



HANDS-ON SCIENCE ACTIVITIES



Activity 2

Weather Wall

For use with participants
ages 5 to 13



LUNAR AND
PLANETARY
INSTITUTE



ALA American
Library
Association



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Discover Earth Themes and Overview of Activities

The *Discover Earth* activities focus on Earth science topics close to home – such as local weather and the plants, animals, crops, and environmental features particular to your region – as well as a global view of our changing planet. Through hands-on investigations and discussions, young audiences discover that Earth’s global environment changes – and is changed by – the local environment. The activities explore three key messages relating to this overall theme: A. We belong to Earth; B. Each region is unique; and C. Your home is changing. These messages all relate to the overall theme: Earth’s global environment changes – and is changed by – the local environment. The activities were developed with guidelines set forth by the National Science Education Standards and American Association for the Advancement of Science (AAAS) benchmarks, and they were designed for audiences in the following four age ranges: 5 to 7, 8 to 9, 10 to 13, and teens.

Overall Theme

Earth’s global environment changes – and is changed by – the local environment.

A. We Belong to Earth

We belong to a complex system of interacting water, ice, air, and life.

Community Activities

The community contributes to two exhibits: In *Century of Change Display*, the community gathers and compares photos and/or illustrations of the local areas taken a century and more ago with more contemporary photos of the same areas. In *Weather Wall*, children track the local weather over a period of two months or more, plotting weather data on a kid-friendly sticker chart.

Icebreaker Activities

Children ages 5 and up are introduced to Earth’s major characteristics (or parts or systems) -- water, ice, air, and life – through the brief icebreaker activities *Catch!...the World’s Ocean*, *Ice-y Experience*, *Share the Air*, and *Web of Life*.

Discover Earth through Reading

I Belong to Earth can serve either as part of a kick-off celebration or as an outreach program to area schools. Children and teens discover Earth science questions and answers using the library’s resources and participate in reading games — customized for ages 5 to 9, 10 to 13, and teens — that combine book lists and reading logs into take-home adventures! After this activity, the reading



games continue to connect patrons with the *Discover Earth* activities and resources. Participants advance by reading, engaging in suggested at-home activities, attending *Discover Earth* library programs, or investigating Earth and the environment through a variety of citizen science programs. Completed game boards may be submitted to the library for display, and if desired, entry into promotional drawings. Participants earn a decal upon completion.

B. Each Region Is Unique

Changes to distant oceans, air moving freely around our globe, and all living things have an influence on our regional environment, now and in the past and future.

Weather Explorations

Children ages 5 to 7 explore various aspects of weather through a series of stations featuring games, crafts, and weather observations in *Weather: The Many Faces of Mother Nature*. Children ages 8 to 9 and 10 to 13 undertake more advanced investigations of rain, wind, clouds, and weather instruments and consider how locally collected weather data relate to the broader Earth systems of water, ice, air, and life in *Weather Stations*.

Regional Explorations

In *Climate Tour*, children ages 10 to 13 celebrate their region of the United States by creating a regionally-inspired postcard and recipe. Finally, they use a set of *What if...* cards about their region to reconsider their postcards and recipes in light of future climate change. In *Polar Bears or Penguins?*, children ages 10 to 13 use a fast-action matching game to demonstrate how each of Earth's polar regions is distinct and special.

C. Your Home Is Changing

Earth's water, ice, air, and life will continue to interact over long-term scales, shaping the particular features of that place we each call home.

Environmental Stewardship

In teams, children ages 11 to 13 build an understanding of how human actions impact global change by playing a board game, *Polar Bears Go with the Floes*, in which chance and choice determine the fate of a lone polar bear on an ice floe. Teens, ages 14 to 18, engage their communities in science through art in *Earth: Artistically Balanced*. The teens first interact with a climate scientist to unravel, on a very basic level, the complexities of Earth's climate system, and then they create a three-dimensional artistic representation of Earth's climate. The art may be created on a large scale and displayed at the library or made on a smaller scale to take home.



How to Use These Activities in Your Programs

You may design your own program of one or more of these flexible activities, or you may choose to build the story of Earth and its changing environment through the complete series of activities! Background information and facilitator resources are provided to help you prepare to lead the activities. Encourage further exploration with the books, websites, and videos listed in the *Facilitator's Resources* packet. Programming ideas for all ages, infant to adult, are also provided.

Reading games, geared toward different age levels, support this module and connect the activities and resources. The games combine the traditional reading log and book list into a board game, where participants advance by reading, engaging in suggested at-home activities, attending library programs, or investigating Earth and the environment through a variety of citizen science programs. These games are introduced in Activity 4: *I Belong to Earth*. The game boards may be customized with your institutions' address, and if desired, an additional step in the instructions for winning prizes. Matching decals may be printed and awarded as prizes. *Read Me* bookmarks are available as a way for children to read, review, and recommend titles to others. These materials (shown below), including the supporting book lists, are available free for educational use at www.lpi.usra.edu/explore/discoverEarth.

The collage features several educational resources:

- Weather Watcher:** A reading log for ages 6 to 9 with a grid for tracking reading progress and activities.
- Thoughtful Steward of the Earth:** A reading log for teens and adults with sections for 'Belong', 'Change', 'Balance', and 'Nurture'.
- Roaming Reader:** A circular board game featuring a map of the United States and various reading activities.
- Discover Earth's Special Places in the Continental U.S.:** A reading list for ages 10 to 13.
- Read Me!** A bookmark template for recommending books.
- Weather Watcher Reading List:** A list of books for ages 6 to 9.
- Thoughtful Steward of the Earth Reading List:** A list of books for teens and adults.
- Discover Earth's Special Places in the Continental U.S. Reading List:** A list of books for ages 10 to 13.



Correlations to National Standards

National Science Education Standards

Grades K-4

Earth and Space Science - Content Standard D

Changes in the Earth and Sky

- Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.

Grades 5-8

Earth and Space Science - Content Standard D

Changes in the Earth and Sky

- Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.



Activity Procedure

Overview

Children track the local weather over a period of two months or more, plotting weather data on a kid-friendly sticker chart. Library patrons between the ages of 7 and 13, as well as younger children working with a teen or adult, contribute a few minutes of time each day to note the previous day's temperature and precipitation. Over time, they collectively document the season's patterns. Weather data may be collected from a weather station housed at the library or from Internet listings.

What's the Point?

- We observe local changes in weather by keeping records of temperature and precipitation.
- Weather varies from day to day, but creates seasonal patterns.

Materials

Facility Needs

- A blank wall space (5' tall and 6' wide) on which to hang the sticker charts

For the Community

- 2 *Weather Wall* charts, created from
 - 2 (18"x72") pieces of butcher paper
 - 1 permanent marker
 - 1 (36") measuring stick
- 500 (3/4") circular stickers or coloring supplies
- A weather station and access to data recorded by it from the previous day, such as the equipment provided with the *Discover Earth* traveling exhibit OR Access to the previous day's weather data on the Internet, preferably from an easy-to-read website such as <http://www.wunderground.com/history>
- Instructions, either posted on the wall or set on a table nearby



For Each Child

- Optional: A weather journal, such as the Woodland Trust's "Weather Diary" (www.naturedetectives.org.uk/download/weather_diary.htm)

Preparation

- Develop an advertising plan. Distribute an invitation to the community describing the activity and timeframe. Create signs to direct patrons to the Weather Wall.
- Prepare a high temperature chart and a precipitation chart. by using the measuring stick and marker to draw a grid pattern on each piece of butcher paper, then add labels:
 - While leaving room on the left, top, and bottom edges for labels, draw a grid with 1"-wide squares. (Alternatively, use software such as Microsoft Excel to create grids with 1"-wide squares, which can be printed on standard-sized paper, trimmed, and pasted together on butcher paper.) Your grid should have 60 equal columns and 12 equal rows. Label the bottom of each column with dates spanning two consecutive months, beginning with the date you will begin offering the *Weather Wall* to the library patrons.
 - Determine your area's *typical* temperature and precipitation using one of the following Internet sources for climate information:
 - "USA Weather Almanac" at <http://www.usatoday.com/weather/climate/usa/wusaclim.htm>
 - "Climates of the States" at <http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl>
 - WorldClimate at <http://www.worldclimate.com>
 - Based on the minimum and maximum typical high temperatures and amount of precipitation for the two months you will cover, label each chart.
 - On the temperature chart, label the bottom and top rows with minimum and maximum high temperatures, respectively, in degrees Fahrenheit. Or, you may choose to label the temperatures in degrees Celsius to give the children practice in using the metric measurements taught in science class.
 - On the precipitation chart, label the bottom row as 0. Use inches if desired, or you may choose to label the amount of precipitation in centimeters to give the children practice in using the metric measurements taught in science class: 0" or 0 cm. Label the top row with the maximum daily precipitation usually observed in your area. For example, if precipitation in summer in your area can range up to 4" (10 cm), label the top row as 4" (10 cm).



- Calculate how to label the rows on the temperature chart as follows: Subtract the minimum from the maximum typical high temperatures and precipitation for the two months you will cover. Divide this number by 11 to calculate how many degrees of temperature rise each row denotes. Label each row accordingly with the nearest whole number.
- Calculate how to label the rows on the precipitation as follows: Divide the typical maximum daily precipitation by 11 to calculate how many inches or centimeters of precipitation each row denotes. Label each row accordingly with the nearest whole number.
- If desired, create a third chart to record daily low temperatures.
- Add a title (“High Temperature” or “Precipitation”) to the top of each chart.
- Provide a station where library patrons may either view data from a weather station at the library (such as at the *Discover Earth* traveling exhibit) or a computer station with Internet access and a list of appropriate weather data sources.
- Post the charts on the wall and provide instructions nearby. Set out stickers or coloring supplies. If the children will be using coloring supplies instead of stickers, line the wall with absorbent paper to protect it.
- If desired, distribute weather journals and invite the children to record the weather at home and update the Weather Wall on their next visits. Science clubs could periodically meet to update the chart.
- Alternatively, or in addition to this effort, invite local schools to generate their own “Weather Walls” in their classrooms.

Activity

1. **Invite the community to contribute by advertising the project.**
2. **Have two of the children visiting on a given day fill in the graphs with the previous day’s weather data.** (Visitors may be recruited randomly, or children may sign up to take responsibility for certain days.) Help them note the correct values from the weather station or an appropriate Internet site. Direct each child through the following steps:
 - a. Gather enough stickers so that each sticker represents one row on the chart. For example, if it rained 1” yesterday and each row represents $\frac{1}{2}$ ” of precipitation, collect 2 stickers.
 - b. Find yesterday’s date on the bottom of the graph.



- c. Fill in the graph vertically for that date with the appropriate number of stickers.

Facilitator's Note: By filling the graph in vertically with stickers, the children are creating an easy-to-read bar graph that can be interpreted by a wide range of ages, including children as young as about five years old (with assistance from a teen or adult).

3. **Monitor the graph to ensure that data is consistently — and accurately — recorded.** If necessary, recruit children to fill in any gaps, especially after days when the library was closed.
4. **Ask the children to look for a pattern in the stickers on the chart.**
 - Is the daily high temperature increasing or decreasing?
 - Is the amount of precipitation consistent or sporadic?
 - Have there been any days of very high or very low temperature?
 - Have there been any stormy days or periods without rain or snow (drought)?
 - What do you predict will happen as the season begins to change?
5. **Continue displaying the completed Weather Wall to showcase the community's collaborative effort!** If desired, continue collecting data for a year ... and keep the conversations going!

Conclusion

Summarize that the local weather varies from day to day, but creates seasonal patterns. By working together to keep records of temperature and precipitation recorded at a weather station, the community tracked these local changes.



Contact Information

Your questions and comments about the *Discover Earth: Hands-on Science Activities* are welcome!

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STAR_Net Project Overview

The *STAR Library Education Network* project (*STAR_Net* for short) is part of a national initiative to support libraries that are already providing informal STEM learning, or want to provide it. The *STAR_Net* project has a number of components, including:

- Two traveling exhibits for libraries: *Discover Earth: A Century of Change*, and *Discover Tech: Engineers Make a World of Difference*.
- An Education Program, which includes developing exemplary hands-on activities for libraries, as well as conducting training (both online and in-person) for library staff.
- An Outreach Program that helps libraries to develop STEM programming and find local partners for collaborations on programming.
- An online Community of Practice (CoP) (<http://community.discoverexhibits.org>) for librarians (both hosts and non-hosts of the exhibits) and STEM professionals who want to support STEM programming in public libraries.

The National Science Foundation (NSF) provided funding the *STAR_Net* project. *STAR_Net* is led by the National Center for Interactive Learning (NCIL) at the Space Science Institute. Dr. Paul Dusenbery is the project director. STAR stands for “Science-Technology Activities and Resources.” In addition to NCIL staff, the project team includes:

- The American Library Association (ALA), which is managing the exhibit tours and helping to raise awareness among librarians of the many opportunities for providing STEM programming



- The Lunar and Planetary Institute (LPI), which is leading the Education Program component. For some years, LPI has led the *Explore* program for libraries, which has been at the forefront of developing STEM programming and training for librarians.
- The National Girls Collaborative Project (NGCP), which is leading the project's Outreach Program. As a project partner, this NSF-funded project is helping libraries across the country partner with a variety of organizations to provide STEM programming.
- NCIL's Kate Haley Goldman and staff from Evaluation and Research Associates are conducting evaluations of the project's components. The project also includes a research component that explores how public libraries can serve as STEM learning centers in rural, under-served communities. The evaluation and research results will be shared with the informal science education community.

The activity described in this packet was developed for libraries to use in support of the *Discover Earth* traveling exhibit, though it may be implemented independently.

Online Community

Librarians, scientists, engineers, educators, museum staff, and others are invited to join the *STAR_Net* online community! The website fosters collaboration among professionals who want to provide or support Science, Technology, Engineering, and Mathematics (STEM) learning experiences in libraries. The *STAR_Net* project team hopes you find the following activity useful. Please join the online community (<http://community.discoverexhibits.org>) and share your experiences implementing it with your colleagues.

For more information about the *STAR_Net* project, please contact:

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Field Tests

Appreciation is extended to the librarians who field tested the materials in their children's, youth, and teen programs.

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