# STEM Science

## An Integrated Science, Technology

### ***E****ngineering****,*** *and* ***M****athematics Unit*

**Grade: 5**

Greening the Schoolyard

How to Become a Maryland Green School

**j0281188**

Baltimore County Public Schools

**Maryland**

**Baltimore County Public Schools**

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**Foreword**

All children are learners, and the innate drive within them to learn must be constantly encouraged and nurtured, never stifled. To adequately fulfill the right of our students to quality education, the various courses of study in the school system must and will continue to manifest rigorous content and competencies that every student is expected to achieve. In recent years, education in Baltimore County has undergone a seismic shift in certain areas, such as increasing diversity, workforce demands, and emerging technology. The school system is committed to meeting those changes as opportunities to further adhere to the highest standards and provide all students the best education possible. Having a strong curriculum focused on 21st Century learning skills is the foundation for preparing students to compete in a global society.

Today, education is a multi‑dimensional process. Still, the primary goal of education is the preparation of students to become self-sufficient individuals who, while pursuing their own objectives in life, will contribute to the betterment of society. This aim incorporates the ideal that education will enable people to attain personal fulfillment through learning as well as adopt responsibilities for others and their total environment. Essentially, education should assist individuals in enriching their lives to the best of their abilities, expanding their horizons and world visions and fulfilling their roles as citizens. More importantly, education must prepare students to be active "learners" for the entirety of their lives.

Curriculum comprises the framework upon which instruction and learning occur.

Many often choose to view curriculum as the product of a bunch of "what's good for” statements: what’s good for the individual, what's good for the community, what's good for business, what's good for the country, what's good for society and culture, and so on – sometimes forgetting what’s good for students. And though input from all of the aforementioned sources is necessary in developing curriculum, educators must always keep in mind that learning is not the sole possession of schools or the classroom. Accordingly, curriculum should increasingly attend, among other demands, to students’ need to increase creative and strategic thinking and learning skills. For with such skills, students will continue the learning process far beyond their classroom environments and into their future years.

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STEM Science

(An Integrated **S**cience, **T**echnology,

**E**ngineering and **M**athematics Unit)

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**Rationale**

Baltimore County Public Schools provides a science curriculum which incorporates hands-on, minds-on experiences as an integral part of the elementary program. Students are given opportunities to be directly involved with the scientific method and essential parts of observing, classifying, comparing, using numbers, predicting (based on patterns), measuring (with standard units), sequencing, collecting evidence, and inferring. These skills are facilitated through teacher or student demonstrations. The unit provides opportunities for the student to demonstrate problem solving behaviors, including critical and creative thinking, and may be added to a student portfolio documenting GT targeted behaviors. Written instructional materials are used to supplement the program.

All activities and instruction are developed in accordance with the Voluntary State Curriculum as well as AAAS/Science Benchmarks levels of readiness learning. BCPS Elementary Science is based upon a program which:

* promotes the development of reasoning and problem-solving skills
* allows for the integration of current issues that interest and motivate students
* fosters an understanding of appropriate scientific terminology
* utilizes performance-based instruction and assessments

**Unit Timeline**

Estimated Unit Length

Twelve to Fifteen 50 minute class sessions

Suggested Timeline in the Classroom

|  |  |
| --- | --- |
| Day 1 | Pre-assessment/Activity 1 |
| Day 2 | Activity 2 |
| Days 3-4 | Activity 3 |
| Day 5 | Activity 4 |
| Day 6 | Activity 5 |
| Days 7-8 | Activity 6 |
| Day 9 | Activity 7 |
| Days 10-12 | Activity 8 |
| Day 13 | Unit assessment |

**Implementation of the Curriculum**

The unit pre-assessment should be scored but not graded for the students. The data obtained from the pre-assessment should be used to lead instruction and to determine student growth through comparison with the unit assessment.

Ancillary materials, such as the Parent Trifold, vocabulary cards, and additional resources, may be found on the Unit BCPS INTRANET, and on the BCPS Intranet web site at <https://intranet.bcps.org/offices/elem_science/grade5.html>.

Materials for the unit are found in the Materials Kit.

**How to Use this Curriculum Document**

The science STEM unit in this guide is based on the Maryland State Curriculum. It contains a Pre-assessment, Short Cycle assessment, and an Embedded Unit assessment, lesson objectives with a formative assessment of each objective, and lesson plans reflective of the “5E Lesson Plan” format. The Unit Overview contains Teacher Background Information, a Materials list for each activity, and Activity Preparation Suggestions, and Unit Vocabulary. The guide also provides a list of pre-requisite skills and possible student preconceptions. Teachers will also find a list of books that may be added to a classroom library, and a comprehensive list of technology resources that may be used to provide additional information for students and teachers. Teachers are strongly encouraged to review these prior to teaching the unit as part of their lesson preparation.

Differentiation strategies are suggested throughout this guide. The strategies provided suggest additional ways to help meet the learning styles and needs of all students. The differentiation suggestions are clearly marked within the Teacher Implementation Guide using the following special bullets:

* Education That is Multicultural−identified in the curriculum as **“Teacher,**

**please note:”**

* English Language Learners …**ELL students**
* Gifted and Talented … **GT students**
* Instructional Technology
* Special Education **… Students requiring additional support**
* Infused Reading strategies
* Infused Writing strategies

Learning preferences (see chart below) are identified in the “Activity Specific Implementation Information and Differentiated Teaching Strategies”. For additional information please refer to “The Guide For Inclusive Education”, BCPS-2004, pp 27-31. (Appendix 3)

|  |  |
| --- | --- |
| * *Visual* | * *Auditory* |
| * *Kinesthetic* | * *Tactile* |
| * *Field Dependent* | * *Active* |
| * *Field Independent* | * *Reflective* |
| * *Global* | * *Sequential* |

Due to the unique nature of our guides, excessive differentiation strategies have been provided. It is not intended for any teacher to try to incorporate **ALL** of the given strategies, but rather to select the most appropriate.

Greening the Schoolyard

|  |  |
| --- | --- |
| Unit Overview | |
|  | |
| Grade/Content Area | Grade 5 Science |
| Unit Title | *Greening the Schoolyard* |
| Theme Statement | *Greening the Schoolyard* is a fifth grade unit designed to be taught to develop understanding of environmental science and the concepts of conservation of natural resources, and the consequences, both positive and negative, of human actions on the natural environment. |
| Unit Scenario | The Baltimore County Executive has issued a challenge to all Baltimore County Schools to become Maryland Green Schools. Maryland Green Schools are special schools that have been recognized for exceptional efforts in learning about the environment and conserving resources both inside and outside the school.  Maryland Green Schools fly a special flag to show the neighborhood that they are a Green School. Maryland Green Schools also receive free trees, books and resources for the school library, a cash award for the school, and a plaque.  Your principal has decided to accept the challenge to make your school a Maryland Green School, and has asked your fifth grade class to help. You will need to learn about renewable and nonrenewable natural resources, how you can make a difference by conserving those resources, and the consequences of human activities on the natural environment. Finally, you will apply what you have learned to plan and design a habitat restoration in your schoolyard.  Good luck on making your school a Maryland Green School! |
| Key Concepts  Unless otherwise noted, all lessons are essential and should be taught. | |  |  |  |  | | --- | --- | --- | --- | | **Lesson Titles** | **Key Concepts/Big Ideas Addressed in Lessons** | **Alignment Information**  Maryland State Curriculum | **Brief Description or Overview** | | Activity 1 | Unit preassessment and schoolyard health assessment | 6.B.1.a | Students will assess their schoolyard to determine its overall health. | | Activity 2 | Natural, renewable, and nonrenewable resources | 6.A.1.a  6.A.1.b  6.A.1.c | Students classify natural resources as renewable or nonrenewable. | | Activity 3 | Conservation, reduce, reuse, recycle | 6.B.2.a | Students explore the three R’s of conservation, reduce, reuse, recycle in order to draft a proposal to create a school wide paper recycling plan. | | Activity 4 | Conservation of electricity | 6.A.1.a  6.B.1.a | Students explore the importance of conserving electricity. | | Activity 5 | Air pollution | 6.B.2.b | Students will investigate air pollution and its effects. | | Activity 6 | Water pollution and conservation | 6.A.1.b  6.B.2.b  6.B.1.a | Students will investigate the water supply, water pollution and its effects, and ways to conserve water. | | Activity 7 | Land pollution | 6.B.2.b  6.B.1.a | Students investigate land pollution, its effects, and waste management. | | Activity 8 | Butterfly garden design | 6.B.2.a | Students will plan and design a butterfly garden using plants native to Maryland. | |
| Alignment | Alignment with the State Curriculum Indicators in Science Grade 5  A. Natural Resources and Human Needs  1. Recognize and explain how renewable and nonrenewable natural resources are used by humans in Maryland to meet basic needs.   1. Identify and compare Maryland’s renewable resources and nonrenewable resources.   b. Describe how humans use renewable natural resources, such as plants, soil, water, animals.  c. Describe how humans use nonrenewable natural resources, such as oil, coal, natural gas, minerals, including metals.  B. Environmental Issues  1. Recognize and explain that decisions influencing the use of natural resources may have benefits, drawback, unexpected consequences, and tradeoffs.  a. Identify and describe personal and community behaviors that waste natural resources and/or cause environmental harm and those behaviors that maintain or improve the environment.  2. Recognize and describe that consequences may occur when Earth’s natural resources are used.  a. Explain how human activities may have positive consequences on the natural environment.   * Recycling centers * Native plantings * Good farming practice   b. Explain how human activities may have a negative consequence on the natural environment.   * Damage or destruction done to habitats * Air, water, and land pollution |
| Estimated Unit Length | 12-15 50 minute class sessions |
| Suggested Timeline in the Classroom | |  |  |  | | --- | --- | --- | | **Day** | **Activity** | **Activity Description** | | 1 | Pre-assessment and Activity 1 | Students will assess their schoolyard to determine its overall health. | | 2 | Activity 2 | Students classify natural resources as renewable or nonrenewable. | | 3-4 | Activity 3 | Students explore the three R’s of conservation, reduce, reuse, recycle in order to draft a proposal to create a school wide paper recycling plan. | | 5 | Activity 4 | Students explore the importance of conserving electricity. | | 6 | Activity 5 | Students will investigate air pollution and its effects. | | 7-8 | Activity 6 | Students will investigate the water supply, water pollution and its effects, and ways to conserve water. | | 9 | Activity 7 | Students investigate land pollution, its effects, and waste management. | | 10-12 | Activity 8 | Students will plan and design a butterfly garden using plants native to Maryland. | | 13 | Unit assessment | Students will take the summative unit assessment. | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Skills/  Strategies and Differentiation | |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Differentiation strategies are suggested throughout this guide. The strategies provided suggest additional ways to help meet the learning styles and needs of all students. The differentiation suggestions are clearly marked within the Teacher Implementation Guide using the following special bullet: ⁂.  The differentiation strategies listed below were developed by “The Elementary Differentiation Team.”   * Education That is Multicultural—identified in the curriculum as **“Teacher,**   **please note:”**   * English Language Learners …**ELL students** * Gifted and Talented … **GT students** * Instructional Technology * Special Education **… Students requiring additional support** * Infused Reading strategies * Infused Writing strategies   Learning preferences (see chart below) are identified in the “Activity Specific Implementation Information and Differentiated Teaching Strategies”. For additional information please refer to “The Guide For Inclusive Education”, BCPS-2004, pp 27-31.   |  |  | | --- | --- | | * *Visual* | * *Auditory* | | * *Kinesthetic* | * *Tactile* | | * *Field Dependent* | * *Active* | | * *Field Independent* | * *Reflective* | | * *Global* | * *Sequential* |   Due to the unique nature of our guides, excessive differentiation strategies have been provided. It is not intended for any teacher to try to incorporate **ALL** of the given strategies, but rather to select the most appropriate. | |
| Prior Knowledge and Skills Required of Students for This Unit | 1. Students will have made predictions about outcomes. 2. Students will be able to read to perform a task. 3. Students will have collected data and constructed data tables/charts. 4. Students will have compared data using observation charts or graphs. 5. Students will have labeled necessary parts of diagrams. 6. Students will have basic calculator skills. 7. Students will have identified that models can represent scientific ideas and processes. 8. Students will have experience drawing and labeling with maps. 9. Students will have basic understanding of science safety rules. 10. Students will be able to access internet resources. 11. Students will have experience working in cooperative groups. |
| Potential Pre-Conceptions of Students | 1. Recycling is the only way to help the environment. 2. There will never be a shortage of water because the oceans are full of it. 3. Trees grow fast enough to provide plenty of wood. 4. Animals and plants are not particular about their environment. 5. Trash thrown away disappears forever. |
| 1Safety Issues | 1. Care should be used when working with water—spills should be cleaned up promptly. |
| Clarification for Skills/ Strategies Instruction | **Teacher Background Information**  **Maryland Green Schools Program**  The Maryland Green Schools Program is an authentic, integrated school project that allows schools to incorporate environmental issues and best practices with student learning. Becoming a Maryland Green School is a school-wide effort that should involve as many students and classrooms as possible. Students are involved in a wide variety of activities that provide opportunities to apply reading and math skills and processes to content area (science and social studies) problems. All Maryland schools, Pre K – 12, public and private are eligible to apply.  The process for becoming a Maryland Green School requires that the applying school document activities over a two year period. The school projects should address different areas such as resource conservation, erosion control, increasing wildlife habitat, reducing the use of fertilizers and pesticides, reducing air and water pollution, controlling rainfall run-off, and using native plants. Examples of student projects include, but are not limited to: designating no-mow zones on school grounds, planting butterfly or hummingbird gardens using native plants, planting native plant rain gardens to control rain water run-off and prevent erosion, paper recycling, installing rain barrels to collect rain water for watering plants, creating light switch plate covers to reduce electricity use, and designing signs for lavatories to reduce water usage. In addition, schools may make infrastructure improvements such as installing low flow automatic water faucets, install motion detecting light switches, and reducing cafeteria waste. Documentation of these projects is included in the Green Schools application process. Schools meeting the criteria are acknowledged by the state of Maryland with a certificate and a Maryland Green Schools flag, which the schools may display. Green Schools status is good for a four year period, and schools must go through a re-application process at the end of that period to maintain the designation.  Further information can be found at <http://maeoe.org/green-schools/>.  **Natural Resources**  Natural resources are generally materials from the earth, but also include the energy we get from the sun. Natural resources include, but are not limited to: water; lumber; minerals; metals; fossil fuels; sunlight; wind; air; and plants (crops for food and trees for wood and paper) and animals (food, leather, and fibers). Some natural resources are found everywhere, such as sunlight and air; some are widely available on most continents, such as water and; still others are found in very limited areas, such as minerals and fossil fuels.  **Renewable and Nonrenewable resources**  Natural resources are either renewable or nonrenewable. Resources that can be replaced for other people to use are called renewable resources. A nonrenewable resource is a resource that is in limited supply and cannot be replaced. The difference between two types of resources has a lot to do with where they are from.  We use renewable resources every day. Most t-shirts and blue jeans are made from cotton, which comes from the cotton plant. Farmers harvest the cotton every year, but the plants grow back and produce more cotton. Cotton, like corn or other crops are renewable resources, and can be grown over and over.  We also use nonrenewable resources every day, but, nonrenewable resources take a long time to form and cannot be replaced at the rate we are using them. For example, the oil and gas that goes into our cars was formed more than three hundred million years ago, long before the time of the dinosaurs. Once these fuels are gone, they cannot be formed again.  Most nonrenewable resources come from the three major forms of fossil fuels; coal, oil or petroleum, and natural gas. We use these fuels to heat our homes and factories, power cars and trucks, and to produce electricity. Fossil fuels were formed from dead plants and animals, which were covered over by rock and over millions of years changed into coal, oil, or natural gas. Other frequently used nonrenewable resources include minerals such as salt, aluminum, gold, silver, copper, and iron. In recent years, due to rate we are cutting down trees, forests are now considered a non-renewable resource.  **Conservation of Resources**  Resource conservation is the responsible use, or reuse, of renewable and nonrenewable resources. One of the most important reasons for resource conservation is protection of Earth’s habitats and organisms. Over harvesting of natural resources such as forests and fisheries destroys habitats, and upsets the balance of nature by reducing or removing vital parts of food chains. This leads to further depletion of other resources, whose habitats may depend on the presence of the over-harvested resource. The burning of fossil fuels for the generation of electricity or for transportation adds pollutants to the air, which adversely affects the health of Earth and its habitats. This in turn may destroy other resources, or make them unusable by injecting harmful substances into a habitat which finds its way into the food chain. An example of this is the presence of heavy metals, such as mercury and lead, which has been detected in tuna and other fish species used for food.  Another reason for resource conservation is to help protect resources which may be limited by a long recovery period, such as forests or some fisheries. Trees used for lumber and paper often take years to replace. Likewise, over harvesting of some fish species, such as tuna, depletes the resource faster than they can reproduce, reducing the harvest for future years, and raising the price beyond the reach of consumers. Recycling of resources, such as paper, plastic, glass, and metals, provides opportunities to reuse resources rather than using new ones. This helps protect those resources that are limited or that have longer recovery times. It also reduces the amount of resources used in the production of products made from those resources, as it usually requires less energy to manufacture goods from recycled materials than it does to manufacture goods from raw or new materials.  A third reason for resource conservation is reduction in the use of energy. Much of the world’s electricity is generated by the burning of fossil fuels, which exists in a limited supply. Conservation of electricity reduces the amount of energy needed, which reduces the demand for the fuels needed to generate the electricity. Conservation of gasoline, by using more efficient vehicles or using public transportation, reduces the amount of fossil fuels needed for transportation. Recently, there has been a major push for the use of solar and wind powered generators to supplement, and perhaps eventually replace, the use of fossil fuels in the generation of electricity. Both solar and wind powered generators provide a clean, unlimited source of electricity, which reduces the demand on fossil fuels.  Water conservation bridges both habitat and limited resource concerns. While 70 percent of Earth’s surface is covered with water, 97 percent of that water is contained in the frozen poles and the oceans and is not usable. Water is a finite resource, which will never increase. However, the water cycle constantly renews and restores the water that is available. But as the world’s population increases, the demand for water for drinking, cleaning, manufacturing, recreation, and farming is rapidly outpacing its availability. Water availability also varies from region to region, plentiful in the world’s rainforest and temperate areas, and scarce in deserts. Mismanagement of resources that result in habitat alteration or destruction affects the availability and quality of both surface and ground water. Water quality is also affected by pollution caused by the burning of fossil fuels for energy generation, transportation, and manufacturing. Climate change, caused by air pollution which is a result of the burning of fossil fuels, causes a redistribution of regional water availability by changing weather patterns and average temperatures.    **Native Plants**  Native plants are those species that occur naturally in a given region. They include trees, shrubs, bulbs, and flowering annuals and perennials. The use of native plants in gardens serves several purposes. First, native plant species are highly adapted to a given region, so they are able to thrive or survive during the common climate of the region. Second, because they are adapted to the regions climates and habitats, they require little or no additional water, fertilizer, or pesticides. Third, animal and plant species evolved together, creating unique habitats. Using native Maryland plants helps to restore endangered plant species and habitats.  Using non-native plants does not always harm the environment, but almost all have an impact. Non-native plants often require the use of fertilizers, pesticides, and additional water to thrive. Many non-native plants become invasive, since they may not have local, natural predators or competitors to control their spread. These plants exploit the local conditions, and spread aggressively, crowding out native species that provide a food or shelter resource for animals in the habitat. An example of an invasive species is kudzu, a vine that was introduced from Japan as ground cover for erosion control. Kudzu grows quickly, and covers anything in its path, covering and choking out trees and other, native vegetation.  **Recycling**  Recycling turns what would normally be trash or waste into valuable resources. Glass, aluminum, plastic, and paper can all be recycled into new products. In Baltimore County, single stream recycling allows residents to place all recyclable materials into one container, which are then collected from curbside along with non-recyclable trash.  Recycling materials saves resources by reusing existing materials. Less power is required to clean paper of ink and make new paper, than to make paper from wood. Less power is needed to melt old glass, than to make new glass from the raw materials. Recycling also saves raw materials, since fewer tress are cut to make paper, if existing paper is recycled rather than making new.  Many different materials can be recycled. Old automobile tires can be recycled into new ones, or can be used as playground material. Glass bottles can be melted down and made into new glass containers. Plastics can be recycled as clothing fiber, park benches, and plastic containers. Paper can be recycled as tissue and cardboard boxes. Aluminum cans can be melted and used to make new cans. Steel and iron can be melted and reused. Water can be filtered and reused at places like car washes.  **Air Pollution**  Air pollution consists of visible and invisible particles in the air that adversely affects air quality for living things and the environment. Invisible air pollution includes carbon dioxide, which in excess is a greenhouse gas that contributes to the warming of Earth. Carbon dioxide is produced by cars, planes, power plants, factories, and other human activities that involve the burning of fossil fuels such as coal, gasoline, and natural gas. Another invisible air pollutant is methane, which is produced as a by-product of decomposition in swamps and by livestock (cattle) during digestion. A third invisible air pollutant is chlorofluorocarbons (CFCs), which were used as refrigerants and aerosol propellants. CFCs have a damaging effect on Earth’s ozone layer, and their use was banned in the 1970’s.  In addition to invisible pollutants, air pollution is also caused be visible particles such as sulfur dioxide, smog, and smoke. Sulfur dioxide and other similar chemical pollutants in the atmosphere combine with water to form acid rain. Acid rain affects plants, aquatic life, and damages buildings and other structures such as bridges. In addition to acid rain, sulfur dioxide and other similar particles blocks sunlight, causing global cooling. Sulfur dioxide comes from natural sources such as volcanic eruptions; today the primary source of sulfur dioxide is the burning of fossil fuels such as coal, oil, gasoline, and natural gas. Other visible pollutants include smoke/soot and smog. Smoke/soot is produced by car exhaust, wood fires, oil and coal furnaces, and incinerators. Smog is a combination of smoke and fog. This blocks sunlight, and results in a serious reduction of air quality for both animals and plants.    **Water Pollution**  Water pollution occurs when the quality of a body of water is compromised for animals and plants living in or near it. Point source pollution occurs when the pollutant is added directly to the water. Non-point source pollution occurs when the pollutant enters the water through runoff from land surrounding  There are several different types of water pollution. One of the most common is pollution of toxic substances, such as herbicides, pesticides, and industrial compounds. These usually enter the water through runoff from farms and factories. These compounds often affect the aquatic plants and insects in the same way that they do land based organisms. Reduction in these organisms has a direct impact on the food chain of the body of water, reducing the number of animals that feed on the plants and insects. It also reduces the amount of underwater vegetation that many aquatic species use for shelter.  Another common type is pollution from organic substances. This is mostly runoff from farms that carries high levels of animal waste where farms are located near streams that feed into a larger body of water, or where the farm directly borders the water. Organic compounds decompose in the water, which reduces the amount of dissolved oxygen available for fish and other aquatic animals. It also clouds the water, which reduces sunlight available for aquatic plants. A form of organic pollution also occurs when inorganic fertilizers find their way to bodies of water via runoff from farms and lawns. These fertilizers add an over-abundance of nutrients to the water, which causes an over-growth of algae, microscopic plants. The over-growth of algae and other aquatic vegetation cause too problems. One, the algae cloud the water, reducing the amount of sunlight available for the normally occurring aquatic plants needed for food and shelter. And, second, as the algae die, they sink to the bottom and decompose, reducing the amount of oxygen available in the water.  A third type of pollution occurs when runoff carries silt into the water. This runoff comes from farms with tilled fields, as well as runoff from construction sites that involves cleared land. Silt in the water clouds the water reducing sunlight available for aquatic plants. The silt also settles on existing plants, reducing the amount of sunlight available. The reduction of sunlight causes large amounts of plants to die, creating a reduction of oxygen in the water. The silt in the water also enters the gills of aquatic animals, which affects the ability of animal to breathe. The silt also often carries the organic and inorganic compounds, contributing to algal blooms and aquatic organism death. The additional silt settles to the bottom of the water, eventually reducing the depth of the water, and choking out essential breeding areas for aquatic animals.  Air pollution can impact water when acid rain falls into bodies of water, or enters waterways as runoff. Acid rain impacts water by raising the pH level of the water, impacting the habitat of aquatic plants and animals. Some plants and animals exist within a very narrow pH range. If the pH of the water varies from that range, the plant or animal either dies, or leaves the area.  Additional forms of pollution include warm water from factories and power generation plants that alter habitats, waste water and sewage spills, oil, gasoline, and antifreeze leaks from gasoline stations, drive ways, and parking lots, and, improper disposal of chemicals and motor oil down storm drains. |
| Assessment Strategies | The problem-based unit *Greening the Schoolyard* contains an embedded preassessment and a unit assessment, which can be accessed on the Office of Science PreK-12 Intranet website. A scoring guide for student responses is also located on the Office of Science PreK-12 Intranet website. |
| Assessment Alignment/  Map | **Unit Assessment Indicator/Objective/Grade Level Match**   |  |  |  |  | | --- | --- | --- | --- | | **Item**  **Number** | **Correct**  **Response** | **MSC Standard/Indicator**  **Grade Level Match** | **Level of Difficulty** | | 1 | C | 6.A.1.a | I | | 2 | B | 6.A.1.b | I | | 3 | D | 6.A.1.b | I | | 4 | C | 6.B.2.a | I | | 5 | D | 6.B.2.a | I | | 6 | B | 6.B.2.b | I | | 7 | A | 6.B.2.b | I | | 8 | A | 6.B.2.b | I | | 9 | D | 6.B.2.c | I | | 10  BCR | See Evaluation Guide | 6.B.2 | III | |
| Technology Links | **Office of Science PreK–12**  **Unit Resources**  <http://www.symbaloo.com/mix/greeningtheschoolyard>  Contains all the links to electronic resources references in the SDAB.  <https://intranet.bcps.org/offices/elem_science/grade5.html> |
| Home-School Connections | The following are sites where families can participate in programs or interact with exhibits to learn more about the environment. Please contact the sites specifically to learn about their current exhibits, calendar of events and possible fees.  Anita C. Leight Estuary Center  (410-612-1688)  <http://www.otterpointcreek.org>    Blackwater National Wildlife Refuge  (410-228-2677)  http://blackwater.fws.gov    Chesapeake Bay Gateway  http://www.baygateways.net/    Gunpowder Falls State Park  (410-592-2897) http://www.dnr.state.md.us/publiclands/central/gunpowder.html    Marshy Point Nature Center  (410-887-2817) http://www.co.ba.md.us/Agencies/recreation/ countyparks/marshypoint/index.html      Oregon Ridge Nature Center  (410-887-1815) http://www.co.ba.md.us/Agencies/recreation/countyparks/oregonridgelodge/index.html |

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| Core Unit Resources and Materials | | | | | | | | | | | |
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| Resource Name | | **Use or Application Notes** | | | | | | | | | |
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| Materials and Resources Needed for Each Activity | | **Activity 1:**  **For the teacher:**   * Computer/projector with Internet access (provided by school) * Satellite image of the schoolyard can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 8 folder, if needed.   **For each group of 4 students**:   * Schoolyard Report Card (provided on BCPS Intranet)   **For the students:**   * Pre-assessment in Student Answer Book * Parent Connection Tri-fold (provided on BCPS Intranet)   **Activity 2:**  **For the teacher:**   * Vocabulary cards (provided on BCPS Intranet) * Computer with Internet access and projection (TV or LCD projector)(provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 2 folder.   **For every student:**  Student Data and Answer Book  **Activity 3:**  **For the teacher:**   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 3 folder.   **For each group of 4 students**:   * BCPS Single Stream Recycling Program flyer (provided on BCPS intranet)   **For every student:**  Student Data and Answer Book  **Activity 4:**  **For the teacher**:   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 4 folder.   **For every student:**   * Student Data and Answer Book * What is a Watt? Text (provided on BCPS intranet) * Light Switch Cover Template (provided on BCPS intranet)   **Activity 5:**  **For the teacher:**   * examples of acrostic poems (provided by teacher) * vocabulary card (provided on BCPS Intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 5 folder.   **For each group of 4 students:**   * Computer Internet access (optional) (provided by school) * Air Pollution text (optional) (provided on BCPS Intranet)   **For each student:**   * 1 air pollution catcher (there are 6 air pollution catchers on the template) (provided on BCPS Intranet) * scissors (provided by student or school) * metric ruler (provided by school) * about 4.5 cm clear tape (provided by school) * sharpened pencil (optional) (provided by student or school) * about 15 cm yarn (optional) (provided in Eco-Trekkers kit) * masking tape (optional) (provided by school) * hand lens (provided in either Geology Rocks or Wee Beasties kit) * Air Pollution text (optional) (provided on BCPS Intranet) * Air Quality Index (provided on BCPS Intranet) * Student Data and Answer Book   **Activity 6:**  **For the teacher:**   * Vocabulary card (provided on BCPS Intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 6 folder.   **For stations (if enough materials/resources are available, consider running two of each station):**  **Station 1:**   * Station 1 Directions (provided on BCPS Intranet) * Computer with internet access (provided by school)   **Station 2:**   * Station 2 Directions (provided on BCPS Intranet) * Computer with internet access (provided by school)   **Station 3:**   * Station 3 Directions (provided on BCPS Intranet) * “One Well” found on pages 320-337 (found in *Wonders* Literature Anthology) * Computer with internet access (provided by school)   **For each student:**  Student Data and Answer Book  **Activity 7:**  **For the teacher:**   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 7 folder.   **For every group of four students:**   * Scissors (provided by student or school) * Plastic straw (provided in kit) * Metric ruler (provided by school) * 30 cm x 10 cm piece of aluminum foil (provided in kit) * Paper towel (provided by school) * Piece of window screen (provided in kit) * Storage container or plastic tub (provided in kit) * 5 metal paper clips (provided in kit) * 5 glass marbles (provided in kit) * Magnet (provided in kit) * balloon (provided in kit) \*\*consider inflating these prior to the investigation\*\* * Piece of wool cloth (provided in kit) * Beaker (provided in kit) * Water (provided by school)   **For every student:**  Student Data and Answer Book  **Activity 8:**  **For the teacher**:   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 8 folder.   **For every student:**   * Computer with internet access (provided by school) * Butterfly Garden Research Notes (optional) (provided on BCPS Intranet) * Student Data and Answer Book | | | | | | | | | |
| Activity Preparation Suggestions for Teachers | | **NOTE**  **When copying items from the BCPS Intranet, be sure that the school’s copy machine is set at 100%.**  **Activity 1:**  1. Prepare copies of the *Parent Trifolds* for each student (provided on BCPS Intranet).  **Activity 2:**  1. Prepare the vocabulary cards needed for Activity 2: **natural resources, renewable resources, nonrenewable resources,** and **fossil fuels** (provided on BCPS Intranet).  **Activity 3:**   1. Prepare the vocabulary cards needed for Activity 3: **conservation, recycling, reduce,** and **reuse** (provided on BCPS Intranet).   **Activity 4:**   1. Prepare the vocabulary cards needed for Activity 4: **watt,** and **kilowatt hours** (provided on BCPS intranet)     **Activity 5:**   1. Prepare the materials for the “A Sticky Situation” investigation. Consider copying the Air Pollution Catcher on card stock or construction paper to give it more rigidity. 2. Since the air pollution catchers must be placed outside, try to do the activity when the forecast doesn’t call for rain. 3. Prepare the vocabulary card for air pollution. 4. Secure computers with internet access (1 per group) for Activity 5F, unless supplying copies of the alternate text “Air Pollution” for all students (provided on BCPS Intranet).   **Activity 6:**   1. Secure computers with internet access for stations 1, 2, and 3. \*\*Note – Consider having two of each station, depending on the size of your class and the availability of computers with internet access. 2. Prepare the vocabulary card for **water pollution.**   **Activity 7:**   1. Prepare the vocabulary cards needed for Activity 7: **waste, compost,** and **landfill** (provided on BCPS intranet) 2. Prepare the materials for “The Super Separator” investigation.   **Activity 8:**   1. Secure computers with internet access for students to complete research on butterfly gardens. 2. Prepare the vocabulary cards for **butterfly garden, native species, rain garden,** and **no-mow zone.** (provided on BCPS Intranet) | | | | | | | | | |
| Classroom Library | | *Catch the Wind, Harness the Sun: 22 Super-Charged Projects for Kids*  By Michael J Caduto  Story Publishing, LLC (April 20, 2011)  ISBN-10: 1603427945  ISBN-13: 978:1603427944  *Tracking Trash: Flotsam, Jetsam, and the Science of Ocean Motion*  By Loree Griffin Burns  Sandpiper; Reprint edition (April 5, 2010)  ISBN-10: 0547328605  ISBN-13: 978-0547328607  *Earth Book for Kids: Activities to Help Heal the Environment*  By Linda Schwartz  Learning Works (October 1990)  ISBN-10: 0881601950  ISBN-13: 978-0881601954  *What’s the Point of Being Green?: And Other Stuff About Our Planet*  By Jacqui Bailey  Barron’s Educational Series (April 1, 2010)  ISBN-10: 0764144271  ISBN-13: 978-0764144271  *Generating Wind Power (Energy Revolution)*  By Niki Walker  Crabtree Publishing Company (November 2006)  ISBN-10: 0778729273  ISBN-13: 978-0778729273  *Recycling Things to Make and Do (Usborne* Activities*)*  By Emily Bone, Leonie Pratt, and Josephine Thompson  Usborne Books; Original Edition (January 2010)  ISBN-10: 0794526756  ISBN-13: 978-0794526757  *Reduce, Reuse, Recycle (Go Green (Sea-to-Sea))*  *By Helen Lanz*  Sea to Sea Publications (January 2012)  ISBN-10: 1597713031  ISBN-13: 978-1597713031 | | | | | | | | | |
| Unit Vocabulary | | | | | | | | | | | |
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| Vocabulary Word | | | Definition | | | | | | | | |
| **natural resources** | | | items from the natural environment that can be used to meet the needs and wants of people | | | | | | | | |
| **renewable resource** | | | a natural resource that can be readily replenished naturally | | | | | | | | |
| **nonrenewable resource** | | | a resource that cannot be readily replaced by natural means | | | | | | | | |
| **fossil fuels** | | | fuels formed from the remains of dead plants and animals that lived millions of years ago | | | | | | | | |
| **conservation** | | | the preservation, management, and care of natural resources | | | | | | | | |
| **recycling** | | | the process of making or manufacturing new products from a product that has served its original purpose | | | | | | | | |
| **reduce** | | | to use less in order to cut down on the amount of waste or garbage produced | | | | | | | | |
| **reuse** | | | to use an item over again instead of throwing it out | | | | | | | | |
| **watt** | | | a unit that measures electricity usage | | | | | | | | |
| **kilowatt hours** | | | the amount of electricity a power plant generates or a customer uses over a period of time | | | | | | | | |
| **air pollution** | | | occurs when gases, dust particles, fumes/smoke, and/or odor are introduced into the atmosphere in a way that makes it harmful | | | | | | | | |
| **water pollution** | | | occurs when foreign substances damage the water quality, making the water undrinkable and dangerous for organisms to live in | | | | | | | | |
| **waste** | | | items we don’t need and discard | | | | | | | | |
| **compost** | | | a mixture of decomposed organic matter that can be used to fertilize soil | | | | | | | | |
| **landfill** | | | an engineered area where waste is placed into the land | | | | | | | | |
| **native species** | | | one that occurs in a particular region, ecosystem, and habitat without direct or indirect human actions | | | | | | | | |
| **butterfly garden** | | | a garden containing plants specifically known to attract butterflies | | | | | | | | |
| **rain garden** | | | the use of plants, in an area where rain water is known to stand and/or cause erosion, to prevent erosion and naturally use the moisture in the soil | | | | | | | | |
| **no-mow zone** | | | an area in a lawn or meadow in which the plants are allowed to grow without cutting or mowing | | | | | | | | |
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| Technology/  Information  Literacy  Standard(s) | **Maryland Technology Literacy Standards**  3.0 Technology for Learning and Collaboration  A. Learning  1. Use and explain how technology tools enhance learning  a) Use technology tools, including software and hardware, from a range of teacher-  selected options to learn new content or reinforce skills.  B. Encourage Collaboration  1. Use and explain how selected technology tools encourage collaboration  a) Use technology tools to work collaboratively within the classroom  C. Increase Productivity  1. Use and explain how technology tools increase productivity  b) Create new documents to complete learning assignments  5.0 Technology for Information Use and Management:  A. Locate, Evaluate, and Gather Information  1. Use and evaluate information resources available through technology, independently or with assistance  a) Select relevant information from appropriate technology resources  B. Organize information  1. Use and evaluate technology tools to organize information  a) Use technology tools independently to support note taking | | | | | | | | | | |
| Materials and Equipment | **Necessary Materials/Equipment** | | | | | **Location (if appropriate)** | | | **Notes on Use or Application** | | |
| Computer with Internet access | | | | | Provided by school | | | Used in Activities 1C | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activities 2E | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activity 3D | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activities 4F | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activities 5E, 5F, and 5H | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activity 6C, 6D, 6E, 6F, and 6H | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activity 7F | | |
| Computer with Internet access and LCD projector | | | | | Provided by school | | | Used in Activity 8C and 8D | | |
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| Technology  Resources | **Type** | | | | | | | **Location** | | | **Notes on Use or Application** |
| Brain POP Natural Resources | | | | | | | <https://www.brainpop.com/science/ourfragileenvironment/naturalresources/> | | | Used in Activity 2E |
| Brain POP Recycling | | | | | | | <https://www.brainpop.com/technology/scienceandindustry/recycling/> | | | Used in Activity 3D |
| TubeChop Video Energy 101 | | | | | | | <http://www.tubechop.com/watch/5848448> | | | Used in Activity 4F |
| Brain POP Air Pollution | | | | | | | <https://www.brainpop.com/science/ourfragileenvironment/airpollution/> | | | Used in Activity 5E |
| “What is Air Pollution” website | | | | | | | <http://eschooltoday.com/pollution/air-pollution/what-is-air-pollution.html> | | | Used in Activity 5F |
| Air Quality Index chart | | | | | | | <http://airnow.gov/index.cfm?action=aqibasics.aqi> | | | Used in Activity 5H |
| Brain POP Water Supply | | | | | | | <https://www.brainpop.com/science/earthsystem/watersupply/> | | | Used in Activity 6C |
| Brain POP Water Pollution | | | | | | | <https://www.brainpop.com/science/ourfragileenvironment/waterpollution/> | | | Used in Activity 6D |
| Eco Kids Water Conservation Around the House | | | | | | | <http://www.ecokids.ca/pub/eco_info/topics/Water/Water/play_waterconserve.cfm> | | | Used in Activity 6E |
|  | National Geographic video on how to conserve water | | | | | | | <http://video.nationalgeographic.com/video/green-guide-howdini/conserve-water-greenguide> | | | Used in Activity 6E |
|  | “A River Ran Wild” narrated walkthrough of the text | | | | | | | <https://youtu.be/IHanEFRl4GU> | | | Used in Activity 6F |
|  | State of the Bay 2014 video | | | | | | | <https://www.cbf.org/about-the-bay/state-of-the-bay-report-2014> | | | Used in Activity 6H |
|  | Brain POP Waste Management | | | | | | | <https://www.brainpop.com/technology/scienceandindustry/wastemanagement/> | | | Used in Activity 7F |
|  | National Wildlife Foundation – Butterfly Gardening | | | | | | | <http://www.nwf.org/pdf/Eco-schools/SchoolyardHabitatsHowToGuide_Part2.pdf#page=17> | | | Used in Activity 8C |
|  | Kids Gardening – Butterfly Gardening Basics | | | | | | | <http://www.kidsgardening.org/node/806> | | | Used in Activity 8C |
|  | Maryland Department of Natural Resources – Common Butterflies and Skippers | | | | | | | <http://www.dnr.state.md.us/wildlife/Habitat/WildAcres/pdfs/CommonButterflies_Skippers.pdf> | | | Used in Activity 8C |
|  | Maryland Native Plant Society – Using Native Plants to Attract Butterflies | | | | | | | <http://www.mdflora.org/resources/publications/gardenersguidelines/gguidelines03.pdf> | | | Used in Activity 8C |
|  | North American Butterfly Association – Top Butterfly Nectar Flowers | | | | | | | <http://nababutterfly.com/wordpress/wp-content/uploads/2014/03/md_central_peidmont.pdf> | | | Used in Activity 8C |
|  | U.S. Fish & Wildlife Service – Native Plants for Wildlife Habitat and Conservation Landscaping | | | | | | | <http://www.nps.gov/plants/pubs/nativesMD/pdf/MD-Piedmont.pdf> | | | Used in Activity 8C and 8D |
|  | Sample Butterfly Garden Plot | | | | | | | <http://www.symbaloo.com/mix/greeningtheschoolyard> | | | Used in Activity 8C |
|  | BCPS Fee-based Databases | | | | | | | <http://www.bcps.org/offices/lis/feebased/> | | | Used in Activity 8C |
|  | ESRI – Map containing satellite imagery of every BCPS elementary school | | | | | | | <http://mdgeoed.maps.arcgis.com/apps/StorytellingSwipe/index.html?appid=9e709b38128446478d732fb39d92a5bb&webmap=8c9b19b8810b482f9cda407d9bdddf68> | | | Used in Activity 8C and 8G |
| Reference  Materials That Support Instruction | **Topic** | | | **Type** | | | **Description** | | | **Link** | |
|
| **Activity Specific Electronic Resources for Teachers/Students** | | | | | | | | | | |
| *The Magic School Bus Holiday Special: Recycling*, Chapter 3, clip 2), | | | | Safari Montage video | | Describes environmental consequences of not recycling | | | <http://10.4.1.240/?a=39290&s=00:10:17:00&e=00:12:22:00&d=01997AA> | |
| *Bill Nye: Garbage* | | | | SAFARI Montage Video | | An excellent resource to explain the whys and hows of recycling | | | <http://10.4.1.240/?a=49194&d=00288AA> | |
| Recycling | | | | Brain POP video | | View during Activity 4E. | | | [http://www.brainpop.com/science/ourfragileenvironment/recycling/](http://www.brainpop.com/science/ourfragileenvironment/recycling/%20) | |
| Electricity | | | | Internet Website | | Southern Company website education section. | | | <http://www.southerncompany.com/learningpower/home.aspx> | |
| Electricity | | | | Internet Website | | Website describing energy, energy use, and electricity. | | | <http://www.exploratorium.edu/theworld/energy/joules.html> | |
| Electricity | | | | Internet Website | | Website describing average energy use and efficiency. | | | <http://www.solartanic.com/index_022.htm> | |
| *Electricity* | | | | Internet Website | | Website describing energy use and efficiency. Includes some interactive activities. | | | <http://www.fplforkids.com/> | |
| Air pollution | | | | website | | Current air quality displayed on US map | | | <http://airnow.gov/> | |
| Air pollution | | | | video | | Effects of air pollution | | | <http://www.brainpop.com/science/ourfragileenvironment/airpollution/> | |
| Water pollution | | | | Internet site | | Who Polluted the Potomac pollution Activity | | | <http://worldsavvy.org/docs/2010_WAC-Lessons-Polluted_Potomac.pdf> | |
| Native plants | | | | Pdf. document | | Native Plants for Wildlife Habitat Conservation Landscaping/  Chesapeake Bay Watershed | | | <http://www.nps.gov/plants/pubs/chesapeake/pdf/chesapeakenatives.pdf> | |
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| Lesson Plan | |
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| Lesson | **Pre-assessment and Activity 1** |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will demonstrate their prior knowledge of natural resources and conservation. Students will assess the health of the schoolyard using the *Schoolyard Report Card*. |
| Alignment | **Maryland State Curriculum Indicator—Science**  A. Natural Resources and Human Needs  1. Recognize and explain how renewable and nonrenewable natural resources are used by humans in Maryland to meet basic needs.   1. Identify and compare Maryland’s renewable resources and nonrenewable resources.   b. Describe how humans use renewable natural resources, such as plants, soil, water, animals.  c. Describe how humans use nonrenewable natural resources, such as oil, coal, natural gas, minerals, including metals.  B. Environmental Issues  1. Recognize and explain that decisions influencing the use of natural resources may have benefits, drawback, unexpected consequences, and tradeoffs.  a. Identify and describe personal and community behaviors that waste natural resources and/or cause environmental harm and those behaviors that maintain or improve the environment.  2. Recognize and describe that consequences may occur when Earth’s natural resources are used.  a. Explain how human activities may have positive consequences on the natural environment.   * Recycling centers * Native plantings * Good farming practice   b. Explain how human activities may have a negative consequence on the natural environment.   * Damage or destruction done to habitats * Air, water, and land pollution   **Maryland State Curriculum Indicator—Language Arts**  1.0 General Reading Processes  E. General Reading Comprehension  3. Use strategies to make meaning from text (during reading).   * Visualize what was read for deeper understanding. |
| Formative Assessment/  Exemplary Response | **Activity 1B**--Pre-assessment. This is not scored, but for answers, see the Teacher’s Answer Key |
| Lesson Preparation | * Prepare copies of the *Parent Trifolds* for each student (provided on BCPS Intranet). |
| Materials | **For the teacher:**   * Computer/projector with Internet access (provided by school) * Satellite image of the schoolyard can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 8 folder, if needed.   **For each group of 4 students**:   * Schoolyard Report Card (provided on BCPS Intranet)   **For the students:**   * Pre-assessment in Student Answer Book * Parent Connection Tri-fold (provided on BCPS Intranet) |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Unit Engagement* | * **Activity 1A**: Students read the scenario as the teacher reads it aloud. * **Activity 1B**: Students will take the Unit Pre-assessment. Be sure to tell students that this assessment is to help determine what they already know and that many of the concepts will be new. * Differentiate the content for **students requiring additional support** by providing visual aids to support the text as the teacher reads the scenario and pre-assessment aloud. Consider student accommodations when differentiating to meet their needs. | | *Exploration* | * **Activity 1C:** Students work outside in groups of four to conduct a survey of the schoolyard using the Schoolyard Report Card. Consider identifying and utilizing several points to stop and survey the surrounding area. For example, as a class walk towards the parking lot and stop a distance away to complete the survey questions on Transportation. **If the weather does not cooperate**, consider using the satellite image of the school via the link in the lesson 8 folder on the Symbaloo to answer the questions. * **Activity 1D:**  Once back inside, students complete the bottom of the final section of the report card. Students then use that information to determine how the schoolyard rates and what the area(s) of greatest need is/are. Next, students make a claim about possible things that could be done to improve the area(s) of greatest need. * For **students requiring additional support**, provide opportunities to pair with a strong reader. | | *Extension* | * **Activity 1E:** Students make a claim about what could be done to help improve the schoolyard environment and community in order to lessen any negative impact on the Chesapeake Bay. * For **students needing additional support,** use the sentence starter “In order to improve the environment in my schoolyard and community I could \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.” | |
| Vocabulary | **none** |

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| Advanced Preparation for Next Lesson | * Prepare the vocabulary cards needed for Activity 2: **natural resources, renewable resources, nonrenewable resources,** and **fossil fuels** (provided on BCPS Intranet). |

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| Lesson Plan | |
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| Lesson | **Activity 2** |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will classify natural resources as renewable or nonrenewable in order to determine how each are used. |
| Alignment | **Maryland State Curriculum Indicators**  6.0 Environmental  A. Natural Resources and Human Needs  1. Recognize and explain how renewable and nonrenewable natural resources are used  by humans in Maryland to meet basic needs.  a. Identify and compare Maryland's renewable resources and nonrenewable  resources.  b. Describe how humans use renewable natural resources, such as plants, soil,  water, animals.  c. Describe how humans use nonrenewable natural resources, such as oil, coal,  natural gas, minerals, including metals |
| Formative Assessment/  Exemplary Response | Students will be assessed using selected response items included in Activity 2G. |
| Lesson Preparation | * Prepare the vocabulary cards needed for Activity 2: **natural resources, renewable resources, nonrenewable resources,** and **fossil fuels** (provided on BCPS Intranet). |
| Materials | **Materials**  **For the teacher:**   * Vocabulary cards (provided on BCPS Intranet) * Computer with Internet access and projection (TV or LCD projector)(provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 2 folder.   **For every student:**   * Student Data and Answer Book |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 2A:** Students will brainstorm a list of natural resources they use every day. Have students share in their groups then engage in a whole class discussion. * For **students requiring additional support,** students could work in pairs. | | *Exploration* | * **Activity 2B:** Students will use analyze the words renewable and nonrenewable resource using word structure (prefixes, suffixes, and base words) in order to generate a definition of each. * For **students requiring additional support,** provide opportunities to pair with stronger readers. * **Activity 2C:** Students will use prior knowledge and the definitions generated in Activity 2B to classify natural resources into renewable and nonrenewable resource groups. Students will then circle any natural resources they claim are fossil fuels. * For **students requiring additional support**, provide labeled examples of the natural resources listed. | | *Explanation* | * **Activity 2D:** Students read the text in order to learn about natural resources, renewable, and nonrenewable resources**.** Interspersed in the text are questions that ask students to list ways that humans use renewable and nonrenewable resources. Encourage students to highlight key words and phrases in the text to help with their comprehension. * Students **requiring additional support** may pair with stronger readers. * **Activity 2E:**  Students view the [BrainPOP video on Natural Resources](https://www.brainpop.com/science/ourfragileenvironment/naturalresources/)   and jot down any notes or new learning from the video. Prior to showing the video inform students that the purpose of viewing the video is to jot down any notes or new learning that will help them revise their classification/lists in Activity 2C.   * For **students requiring additional support,** be sure to activate the closed captions in the BrainPOP video. Also, when needed, pause the video for student completion of tasks * **Activity 2F:** Students revisit Activity 2C in order to revise either their classifications and/or the resources they circled to identify as fossil fuels. Students should use evidence from the text in Activity 2D and/or their notes from the BrainPOP video to help them with their revisions. * Students **requiring additional support** may pair with stronger readers. | | *Evaluation* | * **Activity 2G:** Students respond to selected response items to assess their understanding of natural, renewable, and nonrenewable resources. * For **students requiring additional support,** assessment items may be read by an adult. This adult can also rephrase and clarify for greater student understanding. | | *Extension* | * **Activity 2H:** Students read a text with statistics on water type and distribution. Students then make claim supported with evidence as to whether they think that water is a renewable or nonrenewable resource. * For **students requiring additional support,** provide the following sentence frame:   “I think water is a renewable/nonrenewable resource. I think this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.” | |
| Vocabulary | **Natural Resource**  – items from the natural environment that can be used to meet the needs and wants of people  **Renewable resource –** a natural resource that can be readily replenished naturally  **Nonrenewable resource –**  a resource that cannot be readily replaced by natural means  **Fossil Fuels –** fuels formed from the remains of dead plants and animals that lived millions of years ago |
| Advanced Preparation for Next Lesson | Prepare the vocabulary cards needed for Activity 3: **conservation, recycling, reduce,** and **reuse** (provided on BCPS Intranet). |

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| Lesson Plan | |
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| Lesson | **Activity 3** |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will analyze the three R’s of conservation in order to make a claim as to the importance conserving natural resources. |
| Alignment: | **Maryland State Curriculum Indicators**  6.0 Environmental  B. Environmental Issues  2. Recognize and describe that consequences may occur when Earth’s natural resources are used.   1. Explain how human activities may have positive consequences on the natural environment.  * Recycling centers * Native plantings * Good farming practices |
| Formative Assessment/  Exemplary Response | Students will be assessed on Activity 3K. They will revise their initial claim about the importance, and examples, of conservation in Activity 3A using evidence from the lesson. |
| Lesson Preparation | Prepare the vocabulary cards needed for Activity 3: **conservation, recycling, reduce,** and **reuse** (provided on BCPS Intranet). |
| Materials | **For the teacher:**   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 3 folder.   **For each group of 4 students**:   * BCPS Single Stream Recycling Program flyer (provided on BCPS intranet)   **For every student:**   * Student Data and Answer Book |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 3A:** Students work with their group to develop a claim to describe what conservation is and why it is important. Each student should write their ideas down. Engage students in a whole class discussion. | | *Explanation* | * **Activity 3B:** Students read about conservation and recycling. It may benefit all students to chunk the reading into smaller pieces. Encourage students to highlight key words and phrases in the text to help with their comprehension. | | *Exploration* | * **Activity 3C:**  Students work to respond to several questions about recycling. Engage students in a whole class discussion of their responses. * For **students requiring additional support**, provide opportunities to pair with strong readers and writers. | | *Explanation* | * **Activity 3D:**Students watch the BrainPOP video on Recycling. Inform the students that they are watching the video in order to identify materials, other than paper, that can be recycled. * For **students requiring additional support,** be sure to activate the closed captions in the BrainPOP video. Also, when needed, pause the video for student completion of tasks. * **Activity 3E:** Students read about reduction in order to conserve. Encourage students to highlight key words and phrases in the text to help with their comprehension. * **Activity 3F:** Students make a claim about other examples/ways to reduce the amount of waste/garbage they produce. * For **students requiring additional support**, provide the following sentence frame, “Another example of how I could reduce the amount of garbage I produce is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .” * **Activity 3G:**  Students read about reusing items in order to conserve. Encourage students to highlight key words and phrases in the text to help with their comprehension. * **Activity 3H:** Students make a claim about other examples/ways to reuse items in order to cut down on waste. * For **students requiring additional support**, provide the following sentence frame, “Another example of how I could reuse items in order to cut down on waste is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .” | | *Evaluation* | * **Activity 3I:** Students use evidence from the lesson in order to revise their response in Activity 3A. They also must include example of different ways to conserve natural resources. * For **students requiring additional support**, provide the following sentence frame, “Conservation is important because \_\_\_\_\_\_\_\_\_\_\_\_\_ . One way to conserve natural resources is to \_\_\_\_\_\_\_\_\_\_\_ . This is an example of recycling/reducing/reusing.” | | *Extension* | * **Activity 3J:** Students use the information from the lesson and the BCPS Single Stream Recycling Program flyer to develop a recycling plan for their school. * For **students requiring additional support**, provide opportunities to pair with strong readers and writers. * **Activity 3K:** Student refine the recycling plan from Activity 3J into a proposal, written to the school principal, outlining their recycling plan, how it will benefit the school and the environment, and how the plan is a critical step in becoming a Maryland Green School. | |
| Vocabulary | **Conservation –** the preservation, management, and care of natural resources  **Recycling** – the process of making or manufacturing new products from a product that has served its original purpose  **Reduce** – to use less in order to cut down on the amount of waste or garbage produced  **Reuse** – to use an item over again instead of throwing it out |

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| Advanced Preparation for Next Lesson | * + Prepare the vocabulary cards needed for Activity 4: **watt,** and **kilowatt hours** (provided on BCPS intranet) |

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| Lesson Plan | |
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| Lesson | **Activity 4** |
| Unit Title | *Greening the Schoolyard* |
| Objective/ | Students will calculate electrical usage and understand how electricity is generated and measured in order to make a claim about the importance of conserving energy. |
| Alignment | **Maryland State Curriculum Indicators--Science**  6.0 Environmental  A. Natural Resources and Human Needs  1. Recognize and explain how renewable and nonrenewable natural resources are used by humans in Maryland to meet basic needs.  a. Identify and compare Maryland's renewable resources and nonrenewable resources.  B. Environmental Issues  1. Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences, and tradeoffs.  a. Identify and describe personal and community behaviors that waste natural resources and/or cause environmental harm and those behaviors that maintain or improve the environment. |
| Formative Assessment/  Exemplary Response | Students will be assessed on Activity 4I. |
| Lesson Preparation | * + Prepare the vocabulary cards needed for Activity 4: **watt,** and **kilowatt hours** (provided on BCPS intranet) |
| Materials | **For the teacher**:   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 4 folder.   **For every student:**   * Student Data and Answer Book * What is a Watt? Text (provided on BCPS intranet) * Light Switch Cover Template (provided on BCPS intranet) |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 4A:** Students brainstorm a list of how they use electricity in their everyday lives. Engage students in a brief whole class discussion of how they use electricity every day. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. * **Activity 4B:** Students brainstorm a list of pros and cons about living in a world without electricity. Engage students in a brief whole class discussion of the pros and cons of living in a world without electricity. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | | *Exploration* | * **Activity 4C:** Students will make a claim about how much electricity would be used if lights were left on in the classroom from 4 p.m. Friday until 8 a.m. Monday. This is an opportunity to assess if students understand the unit of measurement for electricity usage. * **Activity 4D:** Students calculate how much electricity was used in the scenario put forth in Activity 4C. Allow students access to a calculator as needed. * For **students requiring additional support**, provide a calculator and provide opportunity to pair with a strong math student. * **Activity 4E:** Students make a claim about how the wasted electricity in the scenario put forth in Activity 4C could have been prevented. * For **students requiring additional support**, provide the following sentence frame, “In order to prevent the electricity from being wasted we could have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.” | | *Explanation* | * **Activity 4F:** Students watch the TubeChop video “[Energy 101: Electricity Generation](http://www.tubechop.com/watch/5848448).” Prior to viewing the video have students set a purpose for watching by previewing the questions. Students should jot down notes/answers to the questions as the video plays. It may be beneficial to pause and/or replay the video for students. Allow students to work together in their groups to discuss/revise answers. Engage students in a whole class discussion of the answers to the questions. * **Activity 4G:** Students will read “What is a Watt?” in order to comprehend how electricity usage is measured and the main sources of electricity generation. Students will become familiar with the wording of the actual law which states “For every action, there is an equal and opposite reaction.” * If sufficient access to internet enabled devices is available, consider uploading the “What is a Watt?” text to the student drive so that students may access and read the text on their device. * For **students requiring additional support,** teacher may read the selection aloud and assist students in highlighting key information/concepts. * **Activity 4H:** Students examine a bar graph showcasing Maryland electricity generation sources. Students interpret the data from the graph to identify coal as the source that is predominantly used to generate electricity in Maryland. Students then consider the impact that using a nonrenewable fossil fuel to generate electricity has on Maryland’s future ability to generate electricity and potential solutions to the problem. Engage students in a whole class discussion of their claims. * For **students requiring additional support**, provide the following sentence frame, “The impact of using coal to generate electricity in the future in Maryland is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A possible solution to this problem is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.” | | *Evaluation* | * **Activity 4I:** Students explain the importance of conserving electricity making sure to include evidence from the lesson to support their reasoning. * For **students requiring additional support**, provide the following sentence frame, “It is important to conserve electricity because \_\_\_\_\_\_\_\_\_\_\_\_\_.” | | *Extension* | * **Activity 4J**: Students use the “Light Switch Cover Template” to design and create a light switch cover that encourages electricity conservation. Consider laminating the student light switch covers and distributing them to faculty and staff to put on light switches around the building. | |
| Vocabulary | **Watt –** a unit that measures electricity usage  **Kilowatt hours –** the amount of electricity a power plant generates or a customer uses over a period of time |

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| Advanced Preparation for Next Lesson | * Prepare the materials for the “A Sticky Situation” investigation. Consider copying the Air Pollution Catcher on card stock or construction paper to give it more rigidity. * Since the air pollution catchers must be placed outside, try to do the activity when the forecast doesn’t call for rain. * Prepare the vocabulary card for **air pollution.** * Secure computers with internet access (1 per group) for Activity 5F, unless supplying copies of the alternate text “Air Pollution” for all students (provided on BCPS Intranet). |

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| Lesson Plan | |
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| Lesson | Activity 5 |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will conduct an investigation and research using multiple sources of information in order to understand air pollution and make a claim about ways to reduce the amount of air pollution in the community. |
| Alignment | **Maryland State Curriculum Indicator—Science**  6.0 Environmental  B. Environmental Issues  2**.** Recognize and describe that consequences may occur when Earth's natural resources are used.  b**.** Explain how human activities may have a negative consequence on the natural environment.   * + - Damage or destruction done to habitats     - Air, water, and land pollution |
| Formative Assessment/  Exemplary Response | Students will be assessed based on their response to Activities 5G. |
| Lesson Preparation | * Prepare the materials for the “A Sticky Situation” investigation. Consider copying the Air Pollution Catcher on card stock or construction paper to give it more rigidity. * Since the air pollution catchers must be placed outside, try to do the activity when the forecast doesn’t call for rain. * Prepare the vocabulary card for **air pollution.** * Secure computers with internet access (1 per group) for Activity 5F, unless supplying copies of the alternate text “Air Pollution” for all students (provided on BCPS Intranet). |
| Materials | **For the teacher:**   * examples of acrostic poems (provided by teacher) * vocabulary card (provided on BCPS Intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 5 folder.   **For each group of 4 students:**   * Computer Internet access (optional) (provided by school) * Air Pollution text (optional) (provided on BCPS Intranet)   **For each student:**   * 1 air pollution catcher (there are 6 air pollution catchers on the template) (provided on BCPS Intranet) * scissors (provided by student or school) * metric ruler (provided by school) * about 4.5 cm clear tape (provided by school) * sharpened pencil (optional) (provided by student or school) * about 15 cm yarn (optional) (provided in Eco-Trekkers kit) * masking tape (optional) (provided by school) * hand lens (provided in either Geology Rocks or Wee Beasties kit) * Air Pollution text (optional) (provided on BCPS Intranet) * Air Quality Index (provided on BCPS Intranet) * Student Data and Answer Book |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 5A:** Students complete an acrostic poem in which they record what they know, or think they know, about pollution. If necessary, provide examples of acrostic poems for students. Also, be sure to inform students that POLLUTION is written in the middle of the line so that the word does not necessarily have to start with the given letters. * Differentiate the acrostic poem for **students requiring additional support** by allowing them to create their poems in their native language. | | *Exploration* | * **Activity 5B:** Students conduct the “A Sticky Situation” investigation. When taking students outside remind students to place the air pollution catchers in a location where it will not be disturbed by other students (e.g. students playing at recess). The air pollution catchers should, ideally, stay outside overnight to increase their effectiveness. \*\*Move on to Activity 5D next.\*\* * For **students requiring additional support**, the teacher could read and model the procedures aloud to the students. * **Activity 5C**: \*\**Do this activity* ***after*** *the air pollution catchers have spent time, ideally overnight, outside*.\*\*After spending time outside, students bring their air pollution catchers back inside to be examined. It is possible that the students do not see any particles stuck to the tape. | | *Explanation* | * **Activity 5D:** Students use their prior knowledge to demonstrate what they know, or think they know, about air pollution using a Frayer model. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. * **Activity 5E:** Students watch the BrainPOP video on Air Pollution in order to add to or revise the information on their Frayer model. Consider playing the video more than once to allow students to gather all the information they need. Allow students time to discuss with their group the information they recorded from the video. * For **students requiring additional support,** be sure to activate the closed captions in the BrainPOP video. Also, when needed, pause the video for student completion of tasks. * **Activity 5F:** In their groups, students access “What is Air Pollution” website via the link on the Symbaloo page, activity 5 folder in order to add to or revise the information on their Frayer model. Alternately, distribute copies of “Air Pollution” text to students. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | | *Evaluation* | * **Activity 5G:** Engage students in a whole class discussion to debrief what they learned and recorded on their Frayer models. Next, students make a claim, and support it using evidence from the lesson, about what they can do in school and/or at home to reduce the amount of air pollution in the community. * For **students requiring additional support,** provide the following sentence starter: “In order to reduce the amount of air pollution in our community I could \_\_\_\_\_\_\_\_\_. This would help cut down on air pollution because \_\_\_\_\_\_\_\_\_\_.” | | *Extension* | * **Activity 5H:** Students are presented with the real world situation of a Code Red air quality day and having a soccer game scheduled. Students make a decision to play or not play using evidence from the “Air Quality Index” chart to support their decision. If students have access to a computer with internet access from Activity 5F they can access the Air Quality index via the link on the Symbaloo page in the Activity 5 folder. If students do not have access to computers, distribute a paper copy of “Air Quality Index” to students. * For **students requiring additional support,** provide the following sentence starter: “A Code Red day means \_\_\_\_\_\_\_\_\_\_. Therefore, I would/wouldn’t play in my soccer game because \_\_\_\_\_\_\_\_.” * **Activity 5I:** Students consider how a change in where they conduct the “A Sticky Situation” investigation might affect the results of the investigation. * For **students requiring additional support,** provide the following sentence starter: “If we conducted the “A Sticky Situation” investigation at/on \_\_\_\_\_\_\_\_\_\_ that would change the results of the investigation. I would expect there to be more/less air pollution particles because \_\_\_\_\_\_\_\_.” | |
| Vocabulary | **Air pollution –**  occurs when gases, dust particles, fumes/smoke, and/or odor are introduced into the atmosphere in a way that makes it harmful |

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| Advanced Preparation for Next Lesson | * Secure computers with internet access for stations 1, 2, and 3. \*\*Note – Consider having two of each station, depending on the size of your class and the availability of computers with internet access. * Prepare the vocabulary card for **water pollution.** |

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| Lesson Plan | |
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| Lesson | **Activity 6** |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will use conduct research using multiple sources of information in order to make a claim about the importance of water and its conservation. |
| Alignment | **Maryland State Curriculum Indicator—Science**  6.0 Environmental  A**.** Natural Resources and Human Needs   1. Recognize and explain how renewable and nonrenewable natural resources are used by humans in Maryland to meet basic needs.    * Describe how humans use renewable natural resources, such as plants, soil, water, animals.   B. Environmental Issues   1. Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences, and tradeoffs. 2. Identify and describe personal and community behaviors that waste natural resources and/or cause environmental harm and those behaviors that maintain or improve the environment. 3. Recognize and describe that consequences may occur when Earth’s natural resources are used. 4. Explain how human activities may have a negatives consequence on the natural environment.  * Damage or destruction done to habitats * Air, water, and land pollution |
| Formative Assessment/  Exemplary Response | Students will be assessed on Activity 6G, in which they make a claim as to whether water is a vital resource that should be conserved or not. |
| Lesson Preparation | * Secure computers with internet access for stations 1, 2, and 3. \*\*Note – Consider having two of each station, depending on the size of your class and the availability of computers with internet access. * Prepare the vocabulary card for **water pollution.** |
| Materials | **For the teacher:**   * Vocabulary card (provided on BCPS Intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 6 folder.   **For stations (if enough materials/resources are available, consider running two of each station):**  **Station 1:**   * Station 1 Directions (provided on BCPS Intranet) * Computer with internet access (provided by school)   **Station 2:**   * Station 2 Directions (provided on BCPS Intranet) * Computer with internet access (provided by school)   **Station 3:**   * Station 3 Directions (provided on BCPS Intranet) * “One Well” found on pages 320-337 (found in *Wonders* Literature Anthology) * Computer with internet access (provided by school)   **For each student:**   * Student Data and Answer Book |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 6A:** Students complete the K column of the KWL chart to show what they know, or think they know, about water, water pollution, the water supply, and/or water conservation. After a few minutes, engage students in a discussion about what they wrote. After the discussion, allow students to go back and write down some questions about water, water pollution, the water supply, and/or water conservation in the W column of the KWL chart. Discuss these as a class as well. \*\*Note – Students will be adding to the L column of the KWL chart throughout the lesson as they visit each station.\*\* * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | | *Exploration/*  *Explanation* | * **Activities 6B-F**: Students will travel with their group around to each of the three stations. Remind students to follow the directions at each station. Consider giving students a minimum of 15 minutes at each station. \*\*Note – Consider ending day 1 of this lesson after students have visited 1 or 2 stations.\*\* After students have had an opportunity to visit each station, debrief what they learned and the answers they wrote down for each station. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. Also, be sure to activate the closed captions in the BrainPOP video. | | *Evaluation* | * **Activity 6G:** Students make a claim as to whether water is a vital/important resource that should or shouldn’t be conserved using evidence from the lesson to support their response.   + For **students requiring additional support,** provide the following sentence starter: “I think that water is/isn’t a vital resources that should/shouldn’t be conserved. I think this because \_\_\_\_\_\_\_\_\_\_\_.” | | *Extension* | * **Activity 6H:** Students watch the “State of the Bay” report video. Students then identify the areas that are improving in the Chesapeake Bay as well as areas that remain a concern. * For **students requiring additional support,** consider using the following sentence frame:   “Areas of the Chesapeake Bay that are improving are \_\_\_\_\_\_\_\_\_\_\_\_. Areas of the Chesapeake Bay that continue to be an area of concern are \_\_\_\_\_\_\_\_\_\_\_.” | |
| Vocabulary | **Water pollution –** occurs when foreign substances damage the water quality, making the water undrinkable and dangerous for organisms to live in |

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| Advanced Preparation for Next Lesson | * Prepare the vocabulary cards needed for Activity 7: **waste, compost,** and **landfill** (provided on BCPS intranet) * Prepare the materials for “The Super Separator” investigation. |

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| Lesson | **Activity 7** |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will conduct an investigation to separate waste materials and gather information on waste management from multiple sources in order to make a claim as to how to decrease the amount of waste that enters a landfill. |
| Alignment | **Maryland State Curriculum Indicators—Science**  6.0 Environmental  B. Environmental Issues   1. Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences, and tradeoffs. 2. Identify and describe personal and community behaviors that waste natural resources and/or cause environmental harm and those behaviors that maintain or improve the environment. 3. Recognize and describe that consequences may occur when Earth’s natural resources are used. 4. Explain how human activities may have a negatives consequence on the natural environment.  * Damage or destruction done to habitats * Air, water, and land pollution |
| Formative Assessment/  Exemplary Response | Students will be assessed on Activity 7G. |
| Lesson Preparation | * Prepare the vocabulary cards needed for Activity 7: **waste, compost,** and **landfill** (provided on BCPS intranet) * Prepare the materials for “The Super Separator” investigation. |
| Materials | **For the teacher:**   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 7 folder.   **For every group of four students:**   * Scissors (provided by student or school) * Plastic straw (provided in kit) * Metric ruler (provided by school) * 30 cm x 10 cm piece of aluminum foil (provided in kit) * Paper towel (provided by school) * Piece of window screen (provided in kit) * Storage container or plastic tub (provided in kit) * 5 metal paper clips (provided in kit) * 5 glass marbles (provided in kit) * Magnet (provided in kit) * balloon (provided in kit) \*\*consider inflating these prior to the investigation\*\* * Piece of wool cloth (provided in kit) * Beaker (provided in kit) * Water (provided by school)   **For every student:**   * Student Data and Answer Book |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 7A:** Students use prior knowledge of natural and human produced waste in order to compare and contrast them using a Venn diagram. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | | *Exploration* | * **Activity 7B:** Students read a paragraph to set the purpose of the investigation in Activity 7C. * For **students requiring additional support**, the teacher may read the paragraph aloud to students. * **Activity 7C:** Students complete. “The Super Separator” investigation. \*\*If is very humid, the aluminum foil may not be attracted to the balloon. Also, if the pieces of aluminum foil are too large, they may not be attracted to the balloon either.\*\* * For **students requiring additional support**, the teacher could read and model the procedures aloud to the students. * **Activity 7D:** Students record data from “The Super Separator” investigation. After the investigation, debrief the results of the investigation with students. If students don’t achieve the expected results, discuss possible reasons why. | | *Explanation* | * **Activity 7E:** Students read in order to gain information about waste, compost, and landfills. * For **students requiring additional support,** teacher may read the selection aloud and assist students in highlighting key information/concepts. * **Activity 7F:** Students watch the BrainPOP video on Waste Management. * For **students requiring additional support,** be sure to activate the closed captions in the BrainPOP video. |  | | *Evaluation* | * **Activity 7G:** Students respond to a prompt in order to make a claim about what could be done to decrease the amount of waste/trash that comes in to the Eastern Sanitary Landfill using evidence to support their response. * For **students requiring additional support,** consider using the following sentence frame: “In order to decrease the amount of waste/trash that comes in to the landfill I could \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. I know this would be effective because \_\_\_\_\_\_\_\_\_\_\_\_\_\_.” | | *Extension* | * **Activity 7H:** Students use information gathered throughout the unit in order to describe ways their school could decrease the amount of waste produced on a daily basis. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. |  | |
| Vocabulary | **Waste –** items we don’t need and discard  **Compost –**  a mixture of decomposed organic matter that can be used to fertilize soil  **Landfill** – an engineered area where waste is placed into the land |

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| Advanced Preparation for Next Lesson | * Secure computers with internet access for students to complete research on butterfly gardens. * Prepare the vocabulary cards for **butterfly garden, native species, rain garden,** and **no-mow zone.** (provided on BCPS Intranet) |

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| Lesson Plan | |
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| Lesson | **Activity 8** |
| Unit Title | *Greening the Schoolyard* |
| Objective | Students will conduct research using multiple sources of information in order to design a successful butterfly garden. |
| Alignment | **Maryland State Curriculum Indicator--Science**  6.0 Environmental  A. Natural Resources and Human Needs  1. Recognize and explain how renewable and nonrenewable natural resources are used by humans in Maryland to meet basic needs.  a. Describe how humans use renewable natural resources, such as plants, soil, water, animals.  B. Environmental Issues  1. Recognize and explain that decisions influencing the use of natural resources may have benefits, drawback, unexpected consequences, and tradeoffs.  a. Identify and describe personal and community behaviors that waste natural resources and/or cause environmental harm and those behaviors that maintain or improve the environment.  2. Recognize and describe that consequences may occur when Earth’s natural resources are used.  a. Explain how human activities may have positive consequences on the natural environment.   * Recycling centers * Native plantings * Good farming practice |
| Formative Assessment/  Exemplary Response | Students will be assessed on Activities 8F, 8I, and 8J. In these activities, students will explain the benefit of using native plants in their butterfly garden, design the butterfly garden on a grid, and calculate the cost of the butterfly garden. |
| Lesson Preparation | * Secure computers with internet access for students to complete research on butterfly gardens. * Prepare the vocabulary cards for **butterfly garden, native species, rain garden,** and **no-mow zone.** (provided on BCPS Intranet) |
| Materials | **For the teacher**:   * Vocabulary cards (provided on BCPS intranet) * Computer Internet access and projection (TV or LCD projector) (provided by school) * Embedded technology links for this lesson can be accessed at <http://symbaloo.com/mix/greeningtheschoolyard> in the Activity 8 folder.   **For every student:**   * Computer with internet access (provided by school) * Butterfly Garden Research Notes (optional) (provided on BCPS Intranet) * Student Data and Answer Book |
| Lesson Planner with Differentiation | |  |  | | --- | --- | | **Components** | **Brief Description** | | *Engagement* | * **Activity 8A:** Students reflect back on the Schoolyard Report Card from Activity 1C in order to identify the area they assessed as needing the most attention. | | *Explanation* | * **Activity 8B:** Students are introduced to the butterfly garden project. Inform students that they will be working in groups to research, design, and finally, calculate the cost of a butterfly garden. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | | *Exploration* | * **Activity 8C:** Students work in groups to research butterfly gardens using the five questions from Activity 8B as a guide: 1) What is a butterfly garden? 2) What are the key components of a butterfly garden? 3) What are some native Maryland butterflies? 4) What are the best native Maryland plants for your butterfly garden? 5) What is the optimal location in the schoolyard for your butterfly garden? * Students may use the resources found on the Symbaloo page in the Activity 8 folder or they may utilize other BCPS fee-based databases. * Allow students options of how to take notes on their research, digitally, in their own notebook/paper, or by using the Butterfly Garden Research Notes page found on the BCPS Intranet. \*\*Note – it will most likely take more than one day for the students to gather sufficient research before moving on to Activity 8D\*\* * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. * **Activity 8D:** Students use their research notes to compile a list of up to six possible plants for their butterfly gardens. Students record the name of the plant, whether or not the plant is native to Maryland, its preferred soil moisture, amount of sunlight, and the type of butterfly it attracts. Most of this information can be found in the Native Plant Guide via the link found on the Symbaloo page in the Activity 8 folder. | | *Explanation* | * **Activity 8E:** Students read “Why Use Native Plants?” which is about native plants and how their use is beneficial in conserving natural resources. * For **students requiring additional support,** teacher may read the selection aloud and assist students in highlighting key information/concepts. | | *Evaluation* | * **Activity 8F:** Students respond to a prompt in order to make a claim, supported by evidence from the “Why Use Native Plants?” text, about how using native plants in their butterfly gardens will help conserve natural resources. \*\*Note – This is a good natural breaking point if additional days are needed.\*\* * For **students requiring additional support** provide the following sentence starter: “Using native plants in my butterfly garden helps conserve natural resources by \_\_\_\_\_\_\_\_\_\_.” | | *Exploration* | * **Activity 8G:** Students describe a specific area in the schoolyard that would be an ideal location for the butterfly garden. Consider having students access the ESRI map that contains satellite imagery for every elementary school in Baltimore County. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | | *Explanation* | * **Activity 8H:** Students are informed that the principal of the school has given them a budget of $2,000 for the butterfly garden project and that the cost per shrub is $25, per plant is $5, and per bag of mulch is $3.50. | | *Evaluation* | * **Activity 8I:** Students use the blank grid to design their butterfly garden. Consider showing students the sample butterfly garden found on the Symbaloo page in the Activity 8 folder. * **Activity 8J:** Students calculate the cost of the plants and mulch used in the design of their butterfly garden. Remind students that they have been budgeted $2,000 and cannot exceed that figure. * For **students requiring additional support**, provide a calculator and provide opportunity to pair with a strong math student. | | *Extension* | * **Activity 8K:** Students draft a press release to share their butterfly garden with the school’s community. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. * **Activity 8L:** Students are introduced to other schoolyard improvement projects such as a rain garden, no-mow zone, and bluebird boxes. Students then use evidence from the Schoolyard Report Card from Activity 1C in order to justify which of the three projects would be good candidates to improve their schoolyard. * For **students requiring additional support**, provide opportunities to pair with a strong writer/reader. | |
| Vocabulary | **Butterfly garden –** a garden containing plants specifically known to attract butterflies  **Native species –** one that occurs in a particular region, ecosystem, and habitat without direct or indirect human actions  **Rain garden –** the use of plants, in an area where rain water is known to stand and/or cause erosion, to prevent erosion and naturally use the moisture in the soil  **No-mow zone –** an area in a lawn or meadow in which the plants are allowed to grow without cutting or mowing |