

**NGCP** 

CONNECT + CREATE + COLLABORATE

# Girls STEAM Ahead with NASA Resources in Action

October 17, 2023



# NGCP Vision

The vision of the National Girls Collaborative Project is to **support and create STEM experiences** that are as **diverse as the world we live in.**



# Our Goals

Connect + Create + Collaborate

1

**Build and sustain a network** of advocates to provide equitable and inclusive STEM opportunities.

2

**Catalyze equity in STEM** from research to practice by providing actionable knowledge that transforms the STEM experience.

3

**Increase our collective impact** by strengthening organizational effectiveness and enhancing our fiscal sustainability.



# NGCP Activities

- Network Partnerships
- IF/THEN Collection
- State Leadership Teams
- Youth Advisory Board



# Today's Presenters



**Dr. Martha Saladino**  
Education and Outreach Scientist  
Space Telescope  
Science Institute



**Laura Woody**  
Assistant Director  
Sequatchie County Public Library  
Boys & Girls Clubs of Carson



**Lindsay Rowe**  
STEM Coordinator  
Boys & Girls Clubs of Carson



**Matt Kirschner**  
Children's Services  
South Brunswick Public Library



**Lisa Broomall**  
Youth Services Coordinator  
Anna Porter Public Library



# Girls STEAM Ahead with NASA

**Dr. Martha Irene Saladino**

Education & Outreach Scientist

Space Telescope Science Institute

# NASA's Universe of Learning



NASA's Universe of Learning is an integrated astrophysics STEM learning and literacy program funded by NASA



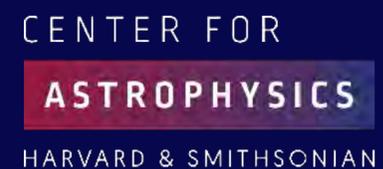
Learners of all ages and backgrounds are engaged and immersed in exploring the universe for themselves



# NASA's Universe of Learning



Direct connection to the NASA's science & missions



# NASA's Universe of Learning Themes

How does the universe work?

Are we alone?

How did we get here?



Life and Death of Stars



Origin & History of the Universe



Structure & Composition of the Universe



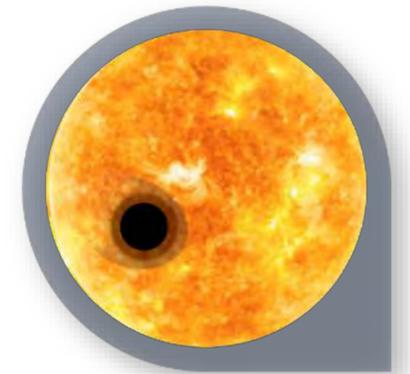
Other Solar Systems, Other Earths



Cosmic Mysteries



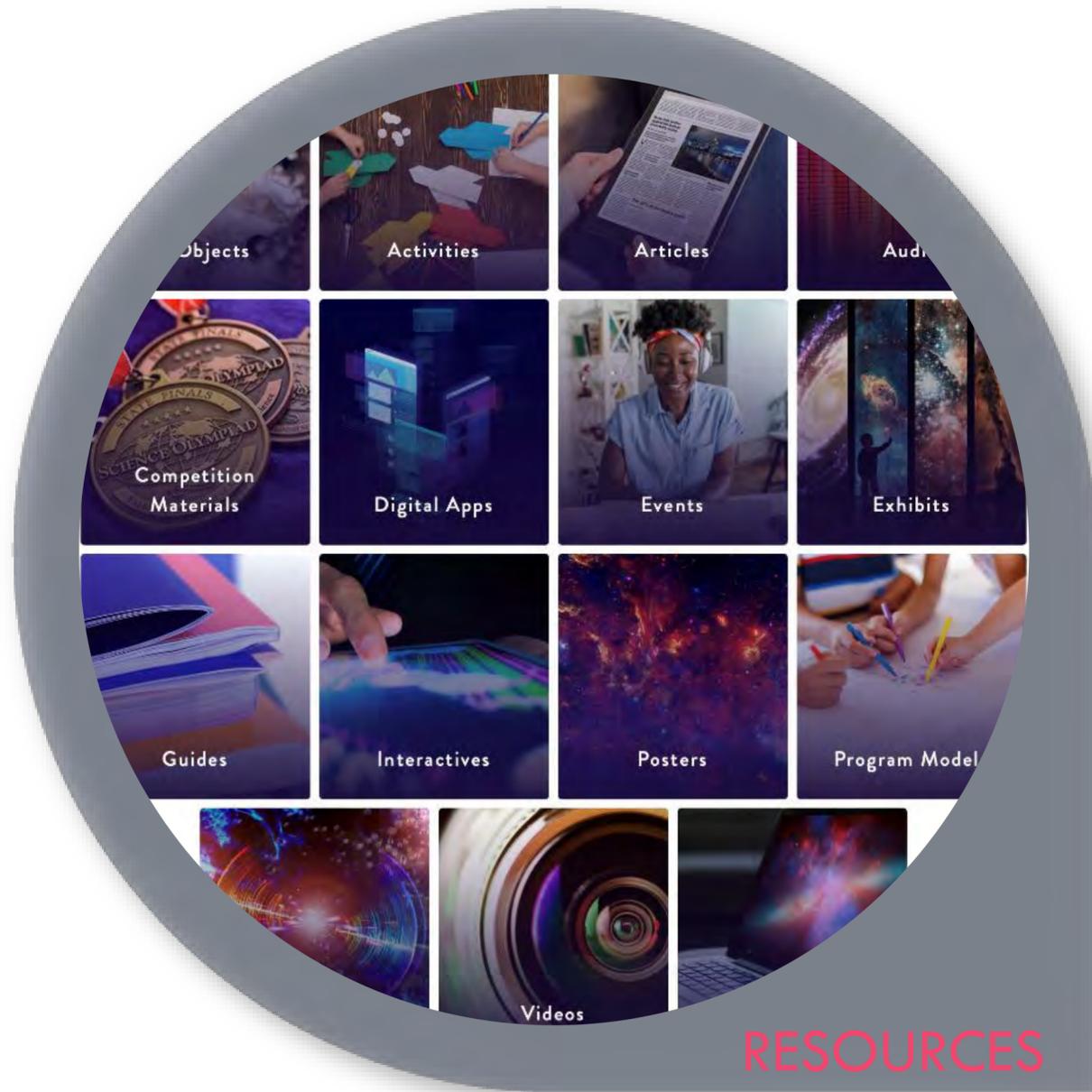
Extreme Physics & Phenomena



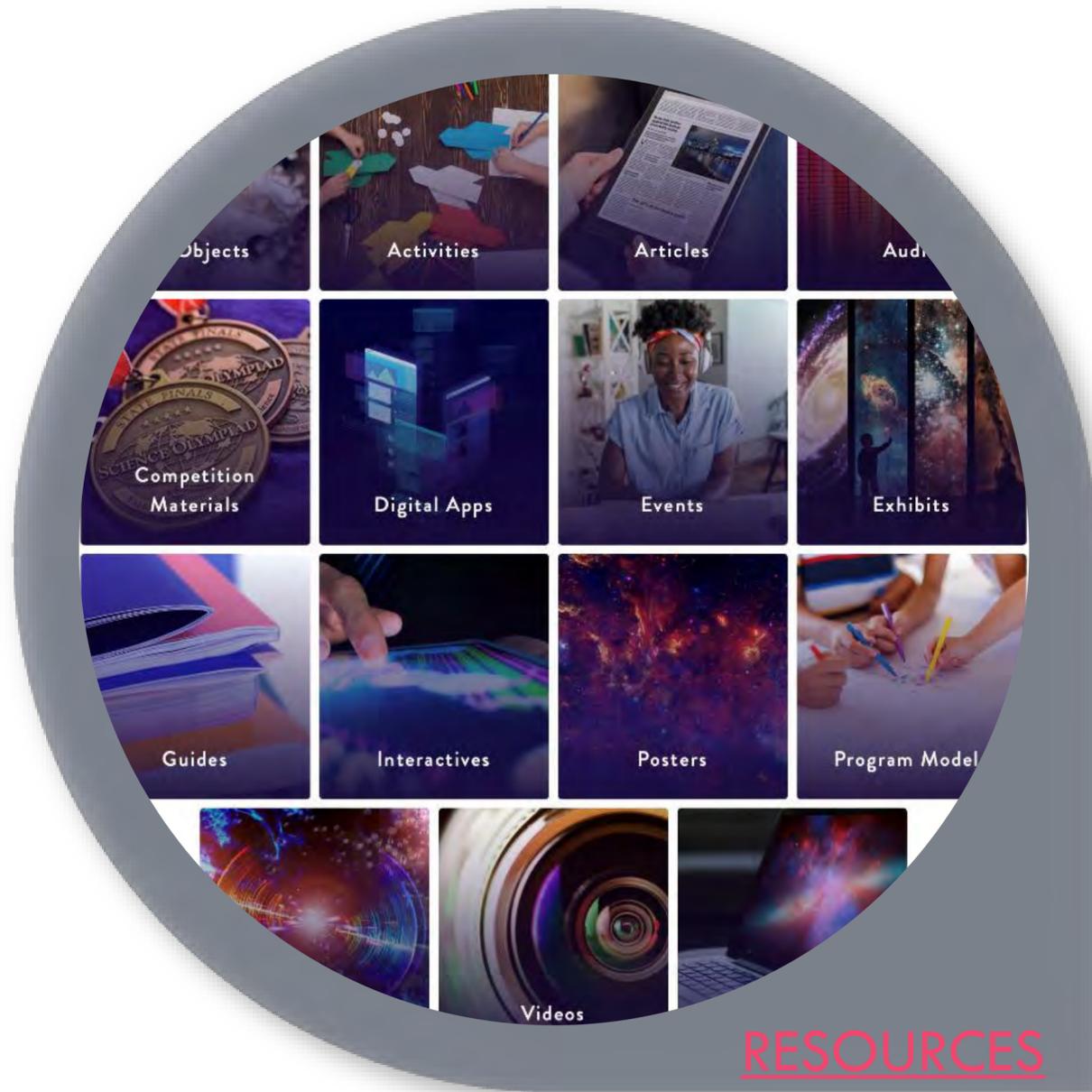
How Do We Know?



# NASA's Universe of Learning



# NASA's Universe of Learning



Hands-on activities



Videos



Exhibits



Computer-based activities



Posters



# NASA's Universe of Learning



# NASA's Universe of Learning



# Girls STEAM Ahead with NASA (GSAWN)

Our **aim** is to empower public libraries and community-based organizations to engage girls and their families in STEM

## GSAWN PROGRAM COOKBOOK



# Girls STEAM Ahead with NASA (GSAWN)



## GSAWN Program Cookbook



### MENU OF EVENT ACTIVITIES & RESOURCES: STAR LIFE CYCLE

Pick and choose from this menu to build your own program. Explore other paper & pencil activities, computer-based activities, and more in our online Resource Catalog. We put together some Sample Scenarios on the following pages to get you started.

**ENGAGEMENT**

- Celestial Tour: A Star's Fight for Life-Star Life Cycles (ViewSpace video)
- Think Tank: A Star Is Born (video)
- Think Tank: When Stars Go Boom (video)

**BACKGROUND BUILDERS**

- The Star Life Cycle (article)
- Imagine the Universe: Stars (article)
- Insight Into: Star Formation (video)
- Stellar Evolution Diagrams (infographics)

**EXPLORATIONS**

- Star Formation: Eagle Nebula (ViewSpace interactive)
- Star Death: Helix Nebula (ViewSpace interactive)
- Star Death: Crab Nebula (ViewSpace interactive)
- Webb VR: Stellar Evolution Module (virtual reality)

**EXTENSIONS**

- Stellar Evolution Flipbook (activity)
- Stellar Evolution Scavenger Hunt (activity)
- Stellar Life Cycle Bookmarks/Flashcards (activity)
- Journey Through an Exploded Star (interactive)

**REAL-WORLD CONNECTIONS**

- Stellar Evolution in Real Time (ViewSpace video)
- Recoloring the Universe with PENCIL code (activity)

**THINGS TO TRY AT HOME**

- Fold a tiny star (activity)
- Diaries of the Cosmos: Hydrogen Hunters (podcast)

Legend:   
🖥️ = computer-based activity   
📄 = paper & pencil activity   
👤 = both

## Menu of activities and resources related to the topic

### RECIPE 4: STARS

Topic Overview

There are more stars in space than there are grains of sand on all of Earth's beaches! Stars in the universe number in the sextillions to septillions: a 1 followed by 21 to 24 zeros. They are giant balls of gas—mainly hydrogen, and helium—held together by their own gravity. Stars come in different colors and sizes, and like humans, they are born, grow old, and eventually die. How long a star will live depends on the amount of material it has when it first forms.



Figure 1. Stars are born in these dusty clouds of gas and dust. Credit: NASA, ESA, CSA, and STScI

Stars might be bright, but their lives are not easy. They spend most of their existence fighting against gravity as it tries to make them collapse. Nuclear reactions going on deep inside a star create an outward pressure that counteracts the inward pull of gravity. For most of its life, these nuclear reactions are fueled by hydrogen that is fused into helium in the central regions of the star—its core. We call this phase of a star's life the main sequence.

Low- and intermediate-mass stars—stars between 0.8 and 8 times the mass of our Sun—fuse the hydrogen in their center very slowly. Hence, they can balance out gravity for longer and have long-lasting lives—on the order of billions of years! Massive stars—stars greater than 8 and up to 100 the mass of our Sun—use a result, they deplete their supplies faster and a living only a few million to a few hundred million years.

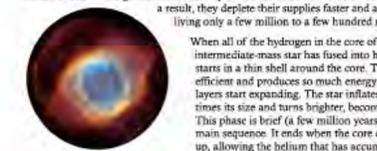


Figure 2. The Helix Nebula is a planetary nebula surrounding a white dwarf star. Credit: NASA, ESA, E. R. Seafield (University of Arizona), and M. M. Meade (McCollough and Co., Inc.) (STScI)

When all of the hydrogen in the core of an intermediate-mass star has fused into helium, the star has exhausted its main sequence. It ends when the core is up, allowing the helium that has accrued on the star to be fused into heavier elements like carbon and oxygen.

The end of a low- or intermediate-mass star's life is marked by the end of the helium in the core has

## Recipe with background content for the facilitator



### MATERIALS

- Flipbook templates or materials listed in the Flipbook Activity Guide
- Stellar Evolution Scavenger Hunt handouts
- Computer and projector to show the videos to introduce the content

### OPTIONAL MATERIALS

- Printout(s) of the "Lifecycle of Sun-like and Massive Stars" diagram
- Scissors to cut apart Stellar Evolution Flash Cards
- Laminator pouches/sheets, or sleeves to cover Stellar Evolution Flash Cards for re-use
- Computers or tablets with internet access, for exploring astronomical images on AstroPix

### SCENARIO 4-1:

## STAR LIFE CYCLE

### OVERVIEW

Like humans, stars have a life cycle: they are born, grow old, and eventually die. A star's life depends on its initial mass. For even younger learners, guide participants through each set of images (e.g., A, B, C) separately, explaining what each object is. This allows participants to focus on ordering the images, as opposed to independently reading captions and trying to determine what each represents.

### ACTIVITY LENGTH

60 minutes. See the following "Tips & Adaptations" section for a 90-minute version.

### TARGET AUDIENCE

Activities are ideal for families and ages 12+, but can be adapted for you participants. See our "Tips & Adaptations" section for more details.

## Sample event scenarios

### TIPS & ADAPTATIONS

#### Beginners/Young Learners

- Introduce mass as the amount of "stuff" contained within an object, like a star.
- Introduce nuclear fusion as tiny particles smashing into each other and giving off a large amount of light and heat as they combine.
- Rather than introducing the star classification based on their mass as low and intermediate mass, refer to them as "Sun-like stars."
- Stellar Evolution Flipbook: Follow the "Adaptations for Young Learners" section in the Flipbook Activity Guide.

- Stellar Evolution Scavenger Hunt: Talk through each of the images contained within the Stellar Evolution Flashcards together as a group, emphasizing key takeaways from each. For even younger learners, guide participants through each set of images (e.g., A, B, C) separately, explaining what each object is. This allows participants to focus on ordering the images, as opposed to independently reading captions and trying to determine what each represents.

#### Advanced Learners

- Stellar Evolution Flipbook: Use the template and color flipbook inspiration sheets for learners to create a more detailed version of the flipbook.
- Stellar Evolution Flipbook: Encourage participants to write some fun science facts about each stage of the star's life represented in their flipbook on the reverse sides (opposite the illustrations).
- Stellar Evolution Scavenger Hunt: Let participants explore the different ways stars can be classified according to their brightness, like red dwarfs, blue giants, brown dwarfs, etc.

#### Virtual Learning

- Stellar Evolution Scavenger Hunt: Send participants a link to a digital copy of the flashcards and the activity sheet so they can complete the activity remotely. Once they've completed their activity sheet, reconvene the group to discuss their answers.

#### Low-tech Learning

- If you will not have access to internet during an activity, you can pre-download the Think Tank videos, as well as the Diaries of the Cosmos audio files and transcript. To view ViewSpace videos without an internet connection, first allow the videos to buffer in your web browser when connected to internet, and then simply keep the tabs open for viewing during the activity.
- To display ViewSpace interactives without active internet, record your computer screen while going through the interactives yourself, and then share those videos with participants.

#### Girls and STEM

- There are many women scientists who have made significant contributions to our understanding of stellar evolution. When describing the various stages in a star's lifespan, you can incorporate:
- Our Women in STEM Fiction Series to highlight certain female scientists who have contributed to our understanding of stars.
  - Our Diaries of the Cosmos: Hydrogen Hunters podcast series.

# Girls STEAM Ahead with NASA (GSAWN)

## GSAWN Program Cookbook – Recipe 4: Stars



### Stellar Life Cycle Bookmark/Bracelet

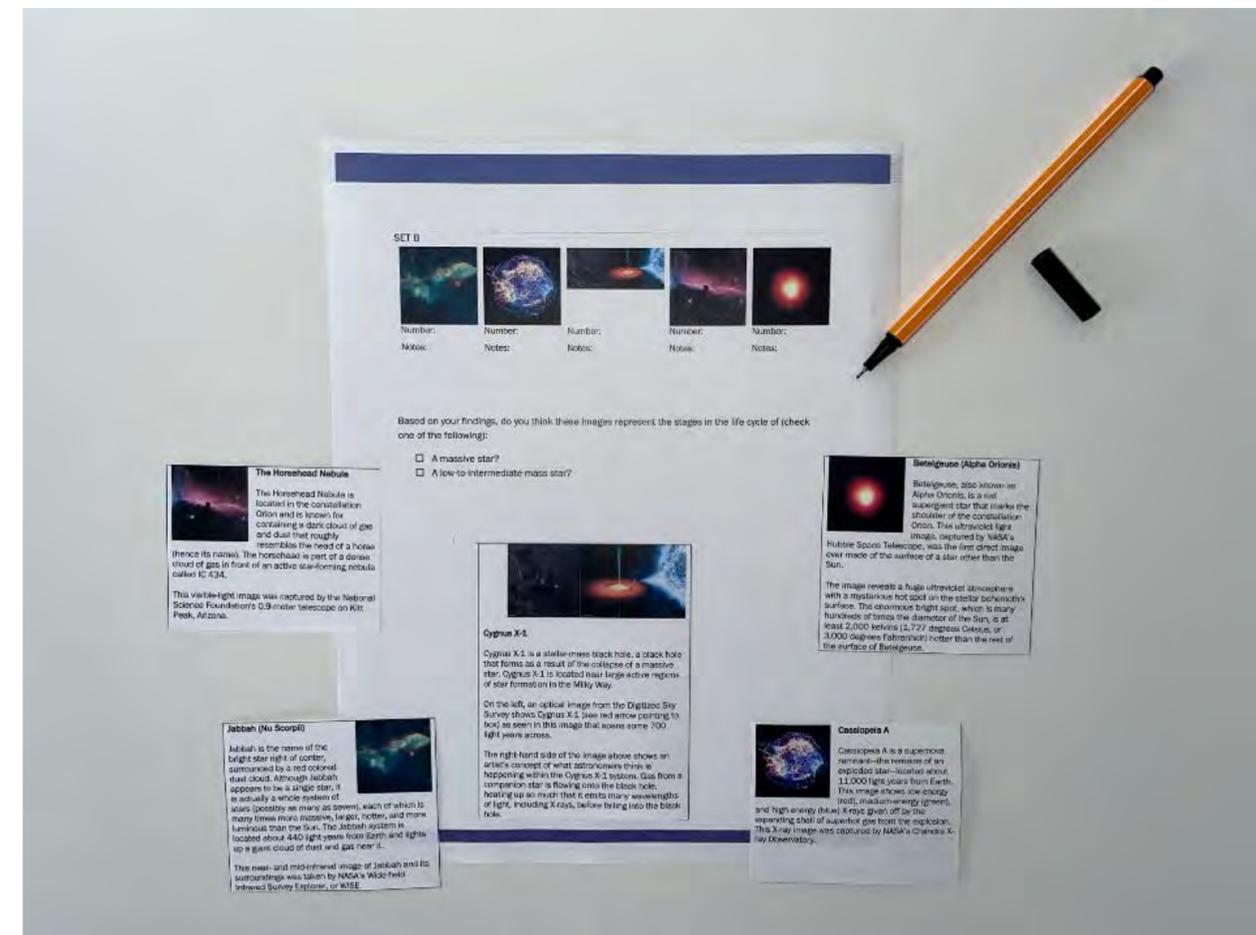


# Girls STEAM Ahead with NASA (GSAWN)

## GSAWN Program Cookbook – Recipe 4: Stars



### Stellar Evolution Scavenger Hunt



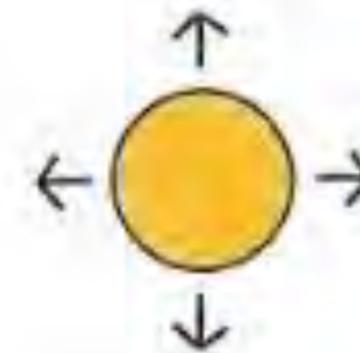
# Girls STEAM Ahead with NASA (GSAWN)

## GSAWN Program Cookbook – Recipe 4: Stars



[Stellar Evolution Flipbook](#)

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# NASA's Universe of Learning SMEs





# Contact us...

<https://www.universe-of-learning.org/gsawn>

Email: [girlsSTEAMahead@universe-of-learning.org](mailto:girlsSTEAMahead@universe-of-learning.org)

**Request a NASA Subject Matter Expert for your GSAWN event**

<https://www.universe-of-learning.org/informal-educators/request-an-expert>

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.



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SCIENCE INSTITUTE

CENTER FOR  
**ASTROPHYSICS**  
HARVARD & SMITHSONIAN



**JPL**  
Jet Propulsion Laboratory  
California Institute of Technology



# GSAWN at BGCC



**BOYS & GIRLS CLUBS**  
OF CARSON

# Who We Are



**Afterschool Service Provider who targets  
young people who need us most through  
targeted programs and high-yield  
activities**



# Who Our Kids Are



## Key Demographics

### Race/Ethnicity

- 33.7% Hispanic
- 28.8% Black/African American
- 5.1% Asian & Filipino
  - 4.5% Other
  - 3.9% Latino

### Gender

- 50.86% Male
- 48.87% Female
- 0.26% Other

### Free/Reduced Lunch

- 82.94%

## STEM Demographics

- 1847 members attended at least 1 STEM program
  - 18 sites

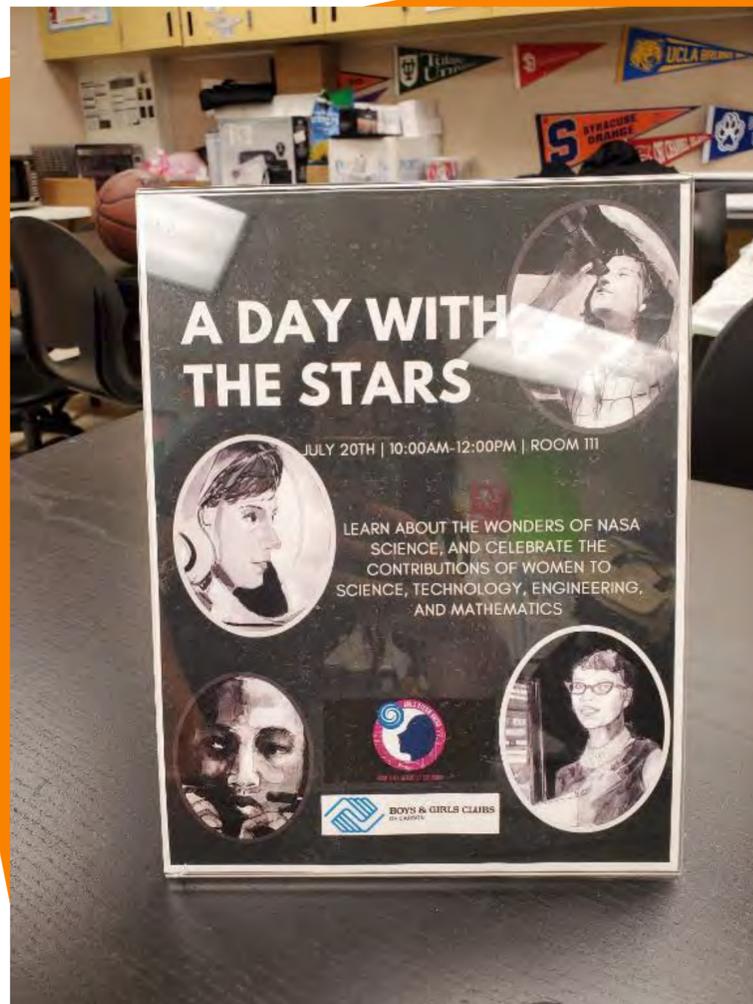
# Targeted Students



- **Students are wary of STEM**
- **King Drew HS targeted for career-focus and exposing students to BIPOC women in space science.**
- **186<sup>th</sup> St. ES targeted for STEM interest and building STEM confidence.**

# GSAWN Event

King Drew Magnet High School | July 20th



## Activities

- Nebula Spin Art
- Galaxy Circuit Cards
- Chandra X-Ray Recoloring the Universe
- DIY Women in STEM Zine



Students Impacted =

15



**BOYS & GIRLS CLUBS**  
OF CARSON



# GSAWN Event

186<sup>th</sup> Street Elementary | July 24th



## Activities

- Galaxy Circuit Cards
- Chandra X-Ray Recoloring the Universe

Students Impacted =

19



# Lessons Learned



1. Train additional staff to lead program to expand reach.
2. Consider time constraints; we run program for 1 hour each.
3. Anticipate learning-level of students and lesson impact.

# GSAWN Impact



## GSAWN Event

- Highly engaging and educational
- Youngest students brought their own knowledge and passion
- Inspired students they can be space scientists

## Post GSAWN Event

- 7 Additional school sites ran Astronomy Week using GSAWN and NASA's Cookbook lesson programming
- Students reporting it is their most enjoyable lesson this school year



Thank You



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