



SEAL

Solar Eclipse Activities
for Libraries

SEAL Virtual Training Series

GLOBE Observer: Eclipse

GORDON AND BETTY
MOORE
FOUNDATION

STAR★net

Science-Technology Activities &
Resources For Libraries

NASA @

My Library

scistarter

Science we can do together.

Webinar Outline

Introduction: Dillon (10 mins)

GLOBE Eclipse: Jessica (15 mins)

GLOBE Eclipse Library Kit: Theresa (12 minutes)

Going Further with GLOBE: GLOBE Surface Temperature: Kevin (12 mins)

Q and A (10 minutes)

Presenters

Dillon Connelly (he/they), Education Specialist, Space Science Institute

Claire Ratcliffe Adams (she/her), Education Associate, Space Science Institute

Theresa Schwerin (she/her), Vice President, Education, Institute for Global Environmental Strategies (IGES)

Jessica Taylor (she/her), NASA Langley Research Center, GLOBE Clouds Scientist

Kevin Czajkowski, Professor, University of Toledo

Agenda

- Introduction/Icebreaker/Agenda
- Introduction to SEAL
- Introduction to GLOBE Eclipse
- GLOBE Eclipse Library Kit
- Going Further with GLOBE: GLOBE Surface Temperature
- Q and A

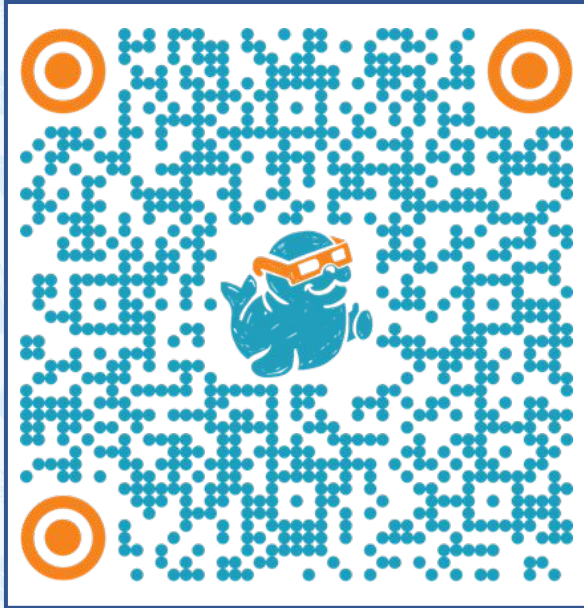
Icebreaker

Citizen science is a great way to connect your community with big ideas about how the world around us. What are some ways you've connected your community to big ideas at your library?

The SEAL Project

- Free eclipse glasses for libraries (up to 2000 per application)
- In-person trainings in all 50 states and 4 territories
- Recorded training videos and virtual workshops
- Circulating kits in state libraries with solar telescopes, books, and activities
- Access to scientists, volunteers, eclipse subject matter experts, and other librarians through the *STAR Net* online community

Getting Started



- SEAL resources blog
- Register for glasses
- Newsletter
- FAQ webinar
- Getting Started with SEAL webinar
 - Monthly (May through August)

GLOBE Eclipse

Jessica Taylor

NASA GLOBE Clouds PI
NASA Langley Research Center

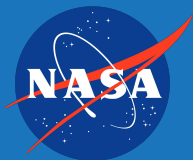


THE GLOBE PROGRAM



Educators	Students	Community Citizen Scientists
44,000+	84,2000+	244,000+

Sponsored by:



Supported by:



Implemented by:



clouds

Identify and report clouds, sky cover and visibility. Coordinate reports with satellite flyovers.

High-Level Clouds
All the Sky
Cirrus
Cirrocumulus
Cirrostratus

the number of central types seen.

mosquito

Document and eradicate habitats and identify larvae.

What is the type of discarded item?
Identify breeding habitat?

Land Cover

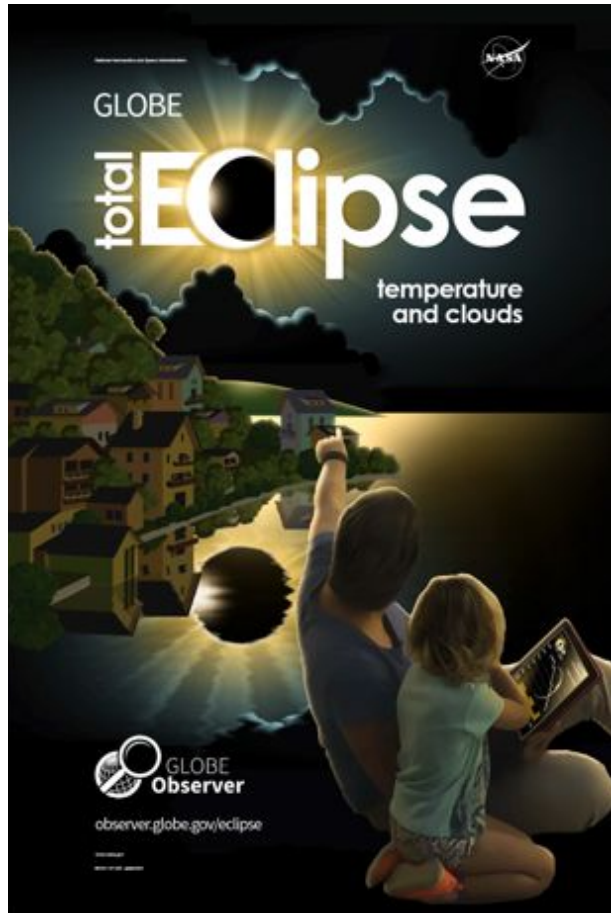
Record what is on the land around you; connect it with satellite data.

Tall Grass
Medium Grass
Short Grass
Forest or Flowers
Sparse
Wetlands
Open Water
Cultivated
Urban

Trees

Measure tree height with your device's camera to verify satellite data.

Measurements
Camera Height: 155.99 cm
Stride Length: 66.2 cm
Number of Steps: 33
Distance to Tree: 22.5 m
Calculated Tree Height: 6.8 m (22 ft. 3 in.)
Circumference: 114 cm (3 ft. 9 in.)



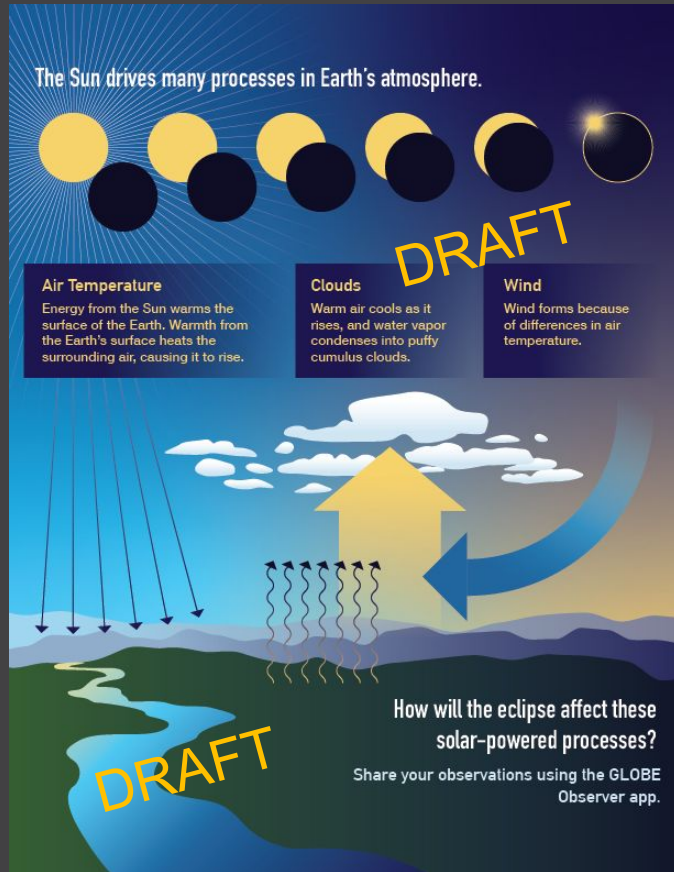
GLOBE Eclipse: Preparing for 2023 & 2024

App Basics



The Earth Science Angle: Study eclipses as a volunteer observer with GLOBE

The Sun drives many processes in Earth's atmosphere.



Air Temperature
Energy from the Sun warms the surface of the Earth. Warmth from the Earth's surface heats the surrounding air, causing it to rise.

Clouds
Warm air cools as it rises, and water vapor condenses into puffy cumulus clouds.

Wind
Wind forms because of differences in air temperature.

How will the eclipse affect these solar-powered processes?
Share your observations using the GLOBE Observer app.

Energy from the Sun warms our planet. Changes in sunlight can cause changes in temperature, clouds, and wind.

- What happens when the Sun is blocked by the Moon during an eclipse?
- How will the eclipse affect these solar-powered processes?

The GLOBE Eclipse tool, will appear a few days before the eclipse. In the tool, volunteer scientists can:

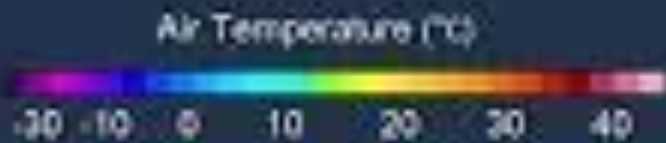
- Observe how the eclipse changes atmospheric conditions near you by reporting on clouds and air temperature



The image shows a vertical screenshot of the GLOBE Observer mobile application interface. At the top, it says "THE GLOBE PROGRAM" and "GLOBE Observer". Below that, it prompts the user to "Choose your protocol:". A yellow box highlights the "total Eclipse" protocol, which is labeled "Sample only" and "Not final graphic". Below this are four protocol options: "Clouds", "Mosquito Habitat Mapper", "Land Cover", and "Trees". At the bottom, there are social media icons for Facebook, Twitter, Instagram, and YouTube, along with buttons to "Visit the GLOBE Website" and "Visit the Observer Website". The footer includes logos for NASA, NSF, and NOAA, and a navigation bar with home, volume, settings, and help icons.

- Provide comparison data even if not on the path of maximum eclipse

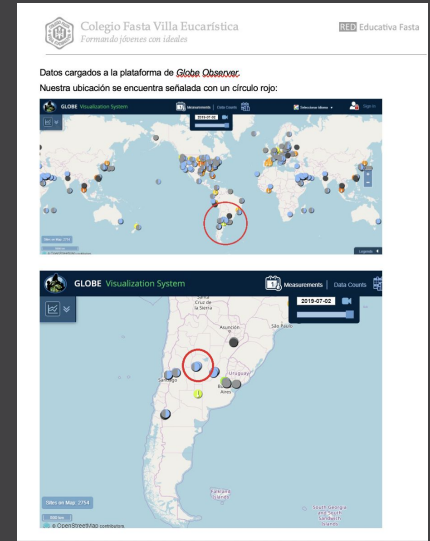
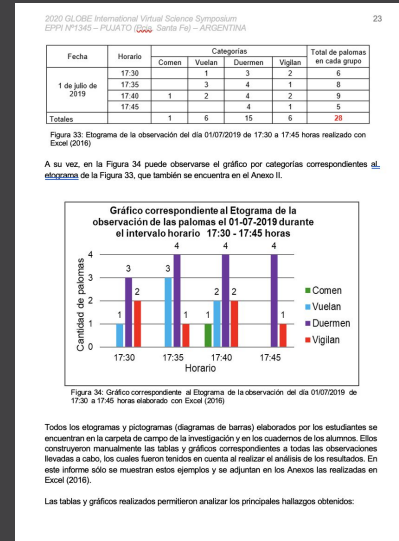
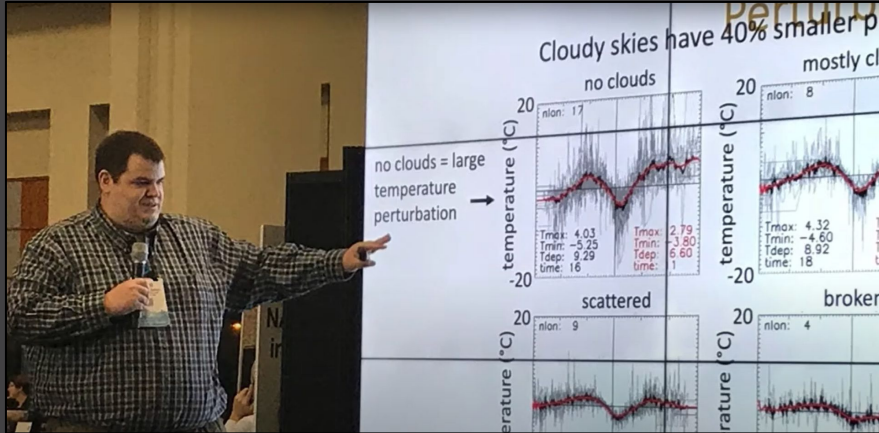
Eclipse shadow location is an estimation.



August 11, 2017 Eclipse
Air Temperature Measurements



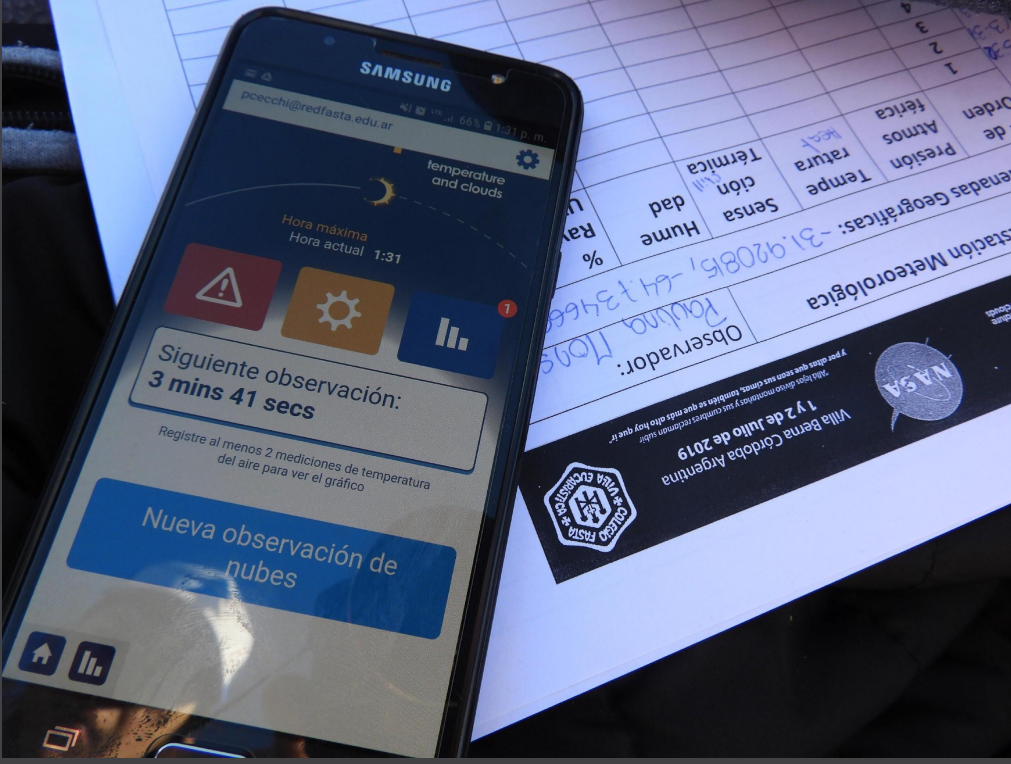
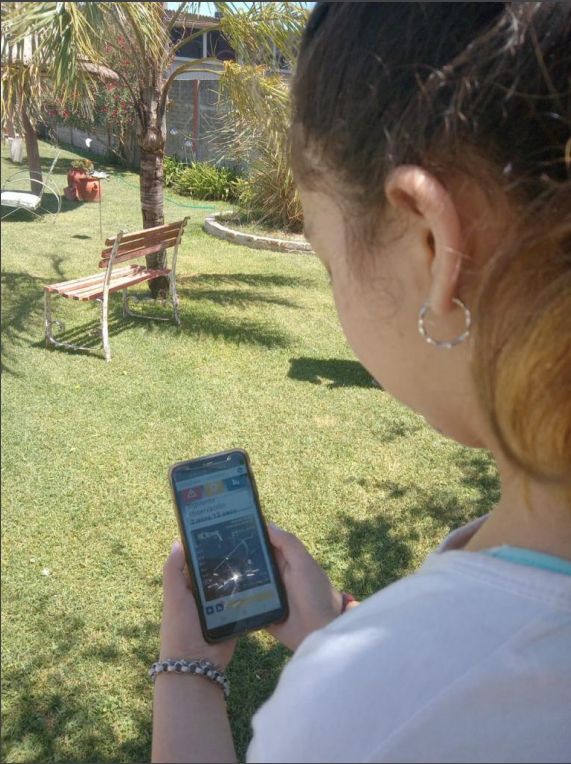
Contribute to a citizen science database used by scientists and students to study the effects of eclipses on the atmosphere



Dr. Brant Dodson (NASA Langley Research Center) presents his paper comparing the citizen science temperature data at different reported levels of cloud cover during the 2017 eclipse.
doi.org/10.1175/JAMC-D-18-0297.1

Student research reports submitted to the GLOBE International Virtual Science Symposia after recent eclipses.
observer.globe.gov/eclipses#studentresearch

Using the GLOBE Eclipse tool



Settings ✕

Please confirm your thermometer type:


Type of Thermometer: ▼

C F

Measurement Alarm: On

Location:
-39.8546, -71.0599

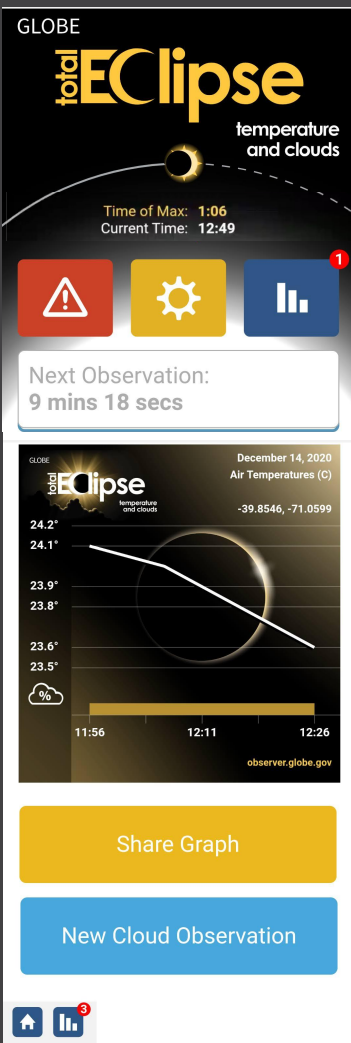
Do a Land Cover observation to characterize your location (include your thermometer in the down photo!)



Using the App: Configuration

- Set the type of thermometer used (liquid filled, digital, weather station, other)
- Choose Celsius or Fahrenheit to display the temperature in the app (all data is stored in Celsius in the GLOBE database)
- Activate reminders for taking measurements
- Current location (automatically set)
- Take a Land Cover observation to tell us about the landscape where the observations are being collected





Using the App: Data Collection 1



Top portion shows the time of maximum eclipse based on the current location



Buttons go to safety/intro pages, configuration/settings (see previous slide), and a listing of the already collected data.

GLOBE

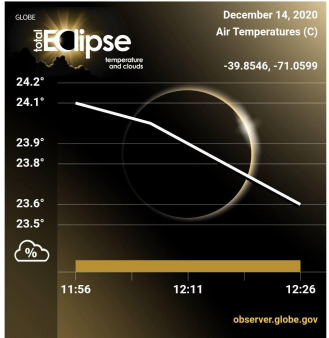
toEclipse

temperature
and clouds

Time of Max: 1:06
Current Time: 12:49



Next Observation:
9 mins 18 secs



Share Graph

New Cloud Observation



Using the App: Data Collection 2

Next Observation:
9 mins 18 secs

Enter Data Now:

Display shows a countdown to the time for the next observation, or “Enter Data Now” when it’s time to collect another air temperature measurement.

Tapping “Enter Data Now” brings up a selection menu for temperature values (right).



GLOBE

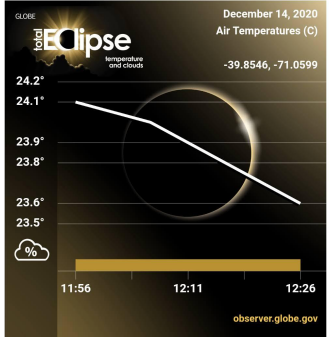
toEclipse

temperature
and clouds

Time of Max: 1:06
Current Time: 12:49



Next Observation:
9 mins 18 secs



Share Graph

New Cloud Observation



Using the App: Data Collection 3



The graph icon goes to a listing of previously collected air temperature data, with options to edit or delete data points if needed.

Data



Air Temperature Observations

11:57 am	27.5° C		
12:07 pm	27.3° C		
12:17 pm	27.2° C		
12:27 pm	27.2° C		
12:37 pm	27.1° C		
12:42 pm	27.0° C		
12:48 pm	26.8° C		
12:53 pm	26.6° C		

GLOBE

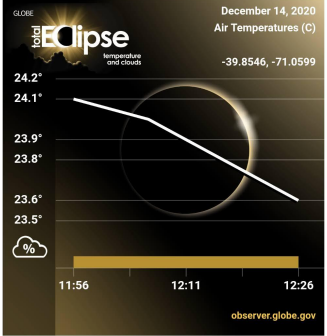
toEclipse

temperature
and clouds

Time of Max: 1:06
Current Time: 12:49



Next Observation:
9 mins 18 secs



Share Graph

New Cloud Observation



Using the App: Data Collection 4

Clouds

Would you like to perform a clouds observation now?

NO

YES

New Cloud Observation

Periodically, the app will also pop up a reminder to take an observation of clouds, although users are also encouraged to take an observation at any time if they notice something changing in the cloud conditions (New Cloud Observation button).

GLOBE

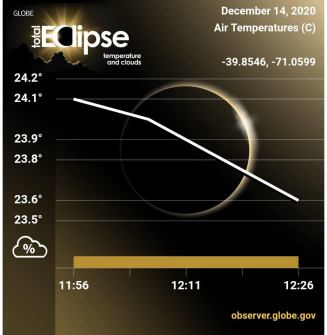
total Eclipse

temperature
and clouds

Time of Max: 1:06
Current Time: 12:49



Next Observation:
9 mins 18 secs

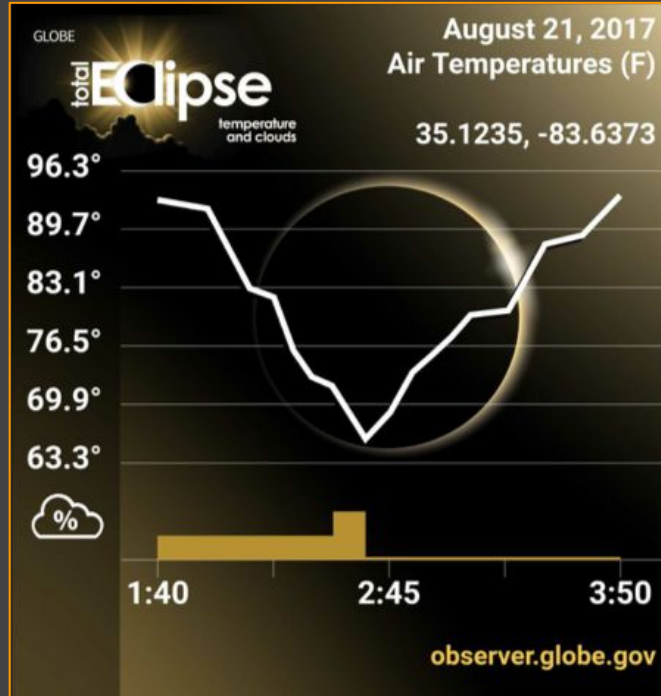


Share Graph

New Cloud Observation



Using the App: Data Collection 5

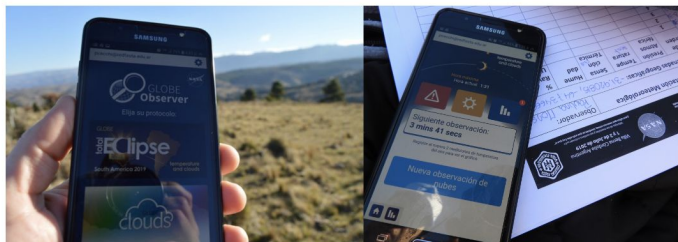


Share Graph

The graph will update as new data points are added, both for air temperature and overall cloud coverage.

The "Share Graph" button allows easy sharing to social media.

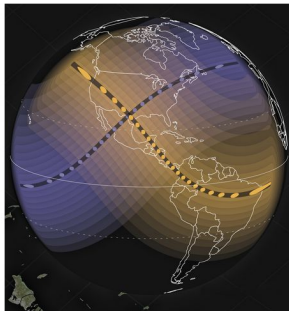
What is GLOBE Eclipse?



GLOBE Eclipse is a temporary tool in the GO app that will help you document air temperature and clouds during an eclipse. The tool is not visible in the app on a regular basis, but is only opened up when a solar eclipse is happening somewhere in the world. The Eclipse tool will prompt you to take air temperature measurements using a meteorological thermometer, as well as taking regular observations of sky conditions using the [Clouds](#) tool. For more details about equipment needed, how to take observations, and frequently asked questions, visit the [Taking Observations](#) page. Our [Resource Library](#) includes additional activities, references and videos.

Image source: GLOBE School Colegio Fausta Villa Eucarística in Argentina, taken during the July 2019 eclipse.

On 14 October 2023, an annular eclipse ☾ will take place in North, Central and South America. The path of maximum eclipse will be across parts of the United States, Mexico, Belize, Honduras, Nicaragua, Costa Rica, Panama, Columbia and Brazil (the path from upper left to lower with yellow circles in the diagram below). A partial annular eclipse will be visible in Canada, and other parts of Central and South America. This map of the 2023 eclipse ☾ shows the percentage of obscuration for any location.



Find more details, including activity guides and extended opportunities for data collection, on the GLOBE Observer Eclipse website, observer.globe.gov/eclipse

GLOBE Eclipse Library Kit

Theresa Schwerin

Lead, GLOBE Observer and Libraries
NASA Earth Science Education Collaborative, PI

Institute for Global Environmental Strategies



GLOBE Eclipse Library Kit

Up to 100 U.S. public libraries will receive the library kit.

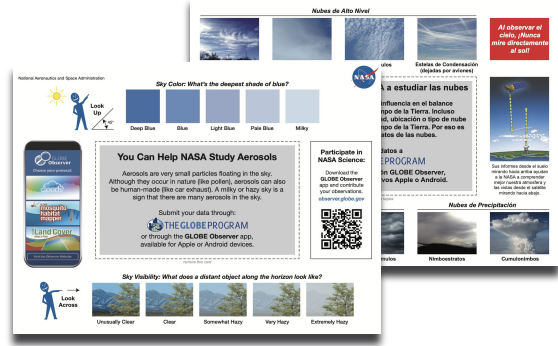
May 31: Applications due

Early June: Select & notify Libraries

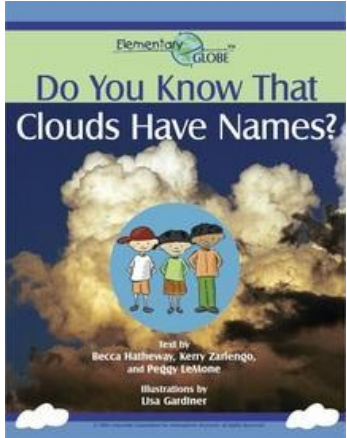
Mid-June and July: Kits shipped.



Bilingual GLOBE Observer Card
Use center hole to project the eclipse onto a surface
100 pack



Bilingual GLOBE Sky Windows - English and Spanish
100 pack



Elementary GLOBE Clouds Books
10 books each per kit of English and Spanish



Digital thermometer for measuring air temperature
1 per kit

GLOBE Eclipse Library Kit Application



Eligibility

- Public libraries in the U.S., D.C., or in a U.S. territory can apply.
- Libraries that are planning programs related to either 2023 or 2024 eclipses
- Not a requirement that a library be on the path of totality; comparison data is also needed

Applications are due May 31, 2023 - <http://nesec.strategies.org/GO-Eclipse-Library-Kits/>

Includes a link to the online application and PDF so that you can see the questions to be answered, which are related to:

- Audiences served
- Prior experience/programming related to STEAM or citizen science
- Strategies for engaging underserved audiences
- Eclipse programming plans

There will not be a separate application process for the 2024 eclipse

All kits will be distributed in 2023

GLOBE Eclipse Library Kit: Expectations for participating libraries:



- **Watch May 4 webinar** (either live or recording on [STARNet Libraries YouTube Channel](#))
- **Attend at least one drop-in/check-in session** during August or September 2023. These are opportunities to share additional information, ask questions, brainstorm ideas, and share your plans.
- **Offer at least one library program** that incorporates GLOBE Eclipse. These events can be leading up to or on eclipse day for either: October 14, 2023, or April 8, 2024.
- **Complete evaluation surveys** about their events and experiences using GLOBE Eclipse. Plans are to have two surveys, one after each eclipse.
- **Join our GLOBE Eclipse Libraries Team** - you can also create your own GLOBE library team.

GLOBE Eclipse Timeline <http://nsec.strategies.org/GO-Eclipse-Library-Kits/>

2023

- May 4 Webinar for libraries, with recording available for on-demand viewing.
- May 31 Applications due; apply online (link at above URL)
- Mid-
Late June Libraries notified first that are accepted, all libraries notified of their status by late June
- Late June
to July Kits distributed to participating libraries
- Aug & Sept Monthly drop in/check in (date TBA) via Zoom to provide updates, answer questions, share/brainstorm programming ideas
- October 14 Annular Solar eclipse
- October 31 Library partners complete evaluation survey (due: October 31)

GLOBE Eclipse Timeline <http://nsec.strategies.org/GO-Eclipse-Library-Kits/>

2024

- | | |
|-------------------------|--|
| Jan/Feb | Kick-off library webinar for 2024 eclipse. <ul style="list-style-type: none">● GLOBE Eclipse data collected● Results from the 1st evaluation survey,● libraries to share examples of programs they did, and reflection on the October 2023/eclipse plans for 2024. |
| February & March | Monthly drop-in (dates TBA) via Zoom to provide updates and answer questions |
| April 8 | 2024 total solar eclipse |
| April 30 | Participating libraries complete evaluation survey |
| Late May/
Early June | Briefing with library partners on results |

GLOBE Eclipse: Additional Benefits for All Libraries

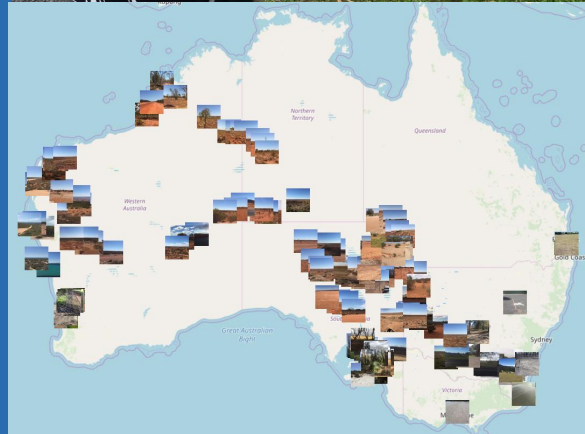
- GLOBE Observer is an ongoing citizen science project that can **support library programs year-round** related to the GLOBE Observer app tools: Clouds, Land Cover, Tree Height, and Mosquito Habitat Mapper.
- GLOBE Eclipse **activities and resources are available online** for **all** to use.
- **Ability to create a GLOBE Team that your patrons can join.** The team tool can be used to track engagement or participation in your programs. You will be able to see how many people join the team, and how many use GLOBE Observer to take observations.

What is a GLOBE Team?

Teams can be used to set up a competition, coordinate a community's citizen science efforts, support an educational or corporate initiative, or simply enable a group of people to work together (including virtually).

Who can join or create a GLOBE Team?

- Anyone with a GLOBE or GLOBE Observer login
- You can join or create as many teams as you wish.
- Teams can be public (anyone can join) or private (by invitation with referral code)



Teams of Scouts and their adult leaders collected nearly 200 land cover observations during a 3-month competition.

Benefits of Creating a GLOBE Team

- Track impact from an event or training
- Invite patrons to take science home and maintain connection to your library
- Set up a competition
- Coordinate volunteer efforts

Learn more:

<https://observer.globe.gov/do-globe-observer/do-more/teams>

NASA at My Library

Virginia, United States of America

Year Created: 2020 Referral Code: GLIDEVQX

Data Site Locations

Data Period: Jan 01, 2019 - May 02, 2023

Protocol	# Observations	Last Entered Date (UTC)
Land Cover	22	04/15/2023
Clouds	22	
Mosquito Habitat Mapper	21	
Biometry - Trees	9	
Biometry - Tree Heights	9	
Show More		
Biometry - Trees	7	11/05/2022
Biometry - Tree Heights	7	
Biometry - Vegetation Covers	7	



Join team NASA at My Library!

Open GLOBE Observer app

Go to settings (small gear at bottom of app screen)

Scroll down to GLOBE Teams:
Join, Create, or Find - use referral code: **GLIDEVQX**



Library Programming Using GLOBE Observer



Examples of STEAM Activities to Support Library Programs

These activities have been used with all ages (6+), including multigenerational audiences.



[Estimate Cloud Cover](#) by creating a simple cloud model using white and blue construction paper to visualize different % of cloud cover in the sky.

Watch this [video demo](#) of the activity by Jessica Taylor at a STAR net webinar



[Create a Cloudscape](#) collage using different materials to represent various types of clouds

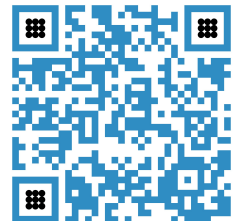
Make a mural with patrons using butcher paper on a library wall. As a virtual activity, patrons can create the cloudscape on a sheet of paper to share with the group.

Check out this [STAR net guide](#) for library adaptations



Follow along in this video with NASA scientist Marilé Colón Robles and her two daughters as they do the [Cloud Dance](#). Learn how clouds get their names from their shape, how high they are in the sky, and if they produce precipitation.

See sample library programs



JUNE 22–27, 2023

ALA ANNUAL CONFERENCE & EXHIBITION

CHICAGO

#ALAAC23

ALA American Library Association

Cloud Watching for NASA!

Monday June 26, 2023, 10:30 AM – 11:30 AM, Location: McCormick Place, W186

Theresa Schwerin, IGES; Jessica Taylor, NASA Langley; and Vivienne Byrd, L.A. Public Library

Learn why NASA is interested in clouds, how and why to observe clouds, do a hands-on activity, and discover resources that can support your programs (hands-on investigations, storybooks, circulating kits, games). Leave with practical ideas and advice from libraries who are engaging their communities in neighborhood science through GLOBE Clouds observation programming for school aged children, families, teens, and adults. Formal training in science is not required to participate, just a curiosity about our planet!

And visit the NASA Exhibit!

Going Further with GLOBE

Kevin Czajkowski

GLOBE Mission Earth
GLOBE Surface Temperature

University of Toledo

Engage Patrons in Surface Temperature Observations

- You will receive an infrared thermometer (IRT) from the University of Toledo to observe surface temperature
- There will be an additional training meeting with the University of Toledo to review how to take and record the surface temperature observations.

Use the same form to apply for the IRT used for the GLOBE Eclipse library kit: <http://nsec.strategies.org/GO-Eclipse-Library-Kits/>



David Padgett,
TSU

TSU Nashville TN

Eureka MO

Greg Lopatka

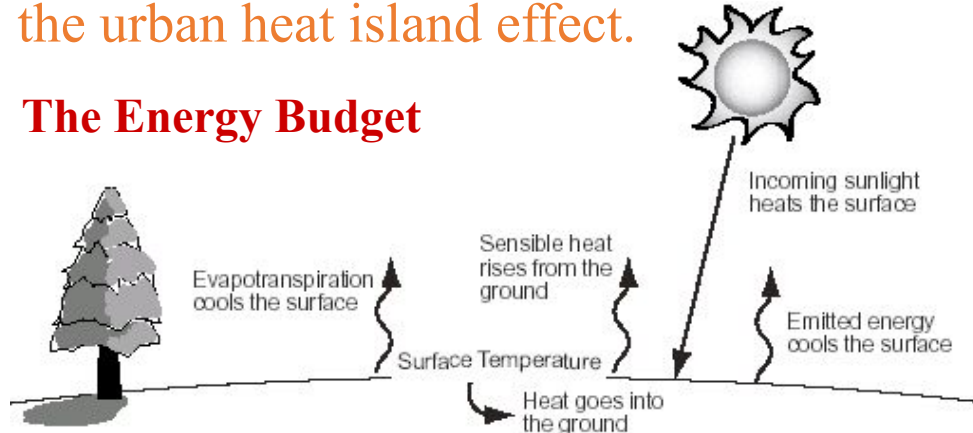
Lake High School

Clay High School

Why do We Measure Surface Temperature?

- To help us understand the influences on the rate of heat exchange between the Earth's surface and the atmosphere. This impacts the weather and climate and can help us understand Global Warming and the urban heat island effect.

The Energy Budget





How do I take my measurements?



HOW?

Hold your arm at arms length and point the instrument at the ground. After you pull the trigger then read the value including the tenths of a degree Celsius.

Photo credit: Kevin Czajkowski

Rahman, Czajkowski, Jiang and Weaver 2019

Validation of GLOBE Citizen Science Air Temperature

Observations Using Data from the Great American Solar Eclipse

GLOBE Observations During the Solar Eclipse 2017

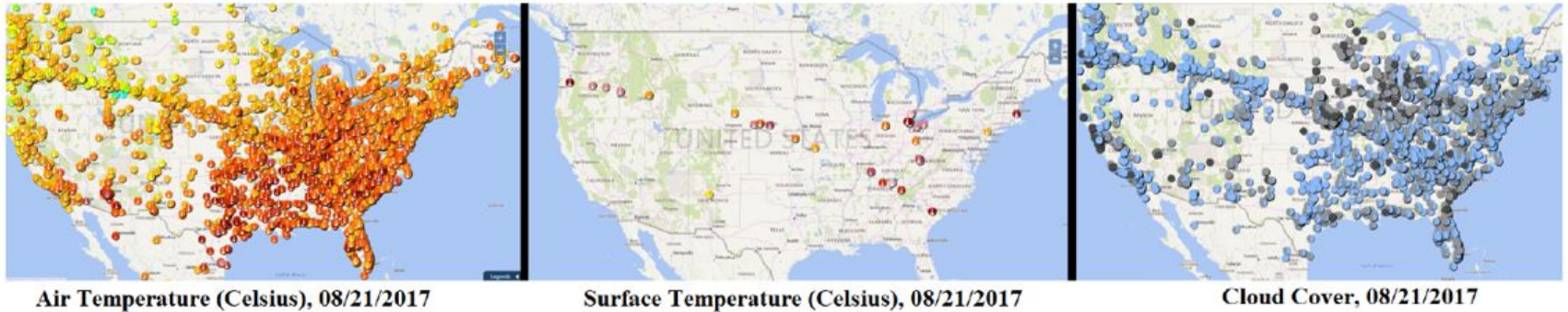
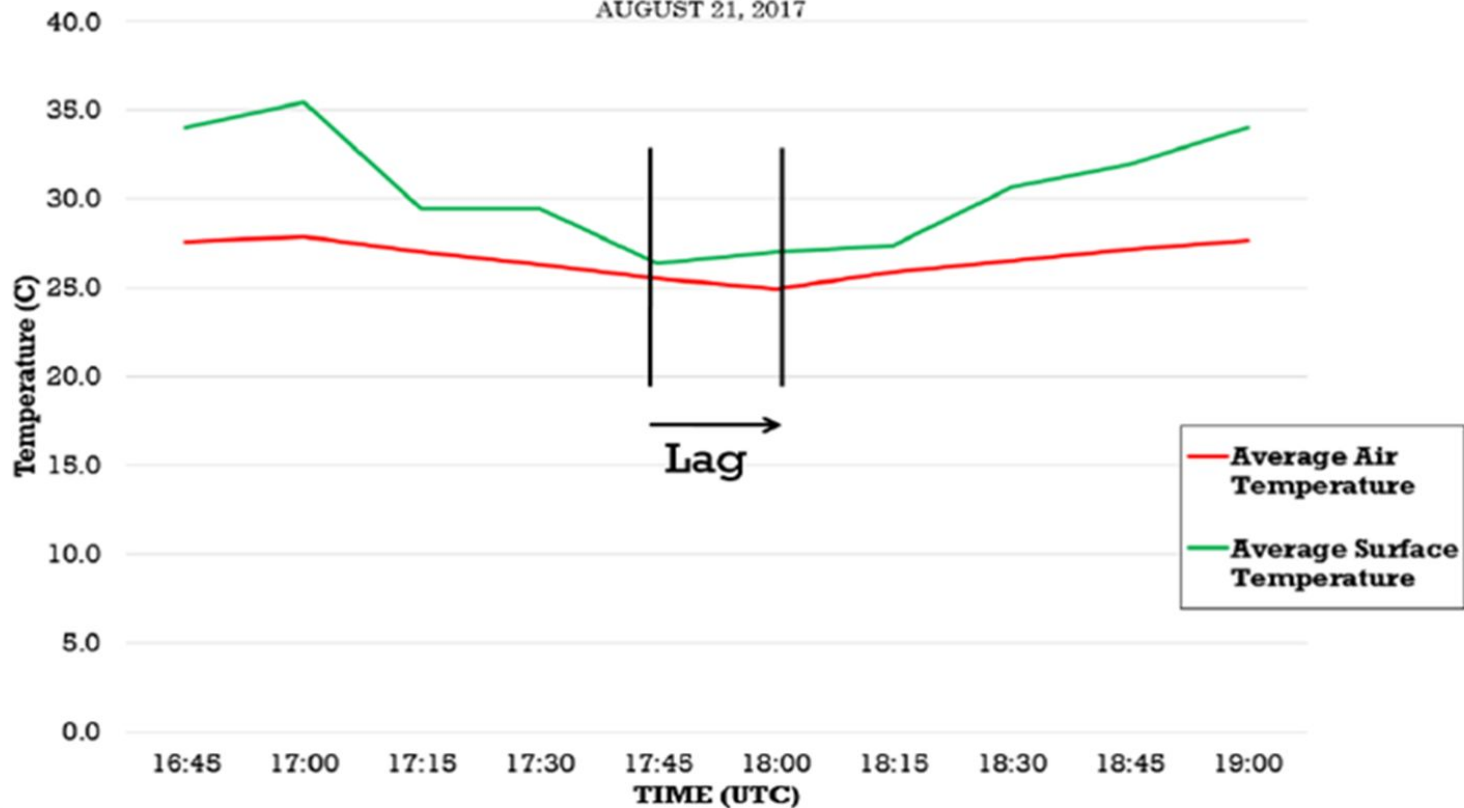


Figure 2. GLOBE Observations taken on August 21, 2017 a) air temperature, b) surface temperature, and c) cloud cover

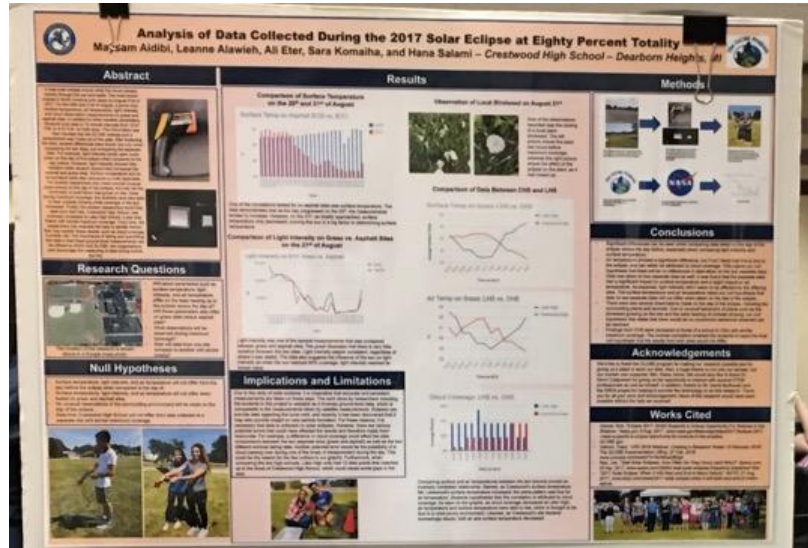
Air Temperature vs. Surface Temperature NEBRASKA

AUGUST 21, 2017



Student Research Projects

[Analysis of Data Collected During the 2017 Solar Eclipse at Eighty Percent Totality](#)



Presented at IVSS, Midwest Student Research Science Symposium in Iowa, and UT SATELLITES Student Symposium in Ohio

Another Project (no photo available)

[Effects of the Great American Eclipse on Surface Temperatures](#)



Broaden Horizons

GLOBE symposia are great ways to showcase the community's research and hard work. Throughout the year, GLOBE organizes six **Student Research Symposia** across the regional U.S., where students can share their research and meet with their peers.

[Learn more about participating in this year's symposia](#)

GLOBE also hosts the annual **GLOBE International Virtual Science Symposium**, a global science fair that engages students with learning science skills and the scientific process in their own communities. Listen to students present their projects in creative ways, attend live webinars from professional scientists, and more at this annual event.

[Learn more about participating in this year's International Virtual Science Symposium](#)

[Open Filters](#)

Sort By: Date | Title



03/19/2021

EFFECTOS DEL ECLIPSE SOLAR EN EL COMPORTAMIENTO DE ESPECIES DE ANFAUNA Y HORMIGAS EN EL PRECISO ESCOLAR

En este reporte se muestran los cambios observados por aves y hormigas del predio escolar durante el eclipse solar del día 14 de diciembre de 2020. Los estudiantes, además de observar el eclipse, realizaron un registro de la temperatura actual y la superficial, velocidad y dirección del viento y cobertura de nubes. >>



03/09/2021

Effect of total sun eclipse on meteorology and cosmic ray flow

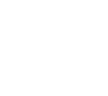
Changes in luminosity, temperatures (air, surface and soil), atmospheric pressure, wind speed and cosmic ray flow during the total eclipse of the sun of 14/12/2020, occurring in Patagonia Argentina and Chile are studied. Measurements are made in the city of Junco de los Andes and data are collected from various sources along the way of the eclipse. The whole was very brief, but it caused an impact on luminosity, temperature (air and surface). No differences are recorded in the other variables. C... >>



03/08/2021

Cambios de la intensidad de luz y temperatura del aire en ocasión de un eclipse total de sol (14 de diciembre de 2020)

Registro y análisis de datos temperatura del aire e intensidad de luz en ocasión del eclipse total de sol del 14 de diciembre de 2020 en Junco de los Andes, Argentina. >>



03/07/2020

"Eclipse total de sol y su influencia en las condiciones ambientales"

El proyecto fue realizado por estudiantes y docentes del Colegio FASTA "Villa Eucarística" de la provincia de Córdoba, Argentina, con el fin de fomentar competencias y capacidades digitales en los modos de enseñar y aprender tanto en estudiantes como en docentes. Mediante la resolución de problemas situados, el trabajo grupal y colaboración se favorecieron instancias de aprendizajes por descubrimiento basados en el método científico a través de protocolos GLOBE. >>



03/07/2020

El comportamiento de las palomas durante el Eclipse Solar 2019

Informe del trabajo realizado por los estudiantes de cuarto grado (9 años de edad) de la EPI 1345 de Pujato (Argentina) quienes estudian el comportamiento de las palomas que habitan en las proximidades de la escuela durante el eclipse solar del 2 de julio de 2019. >>



03/14/2018

Effects of the Great American Eclipse on Surface Temperatures

This project examines the influence of barometric pressure, air temperature, cloud cover, and relative humidity on surface temperatures and the urban heat island effect. >>



03/01/2018

Analysis of Data Collected During the 2017 Solar Eclipse at Eighty Percent Totality

This report summarizes the importance and acknowledges the difference of data taken from Dearborn Heights, Michigan the day before and the day of the solar eclipse in August, 2017. >>



Taking Earth's Temperature

Participants are introduced to a type of energy, infrared radiation, which we can't see with our eyes but we can feel as heat. Then, they explore their outdoor environment using an infrared thermometer (also known as an IR thermometer) to measure the temperatures of concrete, asphalt, grass, and bare soil.

[Open Activity](#)

[Implementation Guide](#)

Rating ★★★★★☆

Participants Enjoyed the Activity ★★★★★☆

Participants Learned from This Activity ★★★★★☆

Activity Instructions Were Clear and Easy to Follow ★★★★★☆

Would Recommend ★★★★★☆

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Content Area
Earth Science

Age Group
Family
Early Elementary
Upper Elementary
Twens (9-12)
Teens
Adults

Time to Complete Activity
10-20 minutes

Time needed to prep Activity
10-20 minutes

Difficulty Level (by content)
Medium

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Q&A