An Analysis of Science Instruction and Environmental Education in Virginia and Oklahoma

By: Megan Wing

Introduction

Global climate change poses one of the most pressing environmental and social challenges of the twenty-first century. Due to the severity of future climate change impacts on young people and the commitment of youth to climate change mitigation, the United Nations Framework Convention on Climate Change (UNFCCC) extended membership rights to youth NGOs to keep these groups informed, active, and engaged (United Nations Youth, n.d.) Additionally, UNESCO advocates for climate change education for children as a way to influence responsible behavior and teach students empathy. In response to international commitment to climate change education among young people, school administrators, curriculum specialists, and teachers of grades Kindergarten through twelve must increase climate change exposure and awareness for young students. Educators must consciously and carefully select materials and use instructional methods that promote science, rather than opinion, and introduce students to human-environment interactions.

In order to understand how science instruction, and specifically instruction targeting environmental and climate change science, in K-5 classrooms can help form students into responsible and conscientious global citizens, I looked specifically at science education in K-5 curriculum. I explored how the Virginia Standards of Learning (SOLs) currently include environmental education and climate change education and how the SOLs provide the potential for future climate change education. For comparison, and to understand how states other than Virginia value environmental science education in the elementary grades, I considered the current Oklahoma Academic Standards (OASs) for K-5 students. In this paper, I will present the opinions and research of experts in the field of science education, and I will share information I have compiled about instructional resources for teachers. I will also address how current standards in Virginia and Oklahoma invite environmental and climate science instruction in K-5 classrooms before presenting recommendations for teaching climate change science in elementary classrooms. Currently, state standards avoid explicit climate change themes and may limit the ability of educators to approach climate change in the classroom. When given autonomy over their own curriculum, educators can use science as an interdisciplinary subject in which students practice their reading, writing, and math skills as applied to a scientific theory, natural phenomenon, or scientific concept.

Through this project, I hoped to understand how scientists, politicians, and educational experts view climate change education for elementary students, organize current learning standards that relate to climate change education in Virginia and Oklahoma, highlight specific ways to incorporate climate change science into the classroom, and provide resources for teachers who desire to address climate change in their elementary classrooms.

Literature Review

Public education exists as a pillar of the American experience and the American Dream. However, not all young Americans have the same encounter with public education in the United States. An achievement gap exists within the American public education system, accentuating differences between groups of different racial, ethnic, socioeconomic, and political backgrounds, but science education and project-based learning can narrow the gap. The achievement gap results in noticeable differences in proficiency, growth, and resources between schools of high socioeconomic composition and schools that draw from neighborhoods of lower socioeconomic status (Walker-Tileston and Darling 2008; Roscigno, et al. 2006). The difference in resources, teacher quality, funding, and state accreditation between rich and poor schools could pose discrepancies in science instruction across a state, because poor schools generally have lower test scores and thus require more emphasis on reading, writing, and math instruction (Walker-Tileston and Darling 2008; Roscigno, et al. 2006). Schools within urban areas generally draw from neighborhoods housing residents of lower socioeconomic status than suburban schools, introducing differences in funding, resources, and teacher quality between urban and suburban schools (Walker-Tileston and Darling 2008; Gulson and Symes 2007; Roscigno, et al. 2006). Individuals, like Michelle Obama, and organizations, such as City Corps and Teach for America, have committed themselves to a social movement for educational equality. However, in order for the education system to experience sustainable changes on the national scale, state officials making decisions about state education standards, school districts, and teacher training and benefits must commit themselves to more equitable distribution of resources and more autonomy for educators.

The observed achievement gap cripples the entire nation, and regional officials have attempted to combat the gap in student achievement, parental involvement, and student attendance by using project-based learning. Project-based learning takes a real-world problem or question and has students solve the problem while using prior knowledge and learning new skills and concepts (Wolpert-Garwon 2015). While the research on project-based learning remains divided and fluid, individual educators and entire schools in the Richmond area have utilized project-based learning to increase graduation rates, student attendance, student motivation, and student achievement. According to Rob McAdams (2016), the founder of Partners in the Arts, project-based learning that ties art and science into math, reading, and writing increases student engagement, investment, and achievement. According to McAdams, Richmond Community High School experienced a dramatic increase in standardized test scores in all subjects, including reading, writing, and math, as a result of their project-based learning curriculum.

From Kindergarten through twelfth grade, science education remains important, and good science instruction in elementary school allows for a greater understanding of science material in more advanced middle and high school courses (Matkins and Bell, 2007). In many states, teachers receive minimal science education themselves, making it hard for them to effectively administer the science curriculum to their students, so states must provide more comprehensive

science training for teachers (Turner 2016; Matkins and Bell, 2007). Nationally, science education, and specifically climate change science, needs more time and focus within public schools. Education World and National Public Radio (NPR) suggest that teachers fear resentment from parents, criticism from colleagues, and challenges from school board members as a result of climate change education in their classrooms (Gorman 2016). The restrictive nature of state standards prevents teachers from approaching climate change in the classroom. For example, since Virginia SOLs for K-5 science do not clearly address climate change, teachers have to find ways to naturally insert climate change education into a lesson aimed at a different, maybe unrelated, standard (Rogers, 2017). Additionally, state standards for science instruction do not always reflect best practice; rather public education officials favor common, rigid, and tested instructional approaches over new, creative, and adaptable approaches, which are best for students (Spillane and Callahan 1999). In response to a need for more climate education for young children, government and non-government organizations have released free climate change materials for teachers. Below are some resources available to teachers and science curriculum specialists to help educate teachers about environmental and climate science and provide instructional materials:

- *The Down-to-Earth Guide to Global Warming*, book by Laurie David & Cambria Gordon (2007)
- NASA's Climate Kids guide: https://climatekids.nasa.gov/menu/teach/
- The National Science Foundation Earth and Environment Class Resources: https://www.nsf.gov/news/classroom/earth-environ.jsp
- Green Schools National Network, evidence-based models for healthy, green, sustainable schools: http://greenschoolsnationalnetwork.org/
- Environmental Education Activities and Resources from the National Education Association: http://www.nea.org/tools/EnvironmentalEducationActivitiesAndResources.html

The nationwide movement towards state standards and high-stakes standardized tests over the last 100 years has decreased teacher autonomy and creativity in the subject of science. The creation of state science standards fuel curriculum and district pacing guides, even though research suggests the public officials who create the state standards more often choose common, rigid, and tested instructional approaches as opposed to new, creative, and adaptable approaches (Spillane and Callahan 1999). Additionally, research indicates that state science standards remain form-focused, which address the educational material required, rather than function-focused, which addresses how students learn the material and use the material they learn functionally (Spillane and Callahan 1999). The movement to standardize science instruction in a way that suppresses problem solving, trial and error, creative thinking, and hands-on experiments hinders teacher creativity and differentiation to meet the needs of individual students. As state politics continue to change and restrict teachers, science instruction, which relies on creativity, student exploration and discovery, and trial and error, may suffer significantly from standardization.

Methods and Background

In order to assess the current state of science instruction in the state of Virginia, I reviewed the Virginia Standards of Learning (SOLs) for K-12 science and compiled the K-5 science standards related to environmental science and climate change science. I used lesson plan ideas found online to consider how the K-5 science SOLs identified as related to environmental science could be taught in an elementary classroom in order to introduce students to climate change. I used two SOLs to create a sample lesson plan, which can be found in the Appendix, that I will make available to K-5 educators in the state of Virginia.

For comparison, and due to my future role as an elementary school educator in the state of Oklahoma, I also reviewed the Oklahoma state standards for K-12 science. I looked for commonalities between Virginia and Oklahoma standards and identified instructional areas consistent across states. As with Virginia, I identified standards for K-5 science that relate to environmental science or climate change science. I envision using these standards to introduce my students to climate change and environmentalism, so I outlined ideas for individual lessons or entire units on climate change that address certain science standards.

For insight into the Virginia K-12 science curriculum, I relied heavily on my first-hand experience as a student in the Virginia public school system during grades four through 12, as well as my experience as a classroom volunteer in a Henrico County elementary school since September 2016. I also conducted informal written surveys with five University of Richmond students who have worked in Henrico County Public Schools or Richmond City Public Schools during their time at the University. Finally, I interviewed Marsha Rogers, an Elementary science Teacher Consultant for Chesterfield County Public Schools in Virginia, to learn more about her role as a science Teacher Consultant and how she views climate change education.

Results

In the state of Virginia, each grade has between eight and ten standards for science instruction. As illustrated in Table 1, many Virginia science SOLs for K-5 students lend themselves towards lessons surrounding environmental science or climate change science, but whether or not individual lessons address climate change or environmentalism depends on district pacing guides, school curriculum models, and individual teachers. If a teacher does not feel confident with leading a lesson on climate change in regards to the relationship between the sun and the Earth (1.6) or the ocean environment (5.6), then that teacher is likely not going to create a lesson addressing these standards with climate change as the global theme. Additionally, some teachers may feel that the standards limit their ability to teach environmental science or climate science in the classroom, since some standards are very specific. Many standards have sub-standards within the overarching standard, and some teachers may find the specific material within each standard to limit lesson creativity and their ability to address global themes, such as climate change.

Environmentalscience.org, a large organization that works to promote careers in the field of environmental science, collect and disseminate scientific research about the environment, and advocates for environmental education, defines environmental education as: "the study of the effects of natural and unnatural processes, and of interactions of the physical components of the planet on the environment" (2017). According to this definition, Virginia addresses environmental education in "a spiral alignment," meaning the elementary science curriculum builds on environmental concepts and methods every year (Rogers, 2017). The Reporting Categories called Life Processes and Living Systems and Earth/Space Systems and Cycles most clearly address environmental and climate change education (Rogers, 2017). While the Virginia K-5 science SOLs do not explicitly address climate change, there is room to work climate change education and awareness into a lesson that directly addresses a SOL (Rogers, 2017).

In Oklahoma, state officials also create standards for each grade level within each subject area. As shown in Table 2, many Oklahoma science standards relate to environmental science or climate change. Starting in Kindergarten, teachers can discuss energy flow and transfers within ecosystems (K-LS1-1) and resource consumption by humans and plants (K-ESS3-1), which relate to human-environment interactions and the global theme of climate change. Interestingly, Oklahoma standards do lend themselves to environmental science instruction and climate change education in elementary school, despite the state's economic interest in fossil fuel extraction and use. The inclusion of key climate change considerations in the elementary science standards could be explained by federal requirements for science instruction at the elementary level. Although states make state-specific decisions on pacing guides and curriculum development, state officials must consider and adhere to federal standards when creating state standards.

Personal observations from Highland Springs Elementary School in Henrico County, Virginia reveal interesting trends in science instruction at the elementary level. Ultimately, teachers, principals, and curriculum specialists prioritize reading and math instructional time over science. In second grade, about five hours of each day are devoted to reading, writing, math, guided reading, and reading intervention, while only 30 minutes a day are set aside for science. Additionally, second grade teachers have science instruction at the end of the day, so when something needs to get cut from a daily schedule, science or social studies is withheld. Even though the schedule does not prioritize science, students really enjoy science lessons, specifically when teachers use experiments and hands-on lessons. The material and instructional approach differ from that of reading, writing, and math, and students enjoy learning about real-world science problems through an interactive lesson. Due to limited science training for teachers, many teachers rely heavily on instructional materials created by other teachers. Most schools do not have reliable science specialists, even though they fund reading and math specialists for intervention and extension. Finally, students in Kindergarten through fifth grade do not have state standardized tests for science in Virginia. If teachers truly "teach to the test" or prioritize teaching concepts that will be tested and assesses, they will not prioritize science, especially when considering that tests that measure academic growth (PALS and MAP tests) in lower elementary do not address science or social studies; only math, reading, and writing.

Table 1. Virginia K-5 Science SOLs related to environmental science and climate change.

Grade	Standard
Kindergarten	K6. Living and non-living things
	K7. Basic needs for life and life processes of plants and animals
	K9. Repeating patterns in daily life
	K10. Change occurs over time
	K11. Reuse, recycle, conservation
First	1.4 Basic life needs of plants and classification of plants
	1.5 Animals and humans have basic needs
	1.6 Relationship between the sun and Earth
	1.7 Weather and seasonal changes
	1.8 Natural resources are limited
Second	2.4 Animal and plant life cycles
	2.5 Living things as part of a system
	2.6 Changes and patterns in weather and common storms
	2.7 Impact of seasonal and weather changes on plants, animals, and their environments
	2.8 Plant ecosystem services and ecological importance
Third	3.4 Adaptations allow animals to meet their needs and respond to changes in the environment
	3.5 Relationships among organisms in aquatic and terrestrial food chains
	3.6 Ecosystems support diverse plant and animal life; all living things compete for resources
	3.7 Composition and importance of soil to plants and animals
	3.8 Natural cycles: night/day, seasons, phases of the moon, tides, animal and plant life cycles
	3.9 Importance of water cycle for plant and animal life
	3.10 Natural events and human actions can affect the survival of other living things
	3.11 Sources of energy: sun, renewable, nonrenewable
Fourth	4.4 Basic plant anatomy and life processes, such as reproduction and photosynthesis
	4.5 Relationships between plants, animals, and nonliving ecosystem components
	4.6 Prediction of weather and storms
	4.7 Solar system organization
	4.8 Relationships between the moon, Earth, and the sun
	4.9 Virginia natural resources- plants, animals, watersheds, water resources, minerals, rocks
Five	5.5 Organisms comprised of more than one cell; cellular composition of living things determine survival
	5.6 Ocean environment
	5.7 Constant change of Earth's surface- rock formation and rock types, rock cycle, fossils, Earth's core, plate tectonics, human impact on the Earth's surface

Table 2. Oklahoma K-5 standards related to environmental science and climate change.

Grade	Standard
Kindergarten	K-LS1-1 Energy flow of organisms: animals get food and energy from plants and other animals
	K-ESS1-1 Difference between weather and climate; measurement of weather and climate
	K-ESS2-2 Plants, animals, and humans change their environments
	K-ESS3-1 Living things, including humans, use natural resources to live
	K-ESS3-2 Weather forecast and geographic trends in severe weather
First	1-LS1-1 Plant and animal structure
	1-ESS1-1 Motion of the sun, the moon and stars
	1-ESS1-2 Seasonal patterns in solar system and sunrise/sunset
	1-ESS3-1 Human actions impact the environment; humans can make choices to reduce impact
Second	2-LS2-1 Plants need water and sunlight to grow
	2-LS2-2 Relationship between plants and animals (pollination for reproduction)
	2-LS4-1 Biodiversity in plant and animal life across land and water
	2-ESS1-1 Change over time on Earth: slow and fast changes
	2-ESS2-1 Processes that change Earth: wind, water, erosion
	2-ESS2-2 Maps showing land and water
	2-ESS2-3 Water exists in oceans, rivers, lakes and ponds as a liquid and as ice
Third	3-LS1-1 Plant and animal life cycle and reproduction
	3-LS3-2 Environment affects traits that organisms inherit and develop
	3-LS4-3 Species of plants and animals survive better in certain environments
	3-LS4-4 Response of living things to changes in environment: migrate, adapt, die
	3-ESS2-1, 3-ESS2-2 Weather and climate, patterns, predictions, and records
	3-ESS3-1 Humans cannot stop natural hazards but can reduce their impacts
Fourth	4-ESS1-1 Rocks as records of past natural processes and events
	4-ESS2-1 Rainfall shapes the land and affects living things
	4-ESS2-2 Plate tectonics, physical features of the land, maps to locate features
	4-ESS3-1 Energy used by humans come from natural resources; not all resources are renewable
	4-ESS3-2 Natural processes result in hazards; humans can reduce impact
Fifth	5-LS2-1, 5-LS2-2 Healthy ecosystems provide all the needs for survival of plants and animals
	5-ESS1-2 Earth orbit around sun causes day and night, months, seasons, year
	5-ESS2-1 Geosphere, hydrosphere, atmosphere, biosphere
	5-ESS3-1 Human activities have major impacts on Earth systems, resources, and processes

A look at current science standards in Virginia and Oklahoma reveals an opportunity for climate change science extension in line with current learning standards. Even though neither state has standards that explicitly require teachers to introduce students to climate change, many existing standards can incorporate climate change themes if prioritized by curriculum specialists and teachers.

Discussion

Currently, both Virginia SOLs and Oklahoma OASs have the ability to accommodate more environmental education and climate change education. The two states have similar standards required for elementary science mastery, even though the order of the standards differs. A comparison of the science standards in Oklahoma and Virginia regarding environmental science or climate science concepts reveals that Oklahoma standards introduce students to environmental science concept earlier than Virginia standards. In Kindergarten Oklahoma standards introduce students to the definitions of weather and climate and the differences between the two concepts (Table 2), but Kindergarteners in Virginia do not learn the difference between climate and weather (Table 1). While first graders in Oklahoma learn that human actions impact the environment and can threaten the survival of other living things (Table 2), elementary students in Virginia do not learn the same concept until third grade (Table 1). The difference between the order of standards in Virginia and Oklahoma probably only indicates the structure of each state's pacing guide, but interestingly, Oklahoma educators are exposing their students to environmental science and critical factors of climate change earlier than educators in Virginia. If educators strive to form their students into responsible global citizens from the beginning, Virginia should adopt a curriculum and standards with more emphasis on human-environment interactions in Kindergarten and first grade.

The importance of climate change education in elementary school increases daily, as each day people in the developed world make lifestyle choices that negatively impact the global climate, global economy, and people in the developing world who are helpless to mitigate the affects of a changing climate. The United Nations Educational, Scientific and Cultural Organization (UNESCO) (n.d.) advocates for climate change education for young people on the basis that education leads to the behavior changes that remain necessary for large-scale climate change mitigation. According to UNESCO (n.d.), climate change education "helps young people understand and address the impact of global warming, encourages changes in their attitudes and behavior and helps them adapt to climate change-related trends." UNESCO and other government and non-government organizations, including the National Science Foundation, National Public Radio, and National Geographic have expressed the importance of climate change education and environmental activism among the world's children. If government and non-government experts can agree that children should engage with climate change education and environmental awareness, and we know that teachers are the primary source of a child's

information, educators and educational officials at the state level must respond with an increased commitment to environmental education starting in elementary school.

Until state standards and curriculum guides reflect the need for more environmental education in elementary classrooms, individual teachers can provide climate change education, promote activism, and instill a sense of responsibility and stewardship among his or her students. Teachers can grow plants in their classrooms, request student help caring for the plants, or start a school garden with student helpers. Additionally, teachers could initiate a semester-long project-based learning curriculum around plants, incorporating science standards related to plants, math standards related to measurements and recording data, and writing practice. Individual science lessons can introduce students to climate change if the teacher frames the lesson around the global theme of climate change, as seen in a model lesson for a Virginia second grade science SOL on plants (Appendix 1). Teachers can promote stewardship, environmental responsibility, and conservation in their classroom by making the room a green classroom. Simple graphics, as seen in Appendix 2, can help educate students about the difference between trash and recycling and how to making Earth-friendly choices. Available to teachers, *The Down-to-Earth Guide to Global* Warming by David and Gordon, has a section on how to create a green classroom and green elementary school. By incorporating global perspectives into their classroom lessons and discussions, teachers can help students think about the global scale of their actions. School administrators and teachers could create service projects related to environmentalism, like a school cleanup day or a tree-planting day. Ultimately, administration and educators can work towards creating an ethic of environmentalism, activism, and social responsibility in their classrooms and their schools by introducing students to climate change starting in Kindergarten and continuing the conservation through high school.

Conclusion

While state standards can limit teacher creativity and classroom differentiation, the Virginia SOLs and the Oklahoma OASs for K-5 science instruction remain broad enough to lend themselves to climate education, but school-based and county-based curriculum specialists and classroom teachers must prioritize climate education within the standards. Individual educators, school leaders, and county-level curriculum specialists have a lot of power to determine what students learn, how they learn the information, and how they react to global issues, such as climate change. With the negative impacts of climate change spanning all corners of the globe, the next generation of learners and leaders, the young students of the world, need to consider climate change and how they can address climate challenges. Teachers and school leaders can help create informed citizens and environmental advocates who can help mitigate the negative impacts of climate change in the future.

Science education gets overlooked and overshadowed by math and reading due to heavy emphasis on literacy and math proficiency by state standardized tests. However, science

introduces a hands-on, real-world platform for teachers to present math, reading, and writing instruction in their classrooms. More emphasis on science training for teachers and on science instruction in K-5 classrooms is critical to addressing and communicating climate change and other scientific phenomenon. The scientific method and scientific inquiry present logical frameworks for asking hard questions, testing possible solutions, and formulating new ideas. Science transcends all political, geographic, and socioeconomic barriers, as well as all instructional areas and methods, suggesting that science education demands more attention and rigor in the nation's K-12 curriculum. Furthermore, as global climate change challenges individuals, societies, and governments more over time, the importance of exposing young students to scientific thinking and problem-solving and climate change themes will increase. THE UNFCCC and UNESCO have identified young people across the globe as critical to climate change mitigation and global cooperation over addressing climate change. State education officials, school administrators, curriculum specialists, and teachers should reflect the urgency of the United Nations to engage young people in climate change issues, considerations, and solutions.

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Appendix

1. Lesson Plan Outline for 2nd grade Virginia Science SOL as it relates to climate education

Grade Level/Subject: 2nd grade Science
Number of Students: Entire class
Introduction
Lesson topic: Ecosystem services of plants- provide oxygen, homes, and food for many animals
Length of Lesson: 1 lesson, about 25 minutes
VA Standards of Learning: 2.8 c: The student will investigate and understand that plants produce oxygen and food, are a source of useful products, and provide benefits in nature. c) plants provide oxygen, homes, and food for many animals
Context: This lesson would be best at the end of the second grade science curriculum for the year, because it assumes students already understand the difference between plants and animals, what plants and animals require for life, the concept that animals and plants are part of a system, the idea that habitats change over time due to many influences.
Global Themes: Since humans are animals, we rely on plants for oxygen, resources to build things, and food. As the global climate changes, the habitat, jobs, and food sources of plants will change, so climate change threatens both plants and animals.
Content Objectives
Students will:
· Be able to define ecosystem services and give examples of ecosystem services
· Be able to explain the importance of plants providing oxygen, homes, and food for animals
· Be able to explain how human and animal life would be different with the ecosystem services provided by plants

Assessment Aligned to Objectives
Formative
· At the beginning of the lesson, have the class write on a notecard one reason why plants are important. The teacher can collect them to read later or have students call their answers aloud.
· Key words to review during the lesson: ecosystem, life cycle, system, ecosystem service, habitat
Summative
· Ecosystem services quiz- two photos of ecosystem with plants removed from the photo; ask students to study the photo, write the difference, and write how the ecosystem would be changed. This will test whether or not the individual students understand the importance of plants for other living things.
· Have a section on the unit test about the definition of ecosystem services, what ecosystem services plants provide to humans and animals, how human life would be different without plants, and how global climate change threatens plants.

Materials/Technology and Advanced Preparation

· Notecards for the formative assessment

· Ecosystem model for each student made out of colored paper

  · Brown paper for the background (to represent the soil), bodies of water cut in blue paper (river, lake, pond, etc.), trees cut in green paper (deciduous and coniferous trees), grass and shrubs cut from green paper, animals cut out of colored paper or photos of animals printed from the internet and cut out (i.e. insects, earthworms, bird, deer, humans)

**The idea is to have an entire food web represented in order to manipulate elements of the ecosystem and expect changes

Teaching and Learning Sequence

TIME	TEACHER ACTIONS	STUDENT ACTIONS
Introduction/Anticipatory Set		
5 minutes	· Ask class: what is a plant? · Ask class: examples of plants? · **Today we will explore why plants are important to animals. We will see how other plants and all animals rely on plants for food, shelter, and oxygen.** · Distribute note cards- one to each student · Ask students to write one reason why plants are important	· Describe plant aloud to class when prompted by teacher · Give examples of plants when prompted by teacher · Read "I Can" statements aloud with the teacher and the class · I can: explain why plants are important to animals, identify the ecosystem services provided by plants, guess what would happen if plants were not a part of the ecosystem. · Write one reason why plants are important on note card · Call reason aloud when prompted by teacher
Lesson Development		
15 minutes	· Distribute ecosystem models to individual students, pairs, or small groups · Ask students to lay down all the ecosystem elements at one time and explain what they observe. · Define ecosystem: all living things, plants	· Observe ecosystem. · Call aloud observations when prompted by teacher · Copy into notebook the definition of ecosystem · Observe ecosystem without the plant

	and animals, in a given area and the nonliving things they interact with · Explain how the system works together · Ask students to remove worms from the ecosystem. · Ask students to predict what happens to the ecosystem without the worms · Without worms, the birds do not have a source of food, and they will eventually die. · Ask students to remove plants- trees, shrubs, and grasses and then predict what will happen without the plants. · Without plants, the animals do not have fresh oxygen to breathe, deer and humans do not have a source of food, and birds, worms and insects do not have a habitat. · Define ecosystem service: the benefits animals and people get from the living things in the ecosystem · What happens to ecosystem without plants? · What happens to plants if their habitat and food change or disappear? · Why are plants important to the ecosystem?	· Predict what happens to the ecosystem without the plant · Call aloud my prediction when prompted by the teacher · Copy definition of ecosystem service into notebook · Manipulate ecosystem as instructed and answer teacher questions when prompted. · Make verbal and written observations.
Closure/Global Theme		
5 minutes	· Animals and humans need plants to live- we need oxygen, food, and a home · If plants disappear, so do animals · Climate change: changes in climate patterns, including temperature, rain, winds, and ocean levels · Happening all over the globe, and when temperatures get hotter and plants get less rain; it will be harder to survive. · Humans need plants to survive, so plant survival is important.	· Copy definition of climate change into notebook · Respond how we can help plants when prompted by teacher · Think about ways we can help plants at home and at school

	· We should protect plants we see- how? · Don't step on plants to pull them out of the ground; ask your parents if you can plant some plants at your house. · Plants are helpful to humans, so let's be helpful to plants.	

Homework: draw 2 ecosystems- one with plants and one without plants and label the ecosystem services in your picture

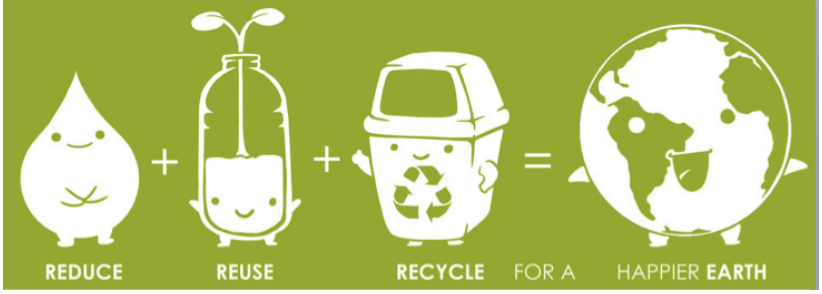
2. Graphics that serve as templates or models to encourage classroom mindfulness, sustainability, and activism

You can help make the Earth happier

REDUCE how much water, electricity, and gas you use and how much food you waste

REUSE plastic bags, paper bags, plastic containers, and shopping bags

RECYCLE paper, plastic, aluminum foil and soda cans, and glass



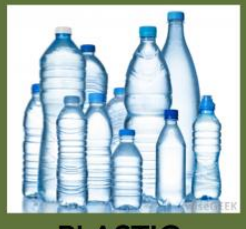
TRASH

STYROFOAM

FOOD WRAPPERS

CONTAINERS WITH LEFTOVER FOOD

RECYCLE



PLASTIC

CARDBOARD

GLASS

METAL

PAPER