NASA'S UNIVERSE OF LEARNING

Presentation to National Academies Committee to Assess Science Activation

April 8, 2019

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STScI

STScI SPACE TELESCOPE SCIENCE INSTITUTE

ipac

JPL Jet Propulsion Laboratory California Institute of Technology

Smithsonian Astrophysical Observatory

SONOMA STATE UNIVERSITY

Partners and Collaborators

External Evaluation

GRG
Goodman Research Group, Inc

CORNER STONE EVALUATION ASSOCIATES

We also collaborate with several members of the Science Activation Collective.

Development & Dissemination

- Association of Science-Technology Centers
- California State University
- McAuliffe Center / Framingham State University
- National Girls Collaborative Project
- National Science Olympiad
- Smithsonian Affiliations
- Space Science Institute
- University of Hawaii / Project PANOPTES
- University of Texas – San Antonio

NASA'S UNIVERSE OF LEARNING

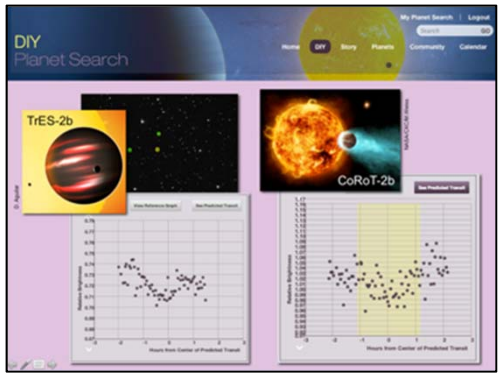
Charge from NASA Science Mission Directorate

SMD's Desired Outcome: *Enable NASA science experts and content into the learning environment more effectively and efficiently with learners of all ages.*

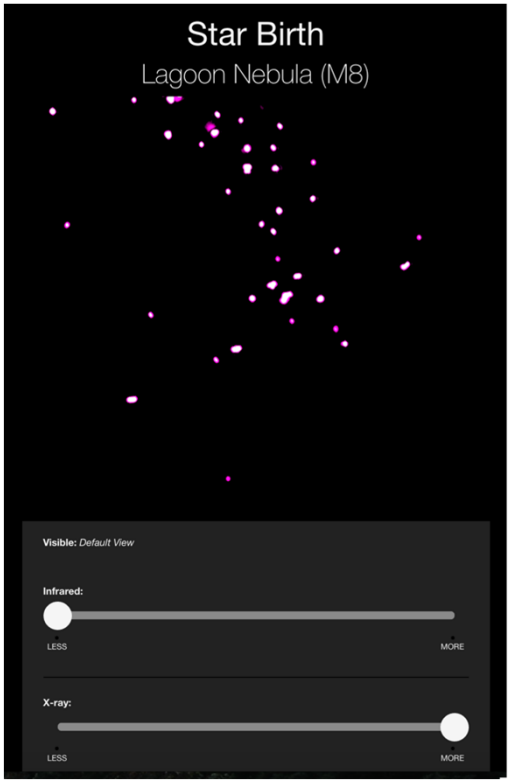
SMD Objectives:

- Enable STEM Education
- Improve U.S. Scientific Literacy
- Advance National Education Goals
- Leverage Efforts Through Partnerships

We Create and Deliver
NASA Astrophysics-Themed Products and Experiences



Data Tools & Participatory Experiences



Multimedia & Immersive Experiences

Professional Learning Experiences

Exhibits & Community Programs

Accessible Learning Resources

NASA'S UNIVERSE OF LEARNING

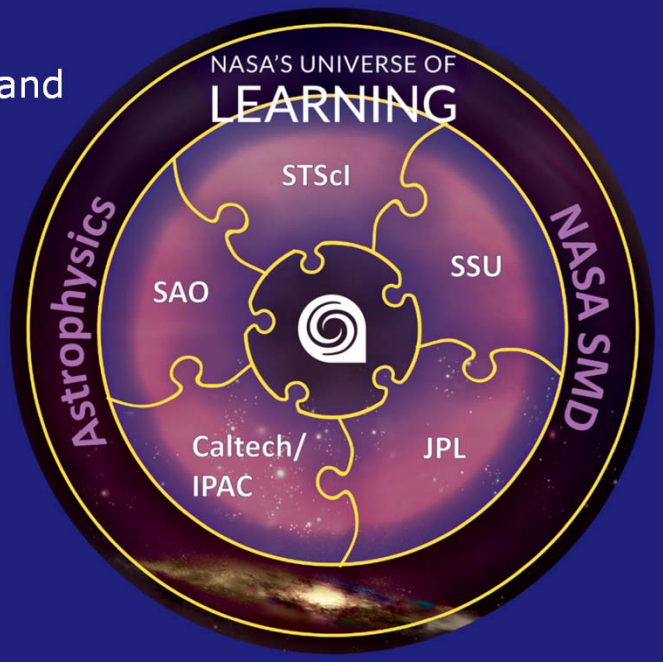
NASA's Universe of Learning: Key Factors Enabling Impact

External evaluation and assessment*

Direct connection to science and Subject Matter Experts

Co-location with communications teams

Rapid response to new discoveries and results



Audience Focus

- informal education
- pre-service
- underserved / underrepresented

Framework of informal learning strands and science content themes

Grounded in research/best practices

** External Evaluators:*
Goodman Research Group
Cornerstone Evaluation Assoc.

Our Goals

We aim to advance NASA SMD's Desired Outcome and Objectives on a national scale by:

- Increasing educators' use of NASA Astrophysics ***science content*** and experts to facilitate STEM learning, and their capacity to do so
- Increasing learners' understanding of the ***process of science***, and key topics in astronomy and space science
- Increasing role of NASA Astrophysics ***science experts*** as partners
- Creating an integrated, coherent, flexible, and ***effective partnership*** and program that uniquely leverages our direct connection to the science

Subject Matter Expert (SME) Engagement

- Direct connection to SMEs involved with ***full range of NASA Astrophysics missions and programs***

- SME involvement is ***carefully designed***
  - Goodman Research Group conducted focus group and survey work to assess SME needs and interests
  - Continuum of SME involvement opportunities based on evaluation results

- Leveraging institutional SME database to enable ***efficiency and diversity*** in SME participation

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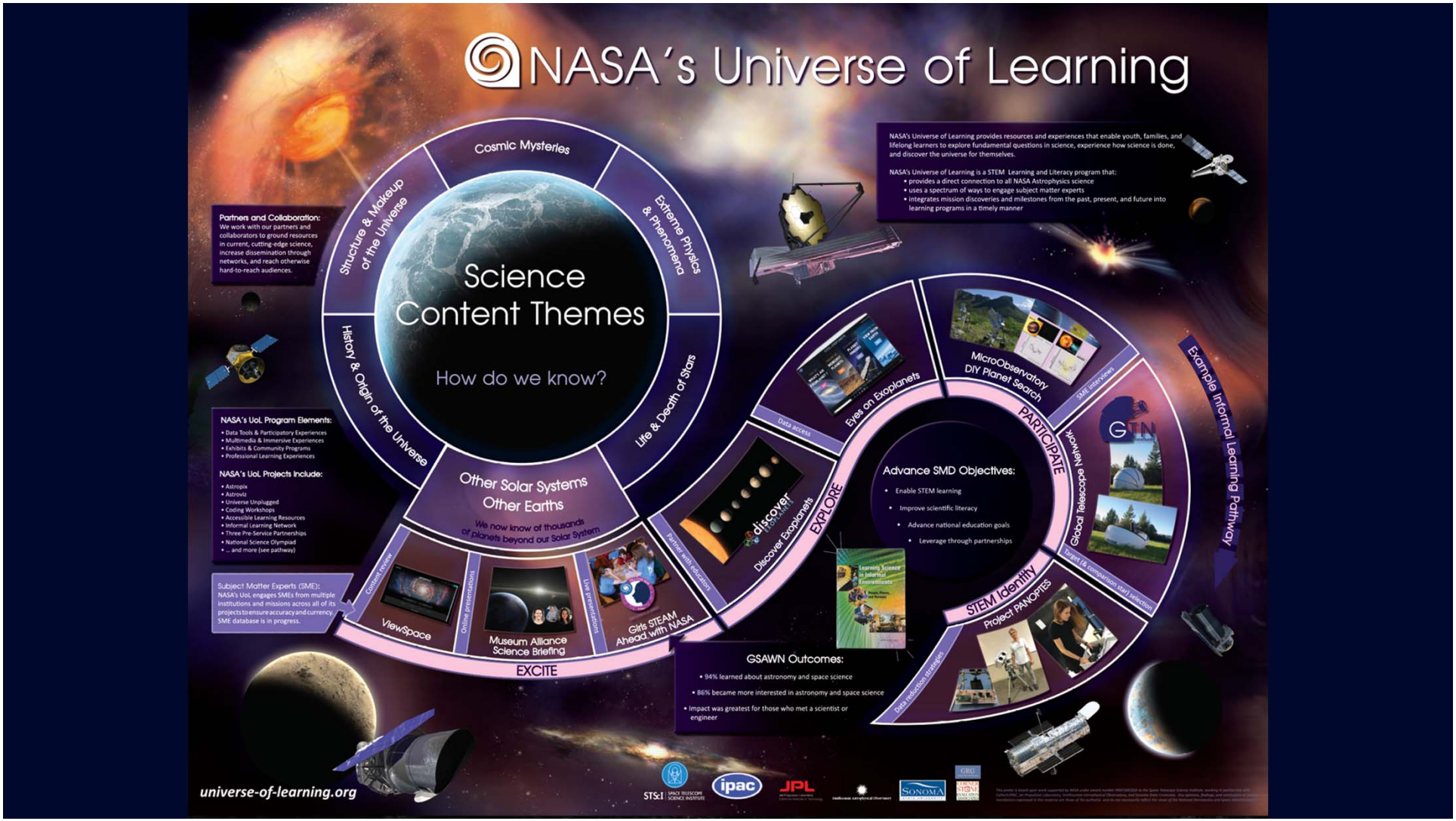
NASA's Universe of Learning
NASA's Universe of Learning provides resources and experiences that enable youth, families, and lifelong learners to explore fundamental questions in science, experience how science is done, and discover the universe for themselves.
NASA's Universe of Learning is a STEM Learning and Literacy program that:
• provides a direct connection to all NASA Astrophysics science
• uses a spectrum of ways to engage subject matter experts
• integrates mission discoveries and milestones from the past, present, and future into learning programs in a timely manner
Partners and Collaboration:
We work with our partners and collaborators to ground resources in current, cutting-edge science, increase dissemination through networks, and reach otherwise hard-to-reach audiences.
Science Content Themes
How do we know?
Cosmic Mysteries
Extreme Physics & Phenomena
Life & Death of Stars
Other Solar Systems Other Earths
We now know of thousands of planets beyond our Solar System
History & Origin of the Universe
Structure & Makeup of the Universe
NASA's UoL Program Elements:
• Data Tools & Participatory Experiences
• Multimedia & Immersive Experiences
• Exhibits & Community Programs
• Professional Learning Experiences
NASA's UoL Projects include:
• Astropix
• Astroviz
• Universe Unplugged
• Coding Workshops
• Accessible Learning Resources
• Informal Learning Network
• Three Pre-Service Partnerships
• National Science Olympiad
• ... and more (see pathway)
Subject Matter Experts (SME):
NASA's UoL engages SMEs from multiple institutions and missions across all of its projects to ensure accuracy and currency. SME database is in progress.
EXCITE
ViewSpace
Content review
Museum Alliance Science Briefing
Online presentations
Girls STEAM Ahead with NASA
UoL presentations
EXPLORE
Discover Exoplanets
Partner with educators
Eyes on Exoplanets
Data access
PARTICIPATE
MicroObservatory DIY Planet Search
SME interviews
Global Telescope Network
Target & constellation star selection
STEM Identity
Project PANOPTES
Data reduction strategies
Example Informal Learning Pathway
Advance SMD Objectives:
• Enable STEM learning
• Improve scientific literacy
• Advance national education goals
• Leverage through partnerships
GSAWN Outcomes:
• 94% learned about astronomy and space science
• 86% became more interested in astronomy and space science
• Impact was greatest for those who met a scientist or engineer
universe-of-learning.org
STScI
ipac
JPL
SONOMA

Our Work with the Science Activation Collective

We provide ***science content and expertise*** to other SciAct cooperative agreements (a few examples):

- NISE Network
- NASA@MyLibrary
- WGBH
- Girl Scouts: Reach for the Stars

We serve on ***SciAct Working Groups /Affinity Groups***:

- Visualization
- Maker
- Women in STEM
- American Indian/Alaskan Native
- EdTech

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Partnership with NISEnet

Advising on and providing science content

Using and disseminating each other's products

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Conceptual Framework for NASA's Universe of Learning (UoL) Evaluation

	Developmental Evaluation	Formative Evaluation	Summative Evaluation
Stage of Development	In development	Being refined	Well-established
Key Strategic Question	What needs to happen?	How well is it working?	What difference did it make?
Select Findings	• SMEs need different options for involvement. • Librarians are interested in astrophysics VR content. • The public holds misconceptions about universe beginnings.	• Interacting with a SME results in better outcomes for girls participating in STEAM programs. • Science briefings and materials are most useful when content is timely.	• ViewSpace viewers better understand the electromagnetic spectrum. • NASA's Astrophoto Challenge participants learn how astronomers collect and create images.

External Evaluation Findings: Contributing to SciAct Success

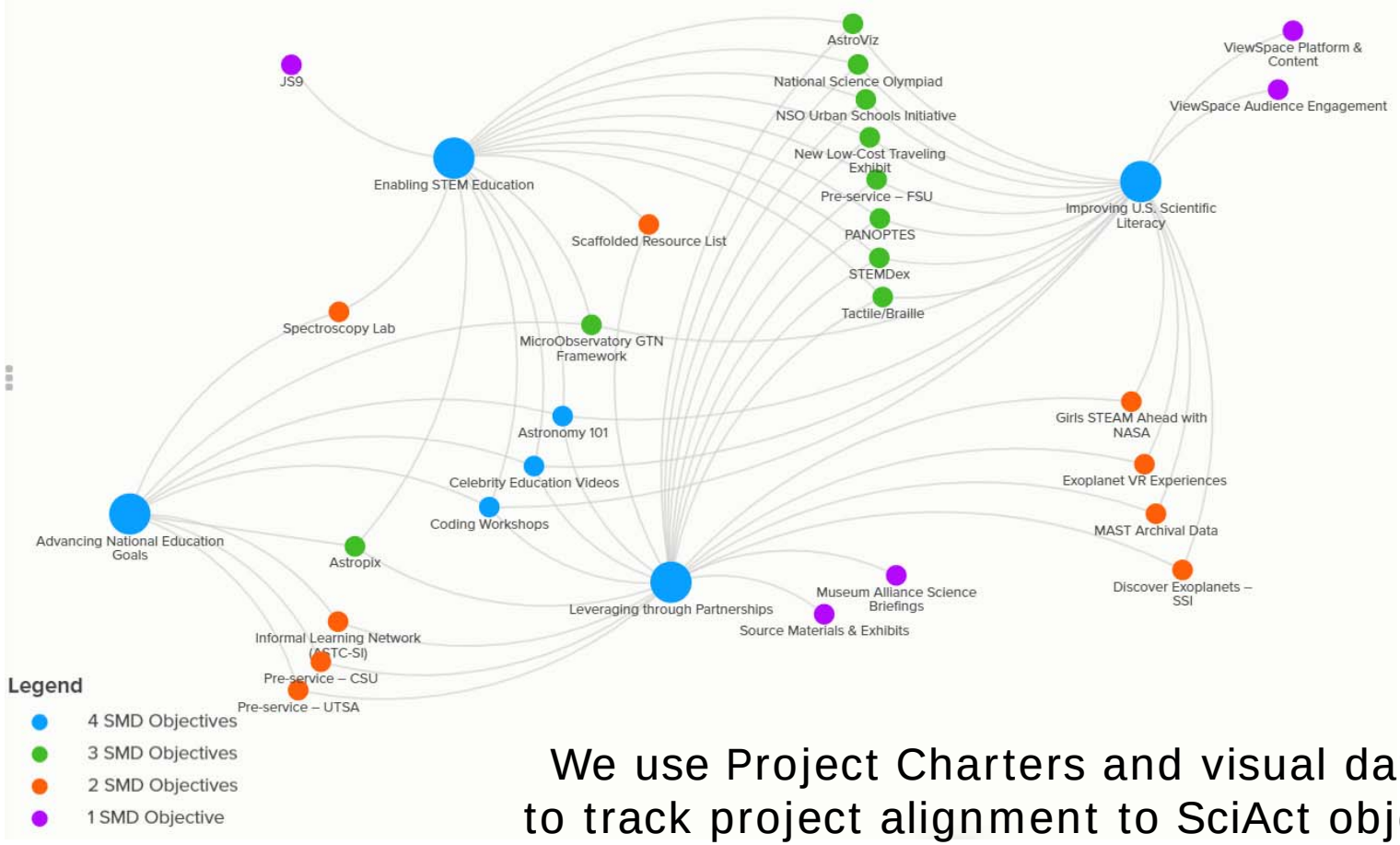
- NASA's UoL has grown increasingly cohesive, consistent, and strategic.

- NASA's UoL partnership continues to:
  - demonstrate effectiveness on key research-tested criteria of successful collaborations
  - expand its connections with the rest of SciAct.

- NASA's UoL has defined metrics for success in partnership with SMD and has begun implementing them.

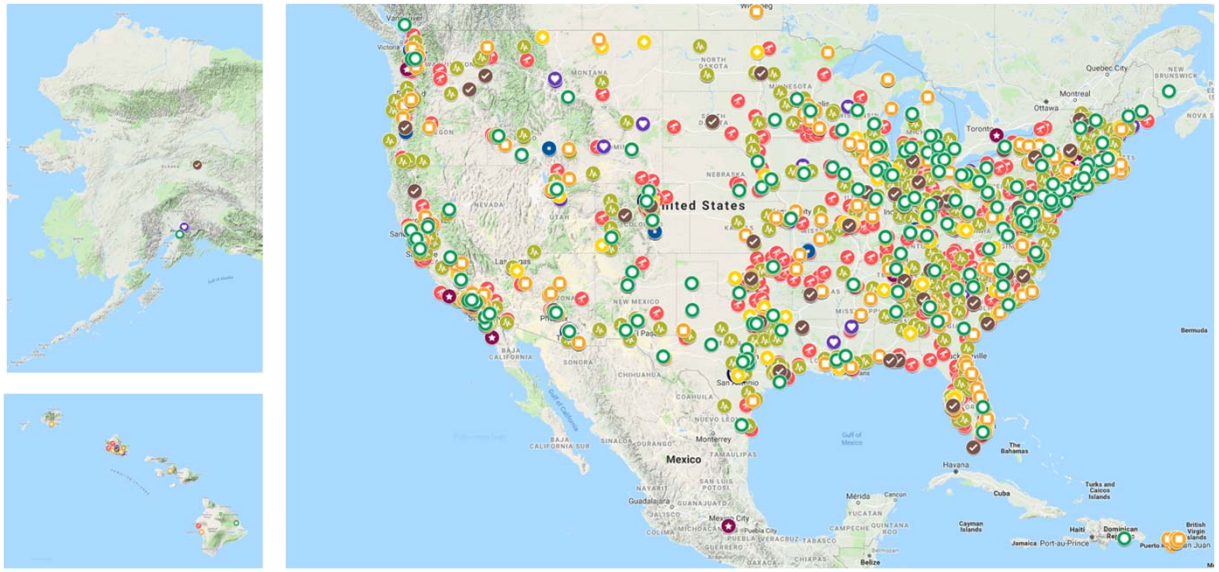
- A set of evaluation studies suggests NASA's UoL is meeting the needs of SMD's audiences and is making progress toward SMD objectives/metrics.

External Evaluation: NASA's UoL projects are aligned with NASA SMD top-level objectives



We use Project Charters and visual databases to track project alignment to SciAct objectives.

Reach of NASA's Universe of Learning



- NASA's Universe of Learning
- MicroObservatory
- National Science Olympiad State Winners
- DIY Planet Search
- AstroViz 2018 Participants
- Girls STEAM Ahead with NASA
- Discover Exoplanets Host Sites
- Science Briefings
- Informal Learning Network Participants
- ViewSpace

NASA's UoL Reach Map can be explored at https://tinyurl.com/NASAUoLReach

NASA'S UNIVERSE OF LEARNING

More than 700 venues

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Thank You!

The NASA's Universe of Learning Leadership Team:

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This presentation is based upon work supported by NASA under award number NNX16AC65A.
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