



Fairchild Challenge at Phipps

2019 – 2020 Middle School Challenges In-Depth

Challenge I: Sculpture

“Litter Birds”

For individuals or groups | Maximum points: 200

Due at Phipps: Friday, October 4 by 5 p.m.

Your Challenge: We know littering is bad. Garbage that is not disposed of properly can contaminate our soil and waterways and harm habitat and wildlife! Yet litter continues to grow as an environmental issue. For this challenge, you will draw attention to the problem of litter by creating a set of three to five bird sculptures entirely out of “found objects,” litter* or recycled materials. Along with your set of sculptures, submit one short (no more than three paragraphs) description of how litter/plastics in the environment can affect birds and wildlife.

Each finished sculpture should be no larger than 6”x6”x6” and should weigh no more than three pounds. Sculptures should not contain any food or edible ingredients (including wheat, seeds, or pinecones). Sculptures from this challenge will be featured in Phipps’ 2019 Winter Show. Therefore, each sculpture should have a string, wire or other attachment so that it can be hung on display.

Resources: The following list of online resources may be used when preparing your entry:

- [Lauritzen Garden Exhibit: Metamorphosis](#)
- [Longwood Garden Children’s Christmas Trees](#)
- [Washed Ashore: Art to Save the Seas](#)
- [EPA: Impacts of Mismanaged Trash](#)

Entry Requirements: Deliver to high school program coordinator at Phipps in person or via certified mail (electronic submission is not accepted):

- Challenge Entry Form
- One set of three to five bird sculptures made from “found objects,” litter* or recycled materials
- Each sculpture should have an attached wire or string for hanging and be no larger than 6”x6”x6” and 3 lbs.
- One written description, three paragraphs or less, explaining how litter in the environment affects birds and wildlife.

- Please include the school name and a list of the students involved in the project.

** Use caution when collecting and sculpting with litter, please do not use any materials that are sharp, soiled or otherwise dangerous.*

School Submits: One set of five sculptures, Challenge Entry Form

State Standards:

- 4.1.12.B Research solutions to problems caused by interrupting natural cycles.
- 4.1.12.E Research solutions addressing human impacts on ecosystems over time.
- 4.5.6.A Examine how historical events have shaped the sustainable use of natural resources.
- 4.5.6.D Identify reasons why organisms become threatened, endangered, and extinct.

Keystone Final Assessment:

BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

Challenge 2: Global Challenge – Field Data Collection

“Shade our Schools – Leaves Are Cool!”

For groups | Maximum Points: 200

Due at Phipps: Friday, November 15 by 5 p.m.

Fairchild Global Challenge: The Fairchild Global Challenge is distributed to the many Fairchild Partner Sites (such as Phipps) by the Fairchild Tropical Botanic Garden (FTBG) in Miami, Florida. Because this challenge is posed to Fairchild Partner Sites around the world, it provides the opportunity for students to have a wider and stronger impact. In this year’s Global Challenge, students from around the world will collect data that will be used by a scientist at the University of Miami.

Your Challenge: In order to understand and predict how plant species are affected by global warming, we need to understand how temperature impacts a plant’s ability to carry out its basic functions. Despite rising ambient temperatures, plants are able to use different characteristics and mechanisms to regulate their leaf temperature. This year, students will help a scientist from the University of Miami conduct a series of experiments to understand how leaf size, shape and color affect leaf temperature. Students will collect data and create an illustrated field journal documenting their observations.

Resources: The following list of online resources may be used when preparing your entry:

- [Types of plants \(video\)](#)

- [Basic Leaf ID Information](#)
- [How to conduct a biodiversity survey](#)
- [ETEKCITY Non-Contact Thermometer](#) (Phipps will have some thermometers available to borrow.)
- [Shade Our Schools Protocol](#), [Shade Our Schools Data Sheets](#)

Entry Requirements: Deliver to high school program coordinator at Phipps in person or via certified mail (electronic submission is not accepted):

- Challenge Entry Form
- Data Requirements:
 - Collect temperature data for leaves of different colors*, different shapes and different sizes as per Shade Our Schools protocol
 - Students must collect temperature measurements for **at least** three leaves per variable
 - Data sheets must be filled out completely (including the “notes” section)
 - Data sheets must include the temperature measurements for the reference
 - Complete data set must be submitted with Field Journal
 - On-time entry submission (late entries may not receive points)
- Field Journal Requirements:
 - Title page of field journal must clearly indicate school name, teacher name(s), and how many students or classes were involved in the collection of data and the creation of the journal
 - Field journal must include a combination of text, labeled drawings, photos and graphs summarizing the results
 - Field journal must include an analysis of the results and conclusions
 - Field journal must be 8.5” x 11” or less, and 12 double sided pages or less, excluding the front and back cover pages. Pages cannot include additional attachments or be used as pockets
 - On time entry submission (late entries may not receive points)

** Leaves that have stopped photosynthesizing and have changed color due to the season change **should not be used** for color comparison. Students can compare leaves that are light and dark green, or other colors as long as they are photosynthesizing and otherwise healthy.*

School submits: Challenge Entry Form, One Field Journal, Data Sheet (Google Sheet provided by FTBG or hardcopy)

State Standards:

- 4.1.6.F
 - Understand how theories are developed.
 - Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.
 - Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.
 - Describe relationships using inference and prediction.

- Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.
 - Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments and are based on scientific principles, models, and theories.
 - Analyze alternative explanations and understanding that science advances through legitimate skepticism.
 - Use mathematics in all aspects of scientific inquiry.
 - Understand that scientific investigations may result in new ideas for study, new methods or procedures for an investigation, or new technologies to improve data collection.
- 4.1.12.B Research solutions to problems caused by interrupting natural cycles.
 - 4.1.12.E Research solutions addressing human impacts on ecosystems over time.
 - CC.3.5.6-8.C Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
 - CC.3.5.6-8.D Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
 - CC.3.6.6-8.F Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Keystone Final Assessment:

- BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.
- BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

Optional Challenge: Video

“Set the Stage for Air Quality”

For individuals or groups

Note: Entries in this challenge will not receive points, but instead will be considered for the Patti Burns Prize in Excellence in Communication and Media.

Due at Phipps: Friday, January 10 by 5 p.m.

Your Challenge:

The air that surrounds us is a vital component of the ecosystem and has a direct impact on our health. In humans, poor air quality can lead to respiratory, cardiovascular and nervous system complications as well as other chronic diseases. While the Pittsburgh region has come a long way from the notorious smog of the industrial revolution, Pittsburgh still struggles with air

quality issues today. In fact, according to the American Lung Association's 2019 State of the Air report, our area's air quality has worsened in the categories of ozone and short- and long-term particulate matter over the last year (https://www.lung.org/local-content/_content-items/about-us/media/press-releases/air-quality-in-pittsburgh.html). Air quality is affected by many different sources, some of which are more obvious than others.

In this challenge, create a video skit that draws attention to an air quality issue that is often overlooked. Choose one of the following topics and research the issue to learn more about it. Then, using characters and a plot, create a short skit that draws attention to the topic and concludes with an action or lesson that viewers can use to take action.

- **Idling:** Pennsylvania has laws against idling diesel vehicles, especially school buses. Research these laws as well as the dangers associated with diesel pollution. You can continue your research by making observations at school. Are there signs posted that prohibit idling? Do buses and other diesel vehicles obey the signage? What can viewers of your video do to make a difference when it comes to idling?
- **Outdoor Activity:** Outdoor athletes are particularly sensitive to air pollution. Research why this is, and how their exposure/risk are increased. What are some ways that athletes can protect themselves? You can continue your research by learning more from teams and coaches at your school. Are there procedures that they follow on "bad air days?" What can viewers of your video do or learn when it comes to outdoor activity and air quality?
- **Indoor Air Quality:** Although humans spend an increasing amount of time indoors, we don't often think about the quality of the air inside our buildings. Research indoor air quality and some sources of indoor air pollution. Continue your research by looking for potential sources of air pollution inside your school. Are there actions you, your fellow classmates and school staff members can take to improve indoor air quality? What can viewers of your video learn or do?

This challenge was created in collaboration with Pittsburgh's Group Against Smog and Pollution (GASP).

Select entries may be featured during the [2020 One Health One Planet™ Symposium, "One Health and the Air We Breathe,"](#) which will be held in April. This two-day conference will bring together experts and leaders from across the country to discuss the critical issue of air quality.

Resources: The following list of online resources may be used when preparing your entry:

- [Group Against Smog and Pollution \(GASP\)](#)
- [EPA Air Topics](#)
- [AirNow](#)
- [Clean Air Council](#)

- [Southwestern Pennsylvania Air Quality Partnership, Inc.](#)

Entry Requirements: Deliver to high school program coordinator at Phipps in person or via mail or email:

- Challenge Entry Form
- Maximum of two videos, each no longer than 4 minutes
- Include a works cited page (in either MLA or APA format), citing at least two sources. Works cited can be included in video or submitted in a separate document.
- Include the school name and the participating students' names in the credits of the video

School Submits: Maximum of two videos, Challenge Entry Form

State Standards:

MS

- 10.2.6.E Analyze environmental factors that impact health.
- 4.5.7.D Describe the wastes derived from using resources, how the waste is managed, and the potential impact on the environment.
- 4.5.7.E Describe how length and degree of exposure to pollutants may affect human health.
- 4.5.8.A Explain how Best Management Practices (BMP) can be used to mitigate environmental problems.
- 4.5.8.C Describe how humans can reduce pollution.
- 15.4.8.G Create an advanced digital project using appropriate software/application for an authentic task.

HS

- 10.2.9.E Explain the interrelationship between the environment and personal health.
- 10.4.9.C Analyze factors that affect the responses of body systems during moderate to vigorous physical activities.
- 4.5.10.C Analyze real-world data and explain how point and non-point source pollution can be detected and eliminated.
- 4.5.10.E Describe the impact of occupational exposure to pollutants.
- 4.1.12.E Research solutions addressing human impacts on ecosystems over time.
- 4.5.12.C Analyze the costs and benefits of means to control pollution.
- 4.5.12.E Analyze how consumer demands promote the production of pollutants that affect human health.
- 10.2.12.E Analyze the interrelationship between environmental factors and community health.

Keystone Final Assessment:

- BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-

Challenge 3: Art and Mathematics

“Wild About Geometry”

For individuals or groups | Maximum Points: 200 (100 points/submission)

Due at Phipps: Friday, February 14 by 5 p.m.

Your Challenge: Have you ever noticed that honeycomb is made up of repeating hexagons, or been curious about the pattern found on a pinecone? Nature is full of repeating patterns and geometric shapes! Look for geometric patterns in nature, such as symmetries, spirals, meanders, waves, tessellations, stripes or the Fibonacci sequence. Choose one of these patterns that interests you (or discover your own!) and create a two-dimensional art piece featuring the pattern as it is found in nature.

Along with your art piece, include three to five interesting facts about the pattern you chose. Is there a theory about the purpose of the pattern? For example, there are multiple theories for why zebras have stripes. Or, is there an explanation about how the pattern occurs, such as how waves form on the ocean? Maybe there’s a mathematical formula for the pattern you chose, like the Fibonacci sequence and sunflowers. Include your interesting facts on the back of your picture or on a separate sheet of paper, and be sure to cite any sources that you use. Formulas or diagrams may be included, but are not required.

Select student artwork will be displayed in the Center for Sustainable Landscapes Gallery.

Resources: The following list of online resources may be used when preparing your entry:

- [The Franklin Institute: Math Patterns in Nature](#)
- [CuriOdyssey: The Mathematics of Nature’s Patterns](#)
- [TED: The magic of Fibonacci numbers](#)
- [ABC Education: Maths in Nature](#)

Entry Requirements: Deliver to high school program coordinator at Phipps in person or via certified mail (electronic submission is not accepted):

- Challenge Entry Form
- Create an art piece featuring a pattern as it is found in nature
- Artwork must be two dimensional and no larger than 16” x 20”
- Include three to five facts about the pattern that you chose. (Such as theories for or mathematical/scientific explanations of the patterns.)
- Cite all sources.
- Label the project with the school name and the names of participating students

School Submits: Maximum of 2 art pieces, Challenge Entry Form,

State Standards:

- CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

- 9.1.8.A Know and use the elements and principles of each art form to create works in the arts and humanities.

Keystone Final Assessment:

G.1.1.1 Identify and/or use parts of circles and segments associated with circles, spheres, and cylinders.

G.1.2.1 Recognize and/or apply properties of angles, polygons, and polyhedra.

G.1.3.1 Use properties of congruence, correspondence, and similarity in problem-solving settings involving two- and three- dimensional figures.

A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically

A2.2.1.1.1 Analyze a set of data for the existence of a pattern, and represent the pattern with a rule algebraically and/or graphically

A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term).

Challenge 4: Game Design

“Nature for the Win!”

For individuals or groups | Maximum points: 200

Due at Phipps: Friday, March 20 by 5 p.m.

Your Challenge:

Playing games is fun, but it’s also a great way to practice creative problem solving, learn about something new, or share something you’re passionate about with others.

Design and create a game that teaches someone something about nature that you think is interesting. Examples of themes may be: highlighting the difference between specialist and generalist pollinators, exploring the complexities of decomposition, or delving into what lives in the deepest parts of the ocean. Get creative about a topic that interests you! You may also choose to format your game however you’d like. It can be collaborative or competitive; and it can be a board game, card game, active game, or any other style you wish! Be sure to include clear instructions that provide details on set-up, player objectives, game play, and ending the game. Don’t forget to cite any sources you use. Your game should be built of only repurposed or found materials. All game pieces should fit into a container no larger than 20x12x5”, and the game should be labeled with the school and participating students’ names. Games (with entry forms) should be submitted to Phipps either by mail or in person.

Resources: The following list of online resources may be used when preparing your entry:

- [Board Game Design Lab](#)

- Board Games to Create and Play by Kevan Davis
- [BoardGameGeek](#)
- Designing Board Games by Kristin Fontichiaro
- Eurogames: The Design, Culture and Play of Modern European Board Games by Stewart Woods
- [Open Educational Resources, The University of Edinburgh – Theme, Setting and Game Mechanics](#)
- [Pittsburgh Center for Creative Reuse](#)

Entry Requirements: Deliver to high school program coordinator at Phipps in person or via certified mail (electronic submission is not accepted):

- Challenge Entry Form
- Game, with the exception of the instructions, should be built of found or repurposed materials.
- Entire game should fit within a container no larger than 20x12x5”.
- Clear instructions for how to set up, play, and end the game should be included.
- Game should be labeled with the school and the participating students’ names.

School Submits: 1 Game, Game Instructions, Challenge Entry Form

State Standards:

- Standard - CC.1.4.6.A Write informative/ explanatory texts to examine a topic and convey ideas, concepts, and information clearly.
- Standard - CC.1.4.6.B Identify and introduce the topic for the intended audience.
- Standard - CC.1.4.6.E Write with an awareness of the stylistic aspects of composition. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Use sentences of varying lengths and complexities • Develop and maintain a consistent voice • Establish and maintain a formal style
- Standard - CC.1.4.6.F Demonstrate a grade-appropriate command of the conventions of standard English grammar, usage, capitalization, punctuation, and spelling.
- Standard - CC.1.4.6.T With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
- Standard - CC.1.4.7.A Write informative/ explanatory texts to examine a topic and convey ideas, concepts, and information clearly.
- Standard - CC.1.4.7.E Write with an awareness of the stylistic aspects of composition. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Use sentences of varying lengths and complexities • Develop and maintain a consistent voice. • Establish and maintain a formal style.
- Standard - CC.1.4.7.F Demonstrate a grade-appropriate command of the conventions of standard English grammar, usage, capitalization, punctuation, and spelling.
- Standard - CC.1.4.7.T With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

- Standard - CC.1.4.8.A Write informative/ explanatory texts to examine a topic and convey ideas, concepts, and information clearly.
- Standard - CC.1.4.8.E Write with an awareness of the stylistic aspects of composition. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Use sentences of varying lengths and complexities • Create tone and voice through precise language. • Establish and maintain a formal style.
- Standard - CC.1.4.8.F Demonstrate a grade-appropriate command of the conventions of standard English grammar, usage, capitalization, punctuation, and spelling.
- Standard - CC.1.4.8.T With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
- Standard - 3.4.6.CI Recognize that requirements for a design include such factors as the desired elements and features of a product or system or the limits that are placed on the design.