



STEM Served Family-Style: Harness the Influence of Families on Children's Perceptions, Attitudes, and Achievement

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Introductions

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- And you?



Our Three Goals Today



1. To increase your knowledge about providing STEM programming for the entire family – highlighting research, best practices, challenges, etc.
2. To introduce you to NASA curriculum support materials designed for use with families in out-of-school time
3. To walk you through hands-on STEM activities you can immediately use in your programming

Research Shows...



- Parental involvement has a positive impact on a child's academic performance, including higher scores on standardized tests.
- Children with parents involved in their education have improved problem-solving skills, better school attendance, and fewer disciplinary issues.
- Families have the greatest influence on children's attitudes toward education and career choices.
- These findings span genders, cultures, and income levels.

Complementary Learning



Families need PD, too!



- Models, reinforces, and supports positive whole-family learning dynamics and behaviors
- Addresses motivational issues and other barriers to participation – especially for underserved groups
- Boosts adults' knowledge, confidence levels, and attitudes – especially in challenging content areas
- Extends beyond on-site program

Best Practices in “Family PD”



Providing family supports



Focusing on family assets



Developing family-focused
program facilitation

Research and Resources

The Evaluation Exchange | FINE Network | OST Database



Harvard Family Research Project



The Harvard Family Research Project separated from the Harvard Graduate School of Education to become the **Global Family Research Project** as of January 1, 2017. It is no longer affiliated with Harvard University.

[Home](#) [Research Areas](#) [Publications & Resources](#) [HFRP News](#) [About HFRP](#)

SINCE 1983, we have helped stakeholders develop and evaluate strategies to promote the well being of children, youth, families and their communities.



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Research Areas

- Complementary Learning**
Linking families, schools, and communities to support success in school and in life.
- Family Involvement**
Promoting strategies to support family involvement in children's learning and development.
- Out-of-School Time**
Supporting the accessibility, quality, and sustainability of out-of-school time programs and initiatives.

New at HFRP

- New ways to think about your work with families**
Learn more about a free webinar and blog to grow new ideas in family engagement!
- Learning Pathways: Leading Our Children to Success in School and Life**
Read the newest blogpost from Harvard Family Research Project highlighting the potential for creating learning pathways for children and families anywhere, anytime.
- Learning Everywhere: Family Engagement in Libraries**

Key Resources

- [the evaluation exchange](#)
- [FINE NETWORK](#)
- [OST DATABASE / BIBLIOGRAPHY](#)
- [Follow us:](#)   

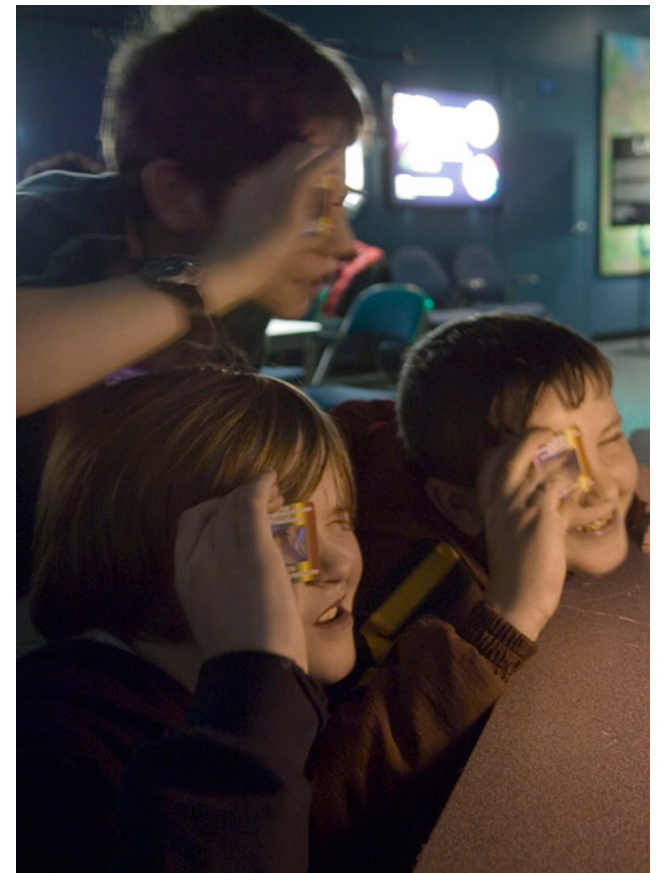
What got me into family learning?



Involving families in out-of-school time learning takes things to the next level!

What is NASA Family Science Night?

- Nine sessions pilot-tested for 4 years at NASA Goddard Space Flight Center in Greenbelt, MD (Washington, DC area)
- Flexible definition of “families” - one adult + one child aged 11-14
- Pilot sessions at Goddard held on weekday evenings for two hours
- Facilitator guides + resources are available



Family Science Philosophy



- Philosophy founded on principles of improved achievement and attitude through parental involvement
- Middle school-age selected as critical STEM target
- Core components:
 - ▣ Families must learn *together*
 - ▣ Adult-child communication and collaboration
 - ▣ Support adults in learning how to learn with children
 - ▣ Support continuity in learning beyond these sessions
- Programs must be based on robust evaluation

Family Science Night Sessions

1. How Big? How Far? How Old?
2. Have You Ever Seen the Invisible?
3. You Are Here!
4. Tis the Seasons
5. Be a Star!
6. Exploring the Moon
7. Batteries Not Included
8. Now You See It ... Now You Don't!
9. Searching for Other Worlds



And new sessions under development and pilot-testing...

About the Program



- Sessions can stand alone for one-time participants, but build upon each other for repeat visitors.
- Content is directly connected with “the real world” and includes connections with everyday life.
- Activities are chosen to engage participants **as a family** as they approach problem-solving, model-making, and other hands-on tasks.
- Topics were chosen to especially include content often overlooked by classroom curricula.

Structure of a FSN session



- Introductory activity on the table upon arrival – largely self-directed, absorbs early and late arrivals, paperwork, etc.
- Opening discussion – rules, introduce event topic
- Core activity (or activities) – explore topic and build understanding, include time to reflect/discuss
- Transfer of knowledge – participants strengthen and demonstrate understanding through open-ended exploration of the topic

Let's jump right in!

- We've placed a bag of objects on each table.
- Take a look at what's inside the bag.
- How many different ways can you sort these items?
- Try to find as many ways to sort them as you can!



Family Science Night Rules



- **Rule #1:** Work as a family to complete the tasks.
- **Rule #2:** Respect each other during group discussions.
- **Rule #3:** Be willing to think outside the box and express yourself.
- **Rule #4:** Have fun!

Debrief: Sorting Bags



- **How** did you sort the items in your bag?
- Was that the **only** way to sort them?
- Was that the **best** way to sort them?
- Is there a **right** way (or wrong way) to sort items?
- What else do we sort in everyday life? Why?

Why do we use this as an opening engagement activity with families?

Time for a Stretch!



- Stand up.
- Talk within your group – how many ways can you come up with to sort yourselves in 5 minutes?
- GO!

Debrief: Sorting People

- Was that the **only** way to sort them?
- Was that the **best** way to sort them?
- Is there a **right** way (or wrong way) to sort people?

Why do we use this activity with families?



Sorting Cards

- Open the pack of cards...
- We're first going to sort them by **HOW BIG?**
- How do you interpret this?
- Can you think of other ways to sort the cards?



Debrief: Sorting Cards

- How does this activity tap into divergent modes of thinking?
- How does this activity complement the others we've done today?
- How do these activities build real-life skills that can be utilized beyond an in-person event? What happens next?



Discussion: Session 1



Challenges in Family STEM Engagement



- ❑ Mixed age/experience audiences are tricky
- ❑ Family members and implementers alike have preconceived notions of teacher-learner dynamics
- ❑ Sufficient staffing levels and implementer PD
- ❑ Timing – never the perfect time, never enough time!
- ❑ Recruitment of families (especially beyond “the usual suspects”)
- ❑ One size never actually fits all – dealing with younger and older children

What We Learned



- Content should be approachable for a wide range of grade levels to engage the whole family – but targeted at middle school
- Activities should be hands-on and exploratory; limited lecture, presentations, demos, etc.
- Activities should encourage participation from all family members as equal partners in learning
- Keeping things simple pleases families and implementers alike (less can be more) – low cost + low tech $\neq$ low engagement

Evaluation

- It was not only important to us to evaluate the effectiveness of our sessions, but also to develop effective evaluation tools
- We did not evaluate the ‘content’ that anyone learns, but the interactions of the families as they work together
- Mixed-methods evaluation led by the RIT Insight Lab:
 - ▣ Observations during each session by two trained observers
 - ▣ Surveys at the start and end of each session (for families, parents, and children)
 - ▣ Follow up conversations with participants

Evaluation Surveys

- Pre-session survey from families:
 - ▣ Understand and describe the “whole family” – who is there, who isn’t there?
 - ▣ Uncover any other recent family science activity
 - ▣ Discover any impacts of previous sessions
- Post-session surveys for parents and kids:
 - ▣ Understand most and least effective parts of the event
 - ▣ Discover likelihood of return to future programs and of describing the science to others
 - ▣ Uncover plans to engage in science over the next month
 - ▣ Find out if they are able to report learning anything new

Evaluation



- Measured outcomes from the program:
 - ▣ Family members are observed to be engaged in the activities, as a family group (not just the kids)
 - ▣ Participants are able to state something new that they learned: about science or about their families
 - ▣ Families complete science activities outside of the workshop, which they report with increasing frequency the more workshops that they attend
 - ▣ Families can describe how science relates to their everyday lives
 - ▣ Return rate was high – after they came twice

The “Real World” Connection



- Children – and adults – respond to content that is relevant and relatable
- Draws connections to activities in everyday life that are “doing science” – even if they don’t realize it
- Helps participants realize their own capabilities in science

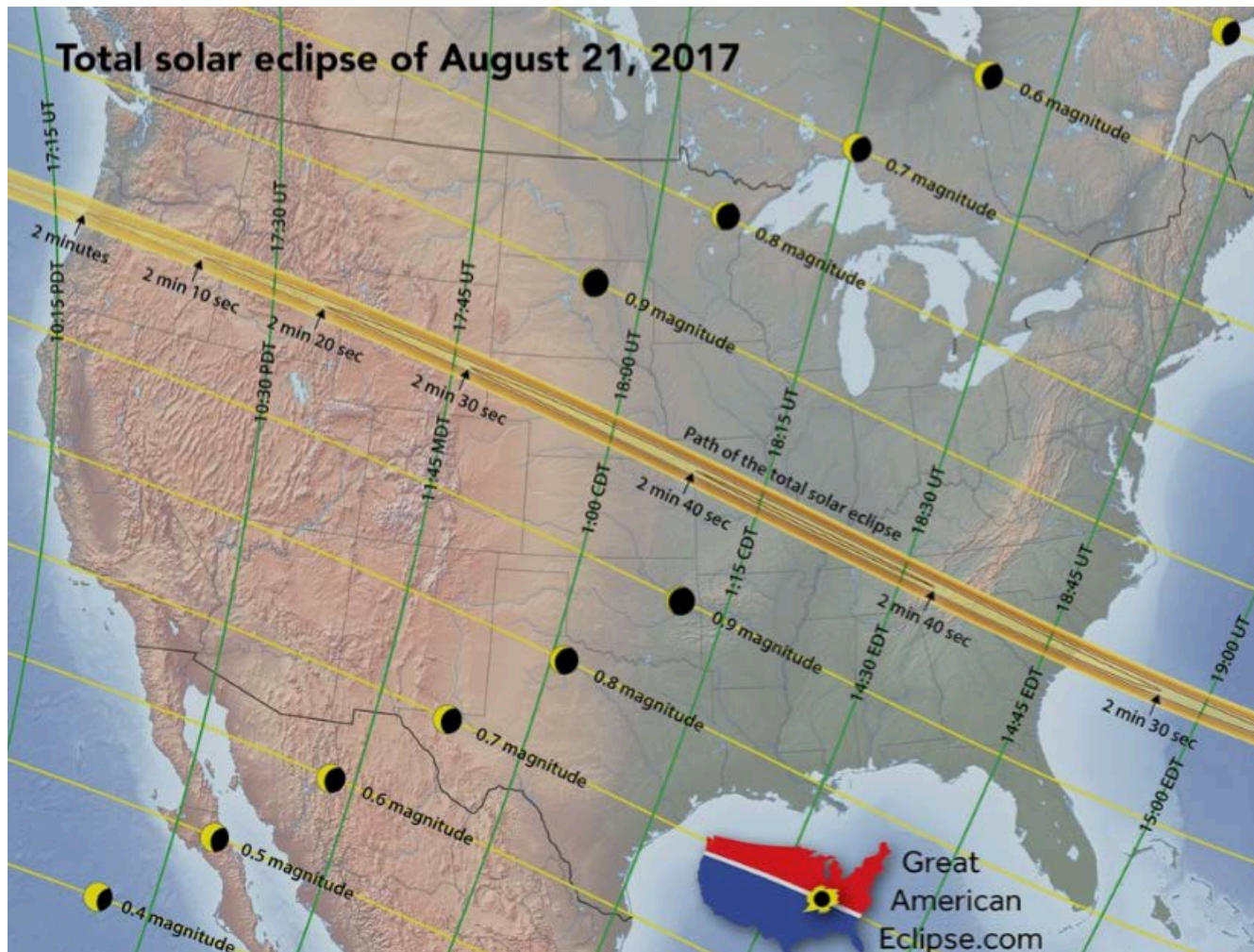
“I am a scientist!”

What's coming next for FSN



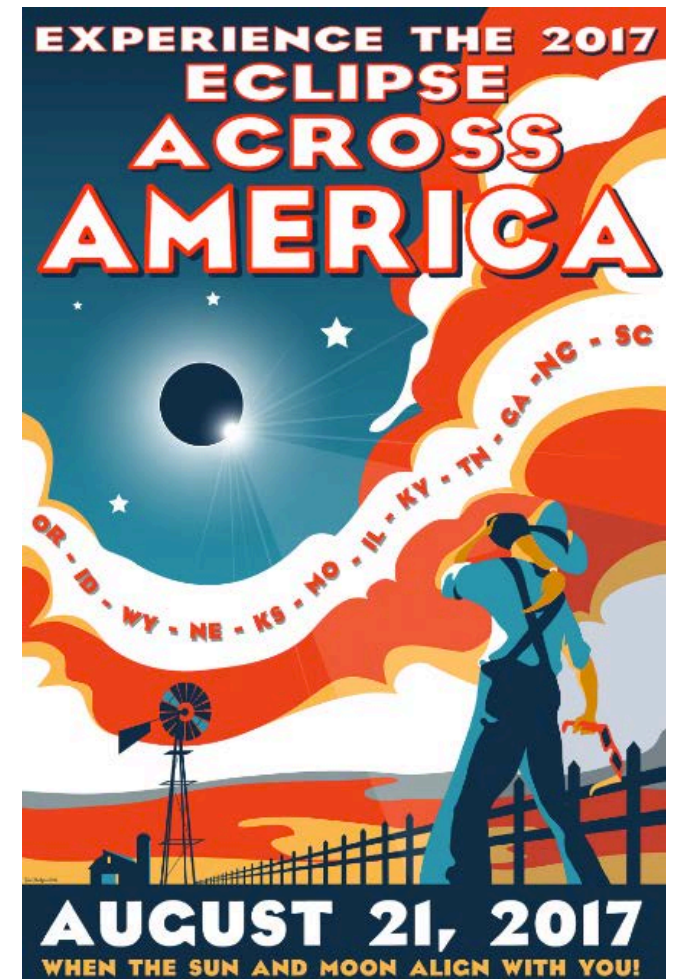
- New session about the Milky Way and other galaxies currently under development
- We'll be looking for pilot-testers to try out this and other new sessions as we evaluate and refine them
- Opportunities for future professional development – in person or online

Families and the 2017 Eclipse



Families and the 2017 Eclipse

- Great opportunity for events – lead-up and day of
- Support safe solar viewing with educational activities
- FSN session 8 covers solar and lunar eclipses
- NASA Eclipse 2017 website: <https://eclipse2017.nasa.gov/>



Discussion



- What are the challenges you're facing with STEM programming? With family programming?
- What lessons can you share from your own experiences?
- What support do you need?
How can we help each other?
- Need resources or references? Just ask!

For more information...



- The original 9 sessions are being implemented at dozens of sites across our growing network
- Contact us for more information about resources and opportunities for pilot-testing
- Evaluation tools and reports available upon request
- Research on family learning – we can share our references, and check out: <http://www.hfrp.org/>

NASA Wavelength

The screenshot displays the NASA Wavelength website. At the top left is the NASA logo and the text "NASA WAVELENGTH" with the tagline "A Full Spectrum of NASA Resources for Earth and Space Science Education". To the right are social media links for Facebook, Twitter, YouTube, and LinkedIn, along with the URL "Visit science.nasa.gov". A blue navigation bar contains links for Home, About, News and Events, Data & Images, Strandmaps, and Blog, followed by "Log in" and "Register" buttons.

The main content area shows a list of resources. A circular callout highlights the "Aster's Holty Toity" resource, which includes a thumbnail image of an asteroid and the text: "Many chunks of rock orbit the sun. Those that meet the earth glow and disintegrate from friction as they plunge through the atmosphere...". Below this, there are buttons for "Cancel", "Delete", and "Save", along with "Go To Resource" and "View Resource Details".

On the right side, there is a "Browse our collections" section with "Audience" and "Topics" filters. Below that is a "Search for Resources" section with a search input field containing the placeholder "Enter a search term here", a dropdown menu set to "All Audiences", and a large blue "Search" button.

At the bottom, a blue banner reads "Create your own collections of resources! List Building on NASA Wavelength" with a "Start Building!" button.

Another resource: Afterschool Universe



- 12-session curriculum (45-60 minutes each)
- Explores the Universe beyond our solar system and how we study it
- Designed for middle-schoolers in out-of-school-time
- No preliminary science knowledge required for program leader – we provide background info
- Very hands-on with interdisciplinary learning techniques
- Flexible implementation to suit different schedules

Afterschool Universe Topics



- Two introductory sessions to start the students thinking:
 - ▣ “Modeling the Universe” draws out mental models participants have at the beginning and end of the program.
 - ▣ “Cosmic Survey” addresses size/scale/distances.

Afterschool Universe Topics



- Three tools sessions to discuss how astronomers use light to gather data:
 - ▣ “Telescopes” allows the students to construct a simple telescope.
 - ▣ “Invisible Light” discusses the light that we cannot see with our eyes.
 - ▣ “Spectroscopes” allows the students to construct a spectroscope with paper towel tubes.

Afterschool Universe Topics



- Five sessions discuss components of the Universe and how they fit together:
 - ▣ “Life Cycles of Stars” (two sessions) explores what makes stars shine and how they live out their lives.
 - ▣ “Our Cosmic Connection to the Elements” discusses the origins of the chemical elements in space.
 - ▣ “Galaxies” allows students to model our own Milky Way Galaxy and figure out our place in the Universe.
 - ▣ “Black Holes” busts myths about these mysterious and fascinating objects.

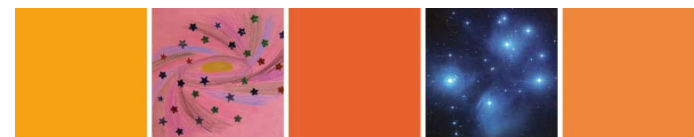
After-school Universe Topics

- Scientist/Engineer visit provides answers to questions and provides an exposure to careers in STEM fields
- Final session is a repeat of the 1st session so that students and leaders can compare and see changes



Afterschool Universe Resources

- Comprehensive manual to run all of the sessions in the program
- Each session is a self-contained recipe with background, activities, and extensions
- YouTube videos to help illustrate several activities



Afterschool Universe

BRINGING ASTRONOMY DOWN TO EARTH

Wrap-up



- Comments or questions?
- Please contact us if you would like to be involved:
 - sara.mitchell@nasa.gov
 - sarah.e.eyermann@nasa.gov

Thank you for coming!

NASA Goddard Astrophysics Resources

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Afterschool Universe

<https://universe.nasa.gov/afterschool/>

Afterschool Universe is the curriculum for a hands-on astronomy program targeted at middle school children in out-of-school-time settings. It explores basic astronomy concepts and focuses on the Universe outside the solar system. The Resources section of the website includes various resources for facilitating the *Afterschool Universe* program with children, including a full PDF of the manual, printable copies of all the handouts, additional background information, and links to 12 activity videos online. These videos can also be found on our YouTube channel (<http://www.youtube.com/user/AfterschoolUniverse>).

Family Science Night

<https://universe.nasa.gov/fsn/>

The *NASA Family Science Night* curriculum is a set of 2-hour sessions intended for middle-school-aged children and their families to explore the importance of science and technology in our daily lives by engaging as a family in activities that change their perception and understanding of science. We are currently working on updating the website to share the resources for this program, but in the meantime please contact Sara Mitchell (Sara.Mitchell@nasa.gov).

Imagine the Universe

<https://imagine.gsfc.nasa.gov/>

The *Imagine the Universe* website explores distant galaxies, massive black holes, brilliant gamma-ray bursts, and the origin of the universe itself for interested astronomers ages 14 and up. The site also shares information about how scientists know what we know, what mysteries remain, and how we might one day find the answers to these questions. The *Imagine the Universe* Educators' Corner features lesson plans, posters, and educator guides aimed at middle and high school audiences. These standards-aligned materials highlight a variety of topics in astronomy from supernovae, the origin of the elements, galaxies, and black holes.

For additional educational resources, please visit:

NASA Wavelength - <http://nasawavelength.org/>

Additional Goddard Astrophysics Resources - <https://science.gsfc.nasa.gov/660/outreach/index.html>

If you have any questions, please email us at Sarah.E.Eyermann@nasa.gov or Sara.Mitchell@nasa.gov