

GA Sciences Education Foundation Education Outreach Overview

Improving STEM (Science Technology Engineering Mathematics) Education for K-12 Students in San Diego and Beyond

Dr. Lawrence Woolf
General Atomics Sciences Education Foundation
(President/Chair)

Lawrence.Woolf@ga-asi.com

July 12, 2023

Outline

- **Brief history**
 - **GA education outreach**
 - **General Atomics Sciences Education Foundation (GASEF)**
- **GASSSS (GA Scientists/Engineers Supporting Science/Engineering for Students)**
- **TutorMate**
- **Supporting regional non-profits**
- **Connecting GA STEM expertise to the K-12 STEM education community**

General Atomics Education Outreach - A Brief History (www.sci-ed-ga.org/about)

- Education outreach initiated by Anne Blue and Pat Winter in 1992
- Non-profit GA Sciences Education Foundation (GASEF) started in 1995
 - Support GA K-12 STEM outreach efforts
 - Fund K-12 STEM programs of regional non-profits
- GASSSS program started in 2010
- TutorMate program started in 2017

- Extensive Fusion Education Outreach Program
 - <http://fusioned.gat.com>

Some GASEF Educational materials

MOLECULES AND SMALL PARTICLES SCATTER LIGHT

When sunlight passes through the atmosphere, the shorter wavelength components are preferentially scattered so that the light rays from the sun are on the blue side when we look through the air, or on the reddish side, if we are on the blue side. This is why the sky has a blue and reddish color for complementary colors.

SUNLIGHT
 Short wavelength (blue) light is scattered more than long wavelength (red) light.

ATMOSPHERE
 Shorter wavelength light is scattered more than longer wavelength light.

LIGHT MATTERS

LIGHT EMISSION

Visible light spectrum: Red, Orange, Yellow, Green, Blue, Violet.

HOW COLOR CHANGES WITH INCREASING TEMPERATURE

As temperature increases, the color of the object changes from red to white.

Reference:
 1. Light: A Handbook of Optics, Craig R. Barakat, John Wiley & Sons, 1982.
 2. The Physics of Light, Robert A. Serfaty, Prentice-Hall, Englewood Cliffs, New Jersey, 1978.
 3. "Color of the Sky," C.F. Bohren and A. T. Fenn, The Physics Teacher, Vol. 15, No. 1, 1987.
 4. "Coloring Glass: Chemistry of Glass," D. Wolfe, The Physics Teacher, Vol. 15, No. 1, 1987.
 5. Light: A Handbook of Optics, Craig R. Barakat, John Wiley & Sons, 1982.

BULK MATTER REFLECTS, TRANSMITS, AND ABSORBS LIGHT

REFLECTION
 Incident light is reflected back into the medium it came from.

TRANSMISSION
 Light passes through the medium.

ABSORPTION
 Light is absorbed by the medium and converted into heat or other forms of energy.

Light in our lives

Light is a form of energy. It is a transverse wave that travels in straight lines. It is responsible for the colors we see and the way we see things.

Light in our lives
 Light is essential for life. It is the source of energy for plants and animals. It is also used in many technologies, such as lasers and fiber optics.

ABSORPTION

Water is a good absorber of light. It absorbs light in the blue and violet regions of the spectrum. This is why water appears blue.

Water is a good absorber of light.
 The blue and violet light is absorbed by water molecules, leaving the red and orange light to be reflected back to our eyes.

REFRACTION

Light bends when it passes from one medium to another. This is why a straw in a glass of water appears bent.

REFRACTION
 Light bends towards the normal when it enters a denser medium.

THE SEASONS

A TALE OF THE SUN, EARTH, AND TWO CITIES

The Earth's axis is tilted at an angle of 23.5 degrees. This tilt causes the seasons.

Summer in the Northern Hemisphere: The Northern Hemisphere is tilted towards the Sun, receiving more direct sunlight.

Winter in the Northern Hemisphere: The Northern Hemisphere is tilted away from the Sun, receiving less direct sunlight.

Equinoxes: The Sun is directly above the equator, and day and night are of equal length.

The Line of Resistance

Using a Graphite Pencil to Explore the Electrical Properties of Materials and Circuits

Institute for Chemical Education

COLOR MIXING

Light

White light is composed of all colors of the visible spectrum.

Printing/Painting

Colors are mixed by subtracting light. Cyan, Magenta, and Yellow are the primary colors for printing.

Colored Objects

Objects appear colored because they reflect certain colors and absorb others.

Mixing Colors of Light

Red + Green = Yellow
 Red + Blue = Magenta
 Green + Blue = Cyan

Mixing Colors of Ink/Paint

Red + Green = Black
 Red + Blue = Purple
 Green + Blue = Cyan

Complementary Colors

Colors that are opposite each other on the color wheel. When mixed, they produce white or gray.

THE LINE OF RESISTANCE

Graphing the resistance of a graphite pencil lead as a function of the length of the lead.

Graph 1: Resistance vs. Length
 Shows a linear relationship between resistance and length.

Graph 2: Resistance vs. Diameter
 Shows an inverse relationship between resistance and diameter.

Graph 3: Resistance vs. Temperature
 Shows how resistance changes with temperature.

Copyright © 2008 by Dr. Lawrence Wood, General Atomics Science Education Foundation. All Rights Reserved.

SCIENCE EDUCATION FOUNDATION
 GENERAL ATOMICS



The General Atomics Sciences Education Foundation has been actively involved in improving K-12 science and engineering education since 1992 by providing outreach support to GA employees, funding STEM non-profit organizations, and developing educational resources.

The Foundation supports employees to engage in education outreach via the GASSSS program, where they can receive a charge number for up to 9 hours as well as reimbursement for up to \$500 in STEM purchases per calendar year. For additional information, see the [GASSSS Details and Application Form](#) on

News

The Foundation has created a resource room to support employees involved in education outreach and the GASSSS program. Please visit [A20/2008](#) to see many different types of educational resources available to employees.

On March 22, the General Atomics Sciences Education Foundation announced that it has provided \$17,500 in funding for 3 STEM non-profits and programs. Click [here](#) for more information about these recent awards and [here](#) for an archive of previous awards.

GASSSS



Employees can contribute their science and engineering skills by participating in the GASSSS (GA Scientists/Engineers Supporting Science/Engineering for Students) program. Employees are reimbursed for purchases.

TutorMate



Employees can volunteer as on-line reading tutors to at-risk 1st graders via the TutorMate program. The tutoring is done from your desk for 30 minutes per week, and includes the reading of science stories.

Education Resources

LIGHT MATTERS



GA scientists have developed education modules, education presentations, hands-on materials, posters, and have published articles.

Funding Guidelines for Non-Profits



The Foundation provides a limited number of grants, mostly to regional science related non-profits. Guidelines for requesting support are provided here.

GASSSS Program: www.sci-ed-ga.org/gassss

- Open to all GA employees
- GASSSS has 2 components
 - Employee must actively perform K-12 STEM activity
 - GASEF will provide
 - Up to \$500 yearly reimbursement for STEM purchases
 - Charge number for up to 9 hours yearly
- GA employee activity determined by the employee interacting with the teacher/students
 - Assist teacher in science activity
 - Perform demonstration
 - Talk about career
- Also hours support for college/university career mentoring/presentations
- Application form on GASSSS site

GASSSS

- [*** GASSSS Details & Application Form \(Doc\) ***](#)

GASSSS Program: www.sci-ed-ga.org/gassss

GASSSS

GA Participants in GASSSS Program

Videos, Photos, Websites about GA

GASSSS Presentations

Educational Materials and Equipment for Outreach

Curriculum Resources for Classroom Activities

Science Education Outreach Opportunities

Education Outreach Guides

GA Scientists/Engineers Supporting Science/Engineering for Students (GASSSS) Program

Welcome!

Welcome to Education Outreach: Where to start if you don't know where to start.

GA employees can contribute their expertise and enthusiasm for science and engineering by participating in the GASSSS K-12 education outreach program. The Foundation will reimburse the employee for associated material purchases of up to \$500 and provide a charge number for up to 9 hours per calendar year. For additional information, see the GASSSS Details and Application Form below.

For new GASSSS applications please always use the most recent GASSSS application form, which is shown below.

GASSSS

- ***** GASSSS Details & Application Form (Doc) *****
- Media Consent Form for use of photos
- GASSSS Matchmaker – Matches GA Employees and Educators (PDF)
- GASEF–GASSSS Introduction (PDF)
- GASSSS Poster (PDF)
- Yearly GASSSS Participation and Funding (PDF)

TutorMate:

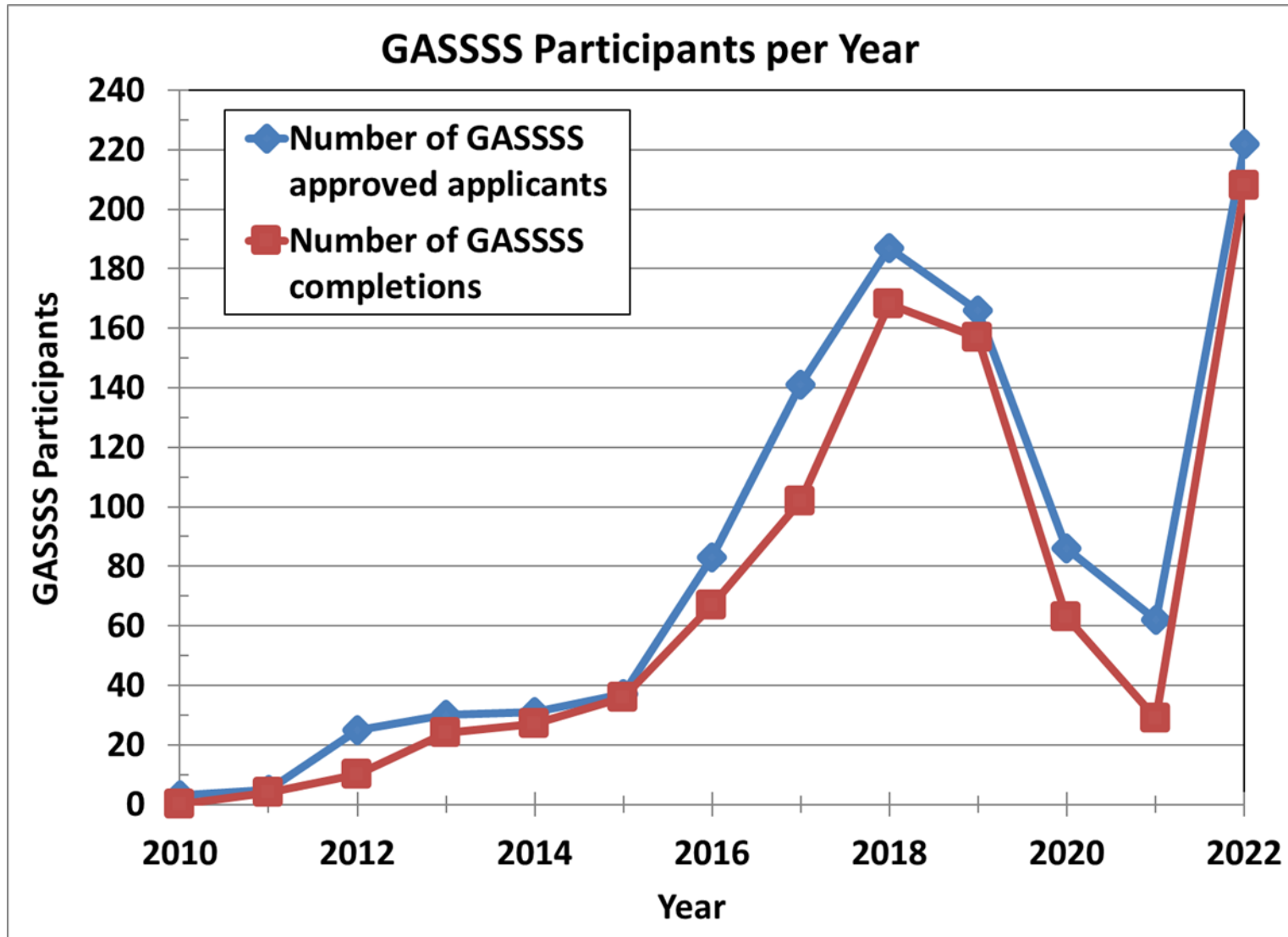
TutorMate registration now open for the 2022-2023 school year. See the Announcement below for details.

- Announcement on internal home pages
- TutorMate flyer

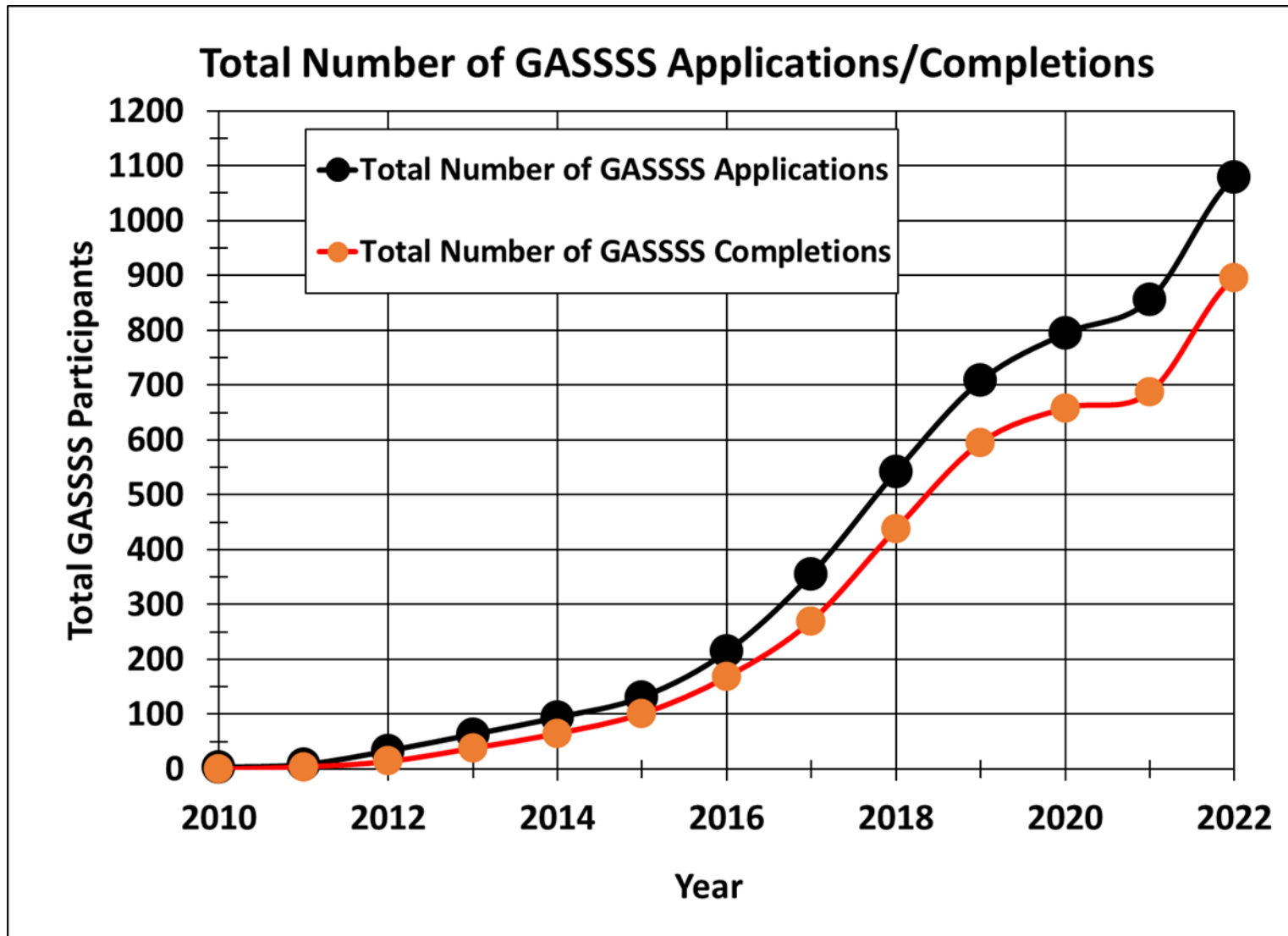
GASSSS Addresses STEM Needs

- **Expose students to scientists and engineers**
 - **Attract students into STEM careers**
- **Create community of interaction between teachers and scientists/engineers**
- **Provide real life examples**
 - **Demonstrate scientific and engineering practices**
- **Improve content knowledge of teachers**
- **Provide a mechanism for GA employees to help their communities**
- **Well received and supported by GA&A scientists and engineers**

Yearly GASSSS Participants



Cumulative GASSSS Participants

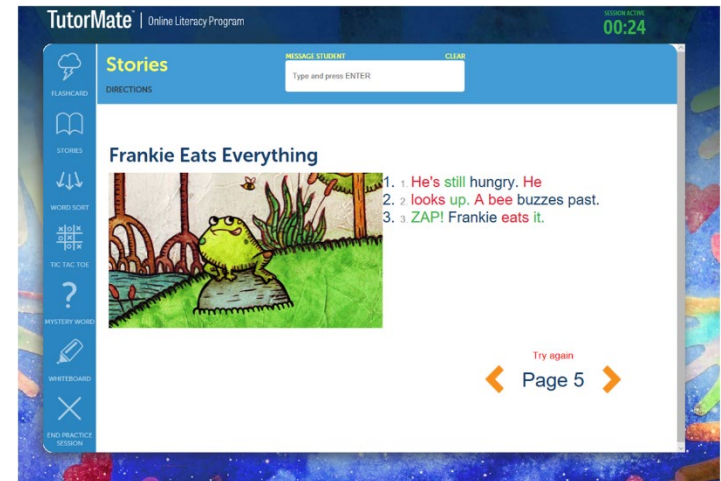


TutorMate:

Help a student learn to read by end of first grade

- **GASEF partnership with TutorMate, leading on-line non-profit tutoring program**
- **TutorMate focus: fight long-term poverty by improving literacy of at-risk students (first grade)**
- **2017-2018: Started**
- **2022-2023: 17 employees participating**

1. **Registration details are announced on internal home pages in ~October**
2. **Complete online background check**
3. **Complete training session**
4. **You are then assigned a student to tutor**
5. **Spend 30 minutes weekly reading with your student**



TutorMate includes STEM

TutorMate combines literacy with STEM



What do we know about day and night? We know that we have day and night because Earth is always moving.



Why do we have day and night?



Materials scientists study matter. They use what they learn to make new products. These products help solve problems that have to do with food, buildings, medicine and transportation. This book will tell you about four new products created by material scientists.

What does a material scientist do?



What do we know about the Milky Way? We know that it is a galaxy. A galaxy is a very large group of stars.

Why is the Milky Way called a galaxy?

It all starts with literacy.



Funding Regional K-12 STEM Non-Profits

- **Since 1999, GASEF has provided over \$900,000 to mostly San Diego area regional STEM non-profits**
 - Reuben Fleet Science Center, Big Brothers/Big Sisters, Expanding Your Horizons, San Diego Children's Discovery Museum, FIRST Robotics of San Diego, San Diego Science Fair, San Diego Natural History Museum, Boys and Girls Clubs, Secondary Science Olympiad ...
 - <http://www.sci-ed-ga.org/about>
- **Funding Guidelines on Foundation web site**
 - <http://www.sci-ed-ga.org/funding-guidelines-for-non-profits>
- **List of awards since 2018 at**
 - <https://www.sci-ed-ga.org/funding-archive>
- **Awards are made every 2-5 months**
- **Funding generally \$1,000 – \$10,000**

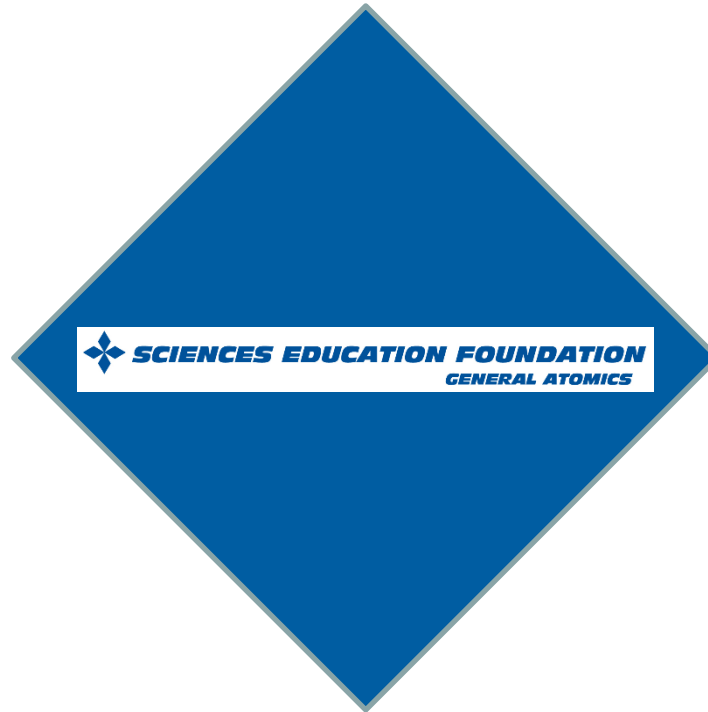
Connecting GA STEM expertise to the K-12 STEM education community

- **Non-profits contact GA/Woolf and their requests are placed as banner announcements on company internal home pages**
 - e.g. Outreach at San Diego Fleet Week, Miramar Air Show, Other Air Shows
 - GASSSS resource room (A20/2008) for STEM outreach items
- **Specific requests that are informational are placed on GASSSS Matchmaker site**
 - http://www.sci-ed-ga.org/Websites/gasef/images/pdf/GASSSS_Matchmaker.pdf
 - GA employees who want to make their interests and expertise known can also post on this site
- **Other major outreach opportunities are placed on GASSSS site:**
 - <https://www.sci-ed-ga.org/science-education-outreach-opportunities>

Summary

GASSSS

TutorMate



**Funding K-12
STEM Non-Profits**

**Connecting GA to
the K-12 STEM
Community**