (2013). *Zero Waste Home: The Ultimate Guide to Simplifying Your Life by Reducing Your Waste*. New York, New York. Scribner.

Teacher Reference Websites
South Carolina Aquarium – Anedata website
This site is where trash data can be inputted as well as all data can be accessed. Shows pictures and has the ability to graph data. Data can also be inputted on the South Carolina Aquarium's Litter-free Digital Journal app by searching South Carolina Aquarium in your smart phones app store.
https://www.anecdata.org/projects/view/122/about

5 GYRES: Science to Solutions
This site offers information about plastic pollution and solutions to the problem.
https://www.5gyres.org/

Citizen Science Center
Learn how you can make a difference by doing real science to help solve our planet's most pressing problems.
http://www.citizensciencecenter.com

NOAA's Marine Debris Program
This site has information about marine debris, as well as activities and curricula.

https://marinedebris.noaa.gov

South Carolina DHEC – Marine Debris
This site has information on marine debris in South Carolina.
http://www.scdhec.gov/HomeAndEnvironment/docs/marine_debris.pdf
http://www.scdhec.gov/HomeAndEnvironment/Docs/SC_MARINE_DEBRIS_POSTER.pdf

Keep America Beautiful
Keep America Beautiful inspires and educates people to take action every day to improve and beautify their community environment.
https://www.kab.org

National Geographic
This National Geographic site offers beautiful pictures and captions of citizen science projects, as well as projects to get involved in.
https://www.nationalgeographic.org/encyclopedia/citizen-science/

United Stares Environmental Protection Agency
This government site provides basic information on ways to reduce and reuse materials.
https://www.epa.gov/recycle/reducing-and-reusing-basics

https://spaceplace.nasa.gov/science/en/#/review/science-fair/scientific-method.html

Student Books

Green, Jen (2005). *Why Should I Recycle?* Barron's Educational Series.

Richmond, Ben (2015). *Where Do Garbage Trucks Go?: And Other Questions about Trash and Recycling*. New York, New York: Sterling.

Seuss, Dr. (1971). *The Lorax.* New York, New York: Random House.