School Program Interpretive Plan

HelioZines: Share Sun Science, YOUR Way!

Overview

In order to better understand both sun science and science communication, students will research and create a handmade publication called a “zine” showcasing an area of heliophysics, the study of the Sun and all it influences. This three-part activity provides a multimodal, multisensory avenue for learning that engages multiple STEAM principles.
Note: while we present this lesson in collaboration with the Heliophysics Big Year, it can easily be adapted to any subject matter.

Audiences

Primary: Students in grades 6-12
Secondary: Parents and teachers

Content Areas

STEAM, English Language Arts, Information Literacy

Format

Three 30-minute class periods: a pre-lesson, lesson, and post-lesson

Objectives

After completing this activity, students will be better able to:

- Engage with NASA’s Heliophysics Big Year
- Identify basic areas of heliophysics
- Research information about heliophysics topics
- Translate scientific information to a zine science communication format
- Use artistic creativity to enhance science communication
- Recognize the importance of effectively communicating science

Background

What is a zine?
Zines are grassroots, usually handmade publications that anyone can make. They can cover any subject, but tend to center on niche content and empower marginalized voices. They have some of their roots in science fiction in the early 20th century, and we can expand that to real-life science communication as a way to empower learners to share their interests—similar to the tried and true "see it, try it, teach it" method.

Zines provide participants of all ages a way to dig deeper into such interests and share their knowledge with others. As Briley Lewis points out in "Using Zines for SciComm", "They present an opportunity to show the diverse faces behind science, to share personal experiences within science, technology, engineering, and medicine (STEM), and to illuminate aspects of science not always presented in mainstream descriptions." Libraries often collect zines, so they're also a way of collecting short pieces on interesting topics.

The Helio Big Year: October 2023 to December 2024
Heliophysics is the study of our star and how it interacts with everything in our solar system. A "Big Year" is a concept that originated with citizen scientists in the birdwatching community. Birders attempt to observe and study as many bird species as possible during a calendar year, and we are challenging the public to do the same with our Sun. During the Heliophysics Big Year, participants will have the opportunity to participate in many solar science events such as watching solar eclipses, experiencing an aurora, participating in citizen science projects, and other fun Sun-related activities. Find out more at go.nasa.gov/HelioBigYear.

Activity presented by the Heliophysics Big Year in collaboration with Aurorasaurus, a citizen science project celebrating solar maximum.

Aurorasaurus is an award-winning collaborative science project that tracks auroras around the world via reports on its website. Using aurora-related reports, it generates a real-time, global map of the Lights. Each report serves as a valuable data point for scientists to analyze and incorporate into space weather models. Aurorasaurus also conducts outreach and education across the globe. Aurorasaurus is a research project that is a public-private partnership with the New Mexico Consortium supported by the National Science Foundation and NASA.

Prep Ahead

- Make sure the following domains are permitted by your school's system administrator. The students may need to access websites on these domains during the pre-lesson.
    - https://blog.aurorasaurus.org/
    - https://www.nasa.gov
    - https://spaceplace.nasa.gov

    - https://solarsystem.nasa.gov
    - https://culturalconnections.gi.alaska.edu/
    - https://www.uaf.edu

- Providing opportunities to showcase their zines can motivate students to engage more deeply with the project. Many libraries have zine collections. Does your school or local library have or want to start a zine collection? Will your students have the option to add their zines to the collection after the post-lesson? If not, will you want to start a classroom zine library or send the zines home with the students?

- It will help for the teacher to familiarize themself with how to fold and cut a zine; clarifying the process is a frequently asked question.

Pre-Lesson: Gathering Information

In this pre-lesson, the concept of zines will be introduced. Students will select a topic from a list and use a worksheet to outline their zines.

Materials and Setup

- Make sure the list of websites under “Prep Ahead” above are permitted by your school’s system administrator
- Computer lab or laptops
- Printer access (color if possible)
- 1 worksheet per student
- Writing materials to fill out worksheet

Introduction: 10 minutes

- Points to make:
    - A lot of different people work on science. Working alongside scientists and engineers are science communicators: people who know how to translate complicated science into something the public can understand and get excited about. Science communicators can write articles, draw scientific art, design educational games, and more.
    - Over the next 3 classes, we are going to try out science communication by creating our own science zines.
    - Zines (pronounced “ZEENS”) are grassroots, usually handmade publications that anyone can make. They can cover any subject, but tend to center on niche content and empower marginalized voices. They have some of their roots in science fiction in the early 20th century.
        - Teachers can print, fold, and share some example zines. Examples may include:
            - Heliophysics Big Year zines
            - Zine about the history of zines (full color or grayscale)
            - Small Science Collective Science Zine Library

        - Zine about kindness
        - Zine about the Psyche mission to an asteroid of the same name
        - Kids Solidarity Mini Zine Pack by Jen White-Johnson and Kevin "Knox" Johnson III
    - Heliophysics (pronounced HEEL-ee-oh-physics) is the study of the Sun and how it interacts with everything in the solar system—for example, sunspots, auroras, and space weather. We will explore these topics and what they mean later today. A scientist who studies these topics is called a heliophysicist.
    - A "Big Year" is a concept that originated with birdwatchers, also called birders. During a Big Year, birders attempt to observe and study as many species as possible during one calendar year. NASA is challenging the public to do the same with our Sun. During the Heliophysics Big Year, participants will have the opportunity to take part in in many solar science events such as watching solar eclipses, experiencing an aurora, participating in citizen science projects, and other fun Sun-related activities.
    - We will make zines about various topics in heliophysics.
    - If students have the option to add their zines to a library, teachers can explain that opportunity.
- Teachers can give the assignment
    - Today we will choose topics and outline our zines. The amount of information that can fit into an 8 page zine like the ones we are making is a short paragraph. We will look at a blog post with a number of heliophysics topics in it. Each student can choose a topic, then take the information that is provided and rephrase it into something interesting and exciting for someone who has never heard of sun science before.
    - Teachers can ask for examples of how science might be made more understandable and exciting. (Answers might include: more pictures, using normal language, experiments, etc.)

Activity: 20 minutes

- Teachers can provide each student with a worksheet.
- They can then point students to any or all of the following resources:
    - **Aurorasaurus' Aurora 101** wordlist provides basic descriptions of concepts related to the formation of the Northern and Southern Lights
    - **NASA Space Place** has resources for students on a variety of topics, as well as a glossary.
      Suggested link: https://spaceplace.nasa.gov/
    - **University of Alaska Fairbanks** hosts a Cultural Connections website with video and interactive resources about the Northern Lights, especially knowledge shared by Iñupiaq elders.
      Suggested link: https://culturalconnections.gi.alaska.edu/multimedia/

- **The Museum of the North** provides activities on a range of topics. They take the form of activity plans for teachers, but students can gather background information from the activity plans.
  Suggested link:
  https://www.uaf.edu/museum/education/educators/heliophysics-aurora-outre/activities/index.php

- **The Heliopedia** is a word list that provides short descriptions of common heliophysics terms. This resource is best for older students.
  Suggested link:
  https://www.nasa.gov/mission_pages/sunearth/the-heliopedia/

- **NASA HEAT's Topics List** is another word list with short descriptions of a range of concepts related to heliophysics. This resource is also better suited to older students.
  Suggested link: https://solarsystem.nasa.gov/heat/topics/

Note: While students at this age are often capable of independent research, heliophysics is frequently presented online at the collegiate or graduate level and may be intimidating or incomprehensible. That said, teachers can customize resources as they choose. For example, instead of online research, students could listen to a guest speaker and build their zines around things they find interesting in the presentation.

- Students can choose a topic, then use the information on the website to think about how they want to present their information and what their zine will be like. Their worksheet can act as an outline. If they want photos from the internet to illustrate their zine, they should print them out.

- Teachers can collect the worksheets and printouts, or otherwise ensure that they will be available to the students for the next lesson. If students need more time, they could take their worksheets home to complete outside of class.

- Teachers can introduce the next lesson. For example, next class we will be taking the information we gathered today and creating our own zines!

- Cleanup & conclude

Note: as an alternative to the above, instead of independent research students could take notes and outline their zines based on a presentation by a guest, like a scientist.

Lesson: Creating Zines

Materials and Setup

- Recipe worksheets from pre-lesson, plus any photos students printed for their zines
- Zine templates (at least 1 per person)
- Felt tip pens/pencils/markers (assorted colors)
- Scissors
- Glues or gluesticks
- Example zines, and history zine, with enough copies to share
- Optionally, teachers can arrange desks into groups to share craft supplies
- Optional baskets to hold supplies
- Optional video demonstrating how to fold and cut the zine

Activity Procedure

- Teachers can remind students of the goal to express the scientific information they gathered in a way that is interesting and understandable to their audience
- Teachers can give instructions for students to use their outlines to create zines. It's important to note the direction and order of the page numbers on the zine templates, because that's the order the pages will be in when the zine is folded and complete.
- Teachers can show the video or demonstrate how to fold and cut the zines.
- Zine creation takes time. It is worth allowing as much of the class period as possible to work.
- Teachers can walk around to the tables to check in while students are working, answer questions, etc.
- As students begin to finish their art, they can fold and cut their zines. Students who finish early can swap and read each other's.
- At the end of class, teachers can collect the zines to share next class. If any students wish to take their zines home to finish, that is also valid.
- Teachers can introduce the post-lesson. For example, in the next class, we will share our zines and talk about ways to share science.

Digital alternative:
If students have access to computers and printers, you can alternatively link the powerpoint version of the template and have them use Powerpoint or Slides to design their zines, then print, fold, and cut as above.

Post-Lesson: Sharing Zines

Materials and Setup

- Completed zines
- Optionally, teachers can arrange desks into groups of 4-5 for easier collaboration

Activity Procedure

- The teacher can take a moment to review the purpose of zines, Heliophysics Big Year, and zinemaking process.
- Then, in groups of 4-5 students can trade zines. If groups of students finish their zines, they can trade with other groups. This step may take 10-20 minutes depending on the class.
    - As they read, they may wish to think about what the author did that they liked and that made the science either easier to understand, or more interesting.
- The class can reconvene for a discussion. Suggested discussion questions include:
    - What was something you saw that made you want to know more about the subject of a zine?
    - What was something you saw that helped you understand the subject of a zine?
    - What do you think is important to include when you're telling someone about science that is new to them?
    - What is one thing you put in your zine to help other people understand your topic?
    - How does your topic relate to someone else's topic? Would their zine work well in a series with yours?
    - Who might find your zine useful?
    - If you wanted to make another zine about science, what topic would you choose?
    - What are some ways you think scientists could better communicate science?
- The teacher can then conclude with a few points:
    - What you all did over the course of this project is called science communication, or "scicomm". Science communicators help people understand and get excited about science in different ways. There are many careers in scicomm, like science journalism, science art, museum education, educational television, and more. If you love sharing science topics with people who are new to them, it's a path to consider.
    - You have also started your participation in the Heliophysics Big Year! From October 2023–December 2024, NASA is challenging everyone to participate in as many Sun-related activities as possible. The Heliophysics Big Year is a unifying effort designed to encourage exploration, creativity, and wonder. We invite you to engage in the world around you with intention and curiosity.
- If the zines will be donated to a library or classroom library, it is important to remind students of the process. Alternatively, students can take their zines home to share their science with family and friends.

Additional Resources

- The Virginia Museum of Fine Arts has a zine collection, and created a zine lesson plan with excellent diagrams of folding techniques
- Pratt Institute LIS has a guide to zines for teachers
- The Met Museum posted an article about the zines in their collection for International Zine Month (July)
- From A to Zine provides educational resources about making zines in the classroom

Education Standards

This lesson applies to a variety of NGSS, art, and writing standards. The specific standards will vary widely depend on the subject matter and techniques teachers choose to utilize, but Heliophysics itself ties into a number of standards, which can be found on the NASA HEAT website. These include:

1. What are the impacts of the Sun on humanity?
Big Ideas
- 1.1 The Sun is really big and its gravity influences all objects in the solar system. (PS2, ESS1)
- 1.2 The Sun is active and can impact technology on Earth via space weather. (PS1, PS2, PS4, ESS2, ESS3)
- 1.3 The Sun's energy drives Earth's climate, but the climate is in a delicate balance and is changing due to human activity. (PS1, PS2, PS3, LS4, ESS2, ESS3)

2. How do the Earth, the solar system, and heliosphere respond to changes on the Sun?
Big Ideas
- 2.1 Life on Earth has evolved with complex diversity because of our location near the Sun. It is just right! (PS3, PS4, LS1, LS2, ESS2)
- 2.2 The Sun defines the space around it, which is different from interstellar space. (PS2, ESS1, ESS2)
- 2.3 The Sun is the primary source of light in our solar system.(PS1, PS2, PS3,PS4, ESS1)

3. What causes the Sun to vary?
Big Ideas
- 3.1 The Sun is made of churning plasma, causing the surface to be made of complex, tangled magnetic fields. (PS1, PS2, ESS1, ESS2)
- 3.2 Energy from the Sun is created in the core and travels outward through the Sun and into the heliosphere. (PS1, PS3, PS4, ESS1, ESS2, ESS3)
- 3.3 Our Sun, like all stars, has a life cycle. (PS1, LS1, ESS1)