WWT in Education

WWT Ambassadors - Projects and Fundraising

- WWT ThinkSpace Labs, funded by NSF award DRL-1503395, $1.4M (2015-2018)
- Bucknell WWT Labs for Astro 101, funded by NSF award DUE-1140440, $200k (2012-2016)
- Bringing the Universe to America’s Classrooms, funded by NASA-CAN, $160k for WWTA (2017-)
- WWT Life in the Universe Lab, funded by John Templeton Foundation, $500k (2015-2018)

ThinkSpace: Spatial Thinking in Middle School Astronomy Labs

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Harvard-Smithsonian Center for Astrophysics

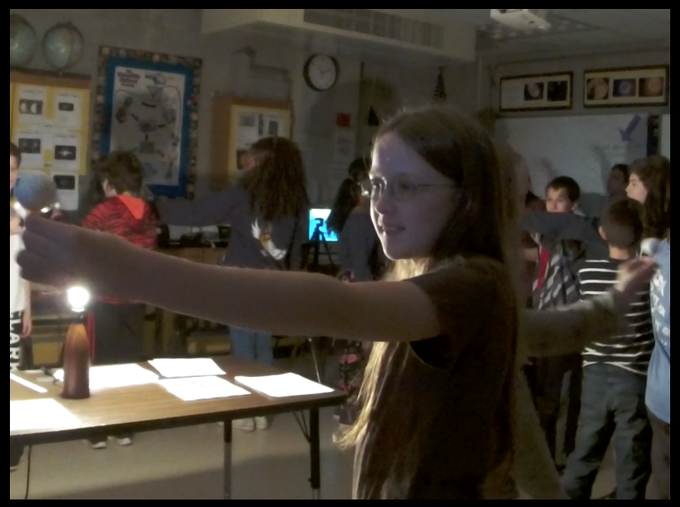
Julia **Plummer**, Abha **Vaishampayan**, Kyungjin **Cho**
Pennsylvania State University

Helen Zhihui **Zhang**
Boston College

This work has been funded by NSF award DRL-1503395

Project OVERVIEW

ThinkSpace labs teach astronomy while supporting spatial thinking skills, like imagining a scene from multiple viewpoints.



Project OVERVIEW

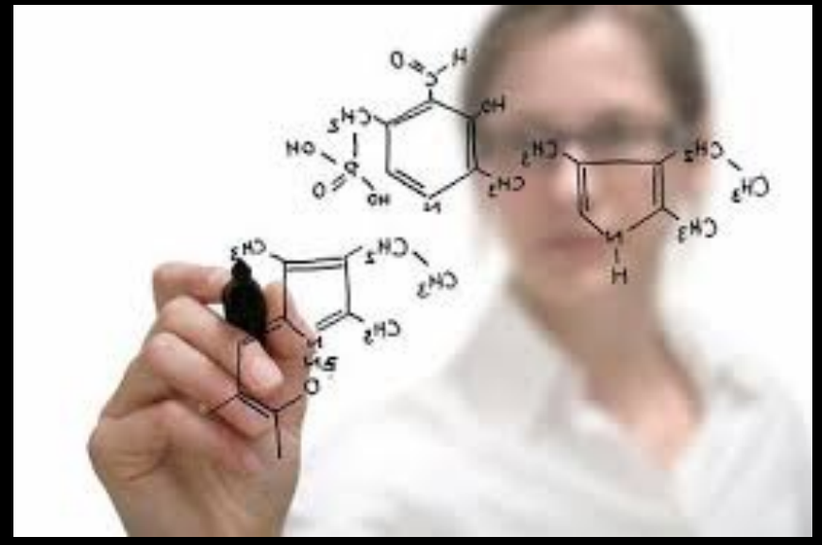
ThinkSpace labs teach astronomy while supporting spatial thinking skills, like imagining a scene from multiple viewpoints.

Lab Options

1) Moon phases and eclipses
2) Seasons

Spatial Thinking and STEM

- Spatial skills correlate with performance in science domains, and likelihood to enter a career in STEM (e.g. Hegarty, 2014, Wai et al. 2009, 2010)



Spatial Thinking and STEM

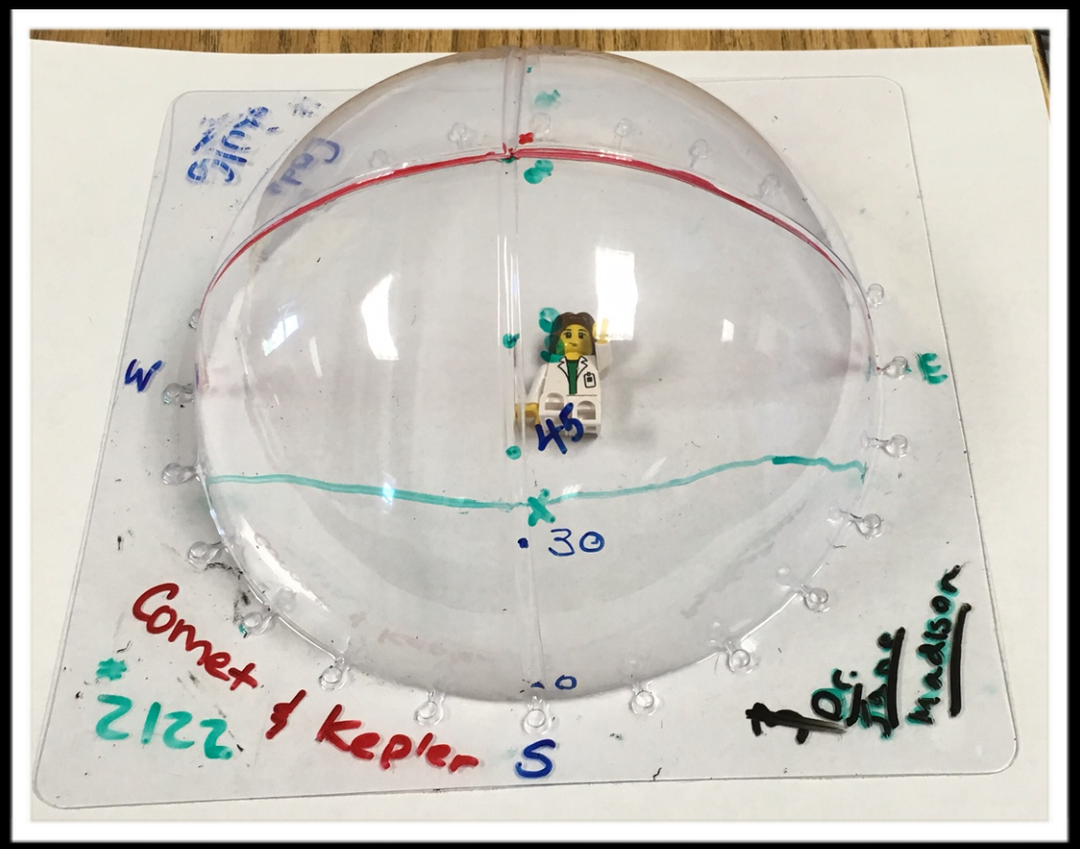
- Spatial skills are malleable and can improve with practice (e.g. Uttal et al., 2013)

WWT ThinkSpace Moon Lab

- 3-day lab experience tested with middle school students
- Focus on WHY we experience Moon Phases and Eclipses
- Students use physical and virtual models (WorldWide Telescope) to understand the Moon phenomena and practice perspective taking skills

WWT ThinkSpace Seasons Lab

- 8-day lab experience tested with middle school students
- Blend of WWT views and physical models
- Focus on connecting space based and earth based perspectives



Student Gains: Moon Phases & Seasons Questions

$$\text{Cohen's d Effect Size} = \frac{\text{Average(Posttest Score - Pretest Score)}}{\text{stdev(Pretest Score)}}$$

WWT Moon Phases: Cohen's d=1.2±0.2; N=330

WWT Seasons: Cohen's d=1.5±0.2; N=290

Cohen's d ~ 0.2 → small effect

Cohen's d ~ 0.5 → medium effect

Cohen's d >0.7 → large effect

Student Gains: Spatial Thinking Questions

$$\text{Effect Size} = \frac{\text{Average(Posttest Score - Pretest Score)}}{\text{stdev(Pretest Score)}}$$

Spatial Thinking: Cohen's d=0.3±0.2; N=630

Cohen's d ~ 0.2 → small effect

Significant gain when compared with control groups who did not use WWT ThinkSpace Labs

Building an Understanding of Astronomical Sizes and Scales with WorldWide Telescope

Ned **Ladd**, Katharyn **Nottis**, Evan **Gingrich**, Kristen **Recine**
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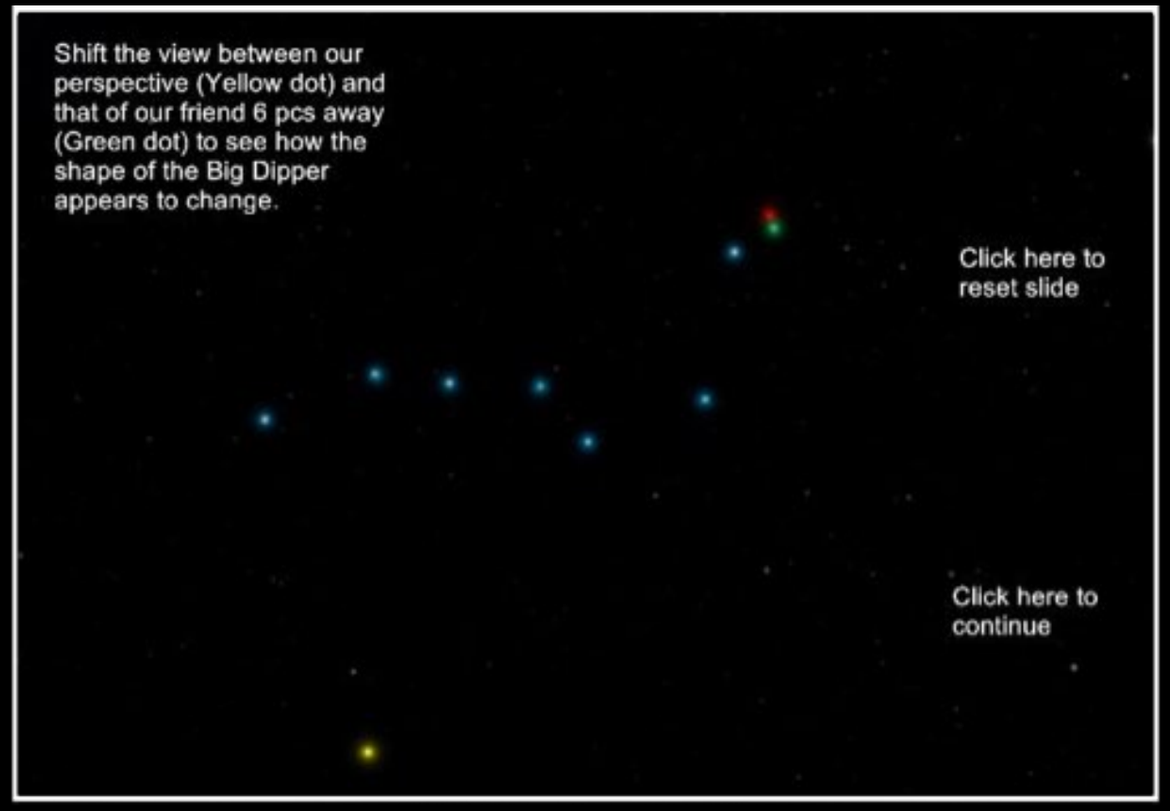
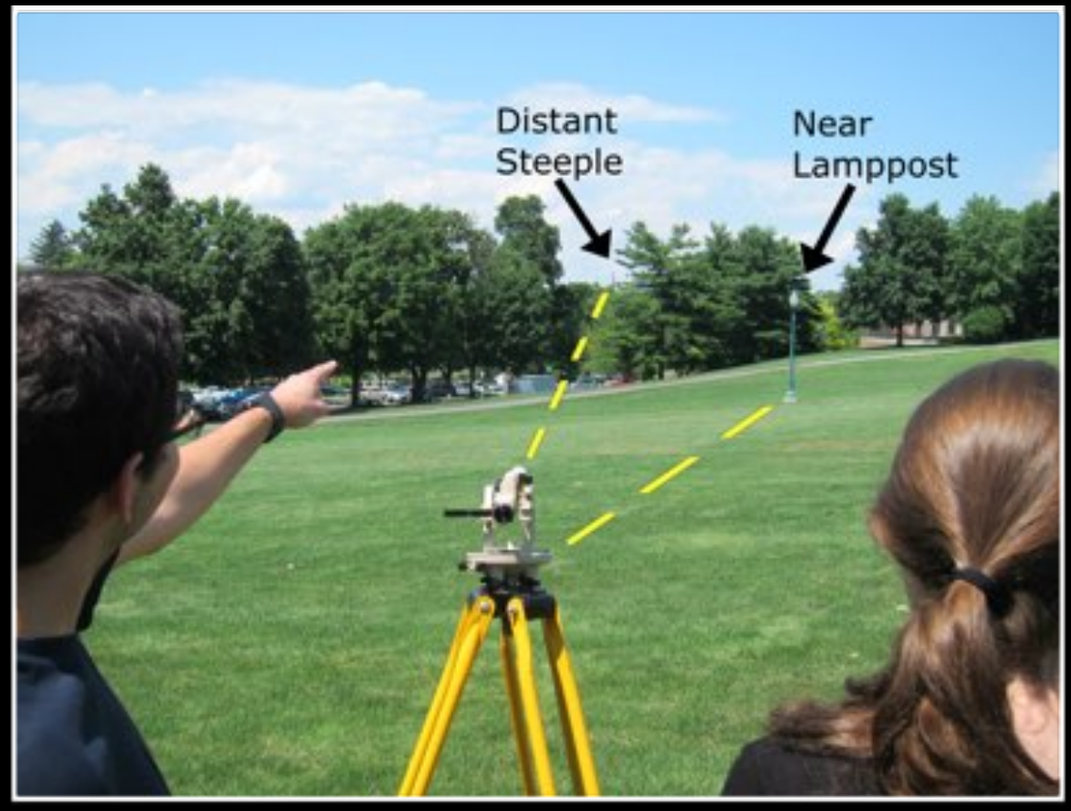
Patricia S. **Udomprasert**, Alyssa A. **Goodman**
Harvard-Smithsonian Center for Astrophysics

This work has been funded by NSF award DUE-1140440

Bucknell WWT Parallax Lab

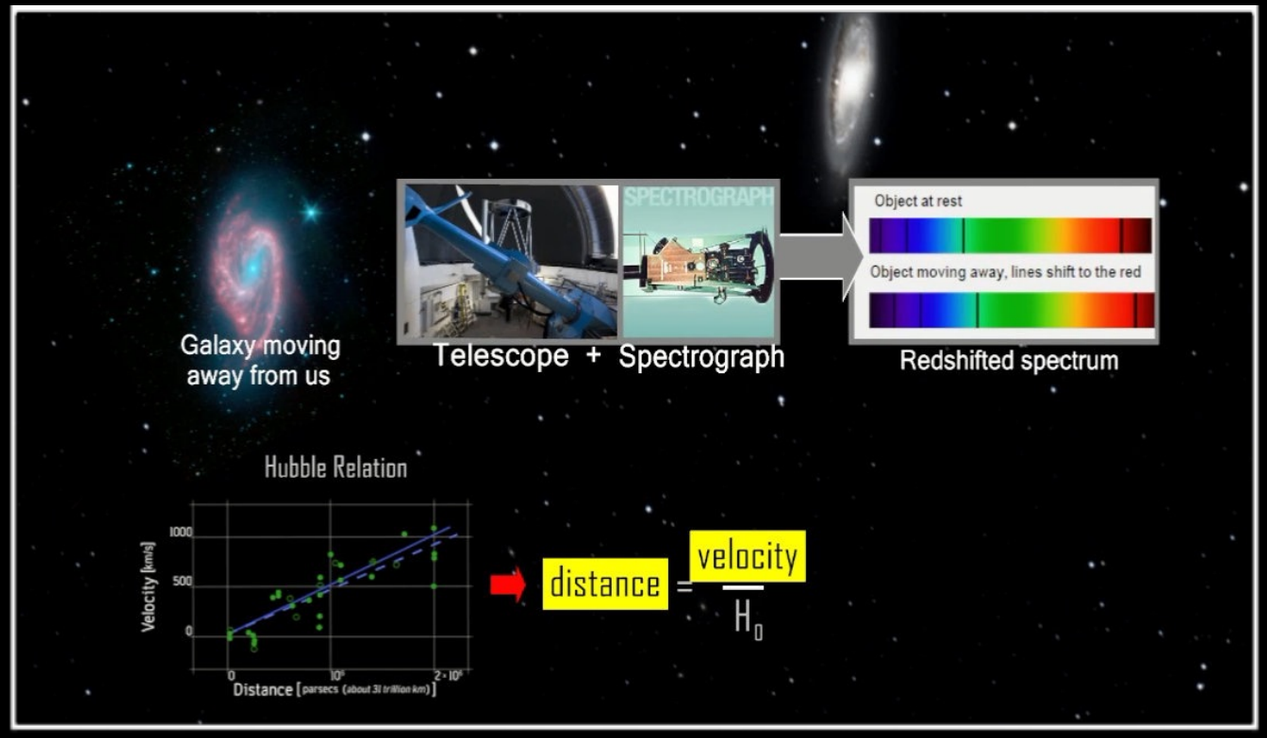
- designed for Astro 101 (non-science undergraduates in an introductory astronomy class)
- blends hands-on and virtual activities.
- Students explore parallax as it is viewed astronomically, and develop physical intuition for the concept by measuring it in real time.

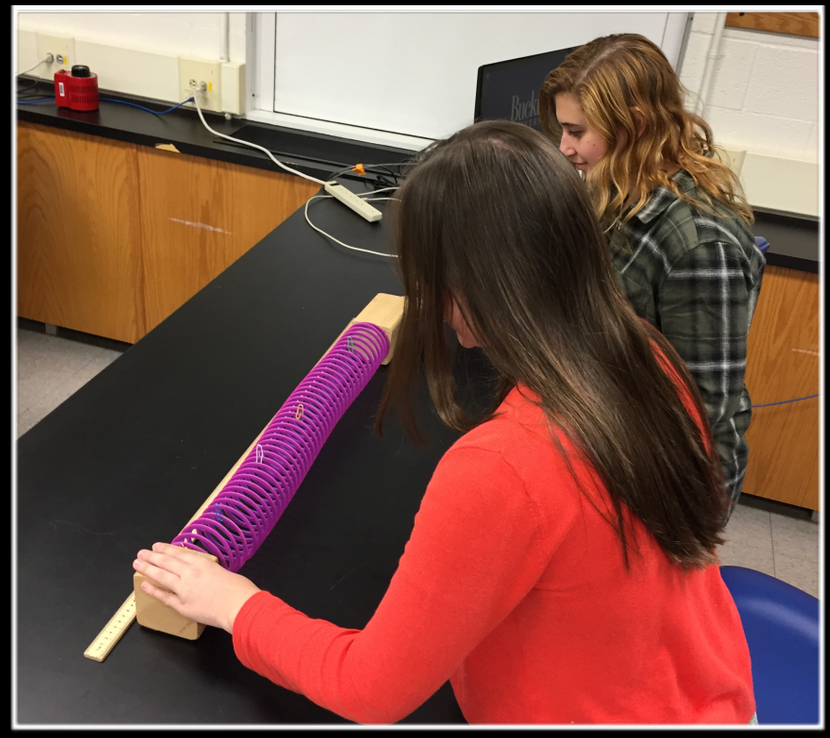




Bucknell WWT Hubble Lab

- designed for Astro 101 (non-science undergraduates in an introductory astronomy class)
- blends hands-on and virtual activities.
- Students explore the universe on its largest scales and develop physical intuition for its geometry and dynamics.





Bringing the Universe to America's Classroom

Rachel **Connolly**, Pegeen **Wright**, Jake **Foster**
WGBH

Patricia S. **Udomprasert**, Alyssa A. **Goodman**, Harry **Houghton**
Harvard University

This work has been funded by NASA award No. NNX16AD71A

PBS LearningMedia™

Year 1: Needs Assessment

Market Survey
80,000 K-12 Science teachers

Market Scan
K-12 Digital Media Landscape

Prototyping
National Teacher Advisor Team
Classroom Testing ~1250 students

Meta-Analysis
Existing WGBH STEM evaluations on Digital Media

Years 2-5: Producing K-12 Instructional Modules

Outcomes

- Deeper, research-based understanding of how to produce digital media for STEM learning
- Optimize delivery and metrics on PBS LearningMedia platform
- Increased engagement with teacher and student audiences around authentic STEM experiences

PBS LearningMedia

PBS LearningMedia
pbslearningmedia.org

Metrics & Reach

- 1.86 M registered users
- 65% of all public schools
- 88% of Title I schools with enrollment greater than 1,000
- 67% of schools with bilingual education programs

2016-2017 SY Monthly Average (Sept '16 – May '17):

- 964,725 unique visitors (1M+ Jan-March)
- 1,293,988 sessions
- 3,145,933 page views
- 120,000 FREE digital learning resources
- Nearly 100% of stations have localized platform and participate in PBSLM engagement activities

WGBH BRINGING THE UNIVERSE TO AMERICA'S CLASSROOMS

Earth Modules | Using the Modules | About the Project

EARTH MODULES

This collection brings together cutting-edge digital media—including videos, images, data visualizations, and games from WGBH's signature programs, like NOVA and PEEP and the Big Wide World—to provide K–12 STEM teachers with high-quality resources for teaching topics in the Earth and Space Sciences. Resources in this collection are standards-aligned, and include background essays and teaching tips to support instructional use and curricular integration.

Grades K-2 | Grades 3-5 | Grades 6-8 | Grades 9-12

Land & Water

Photo credit: NASA

Get up close to our planet and its processes with these resources that explore the systems and interactions of land and water on Earth. Through satellite images, scientific data visualizations, and beautiful simulations, you and your students will experience geological phenomena—including landslides, precipitation, earthquakes, and erosion. Resources include support materials such as background essays, activities, teaching tips, and student handouts.

Weather

Photo credit: NASA

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USING THE MODULES

Tour | Maps | Features | Design

ABOUT THE PROJECT

Mission | Team | Research | Partners

Photo credits: NASA/JPL-Caltech/SwRI/MSSS/Gabriel Fiset

Mission

WGBH, in collaboration with NASA, is presenting *Bringing the Universe to America's Classrooms**, an initiative for the development of media-rich digital learning resources to increase students' engagement with science phenomena and practices in the classroom. Produced by WGBH, these resources will be distributed free of charge through the PBS LearningMedia platform, reaching millions of students and teachers nationally.

In each of the five years of the project, teams of 50 K-12 teachers will advise WGBH on the development of these resources, working with leading media producers and educational researchers to design new ways to engage students around topics in Earth, space, and physical sciences.

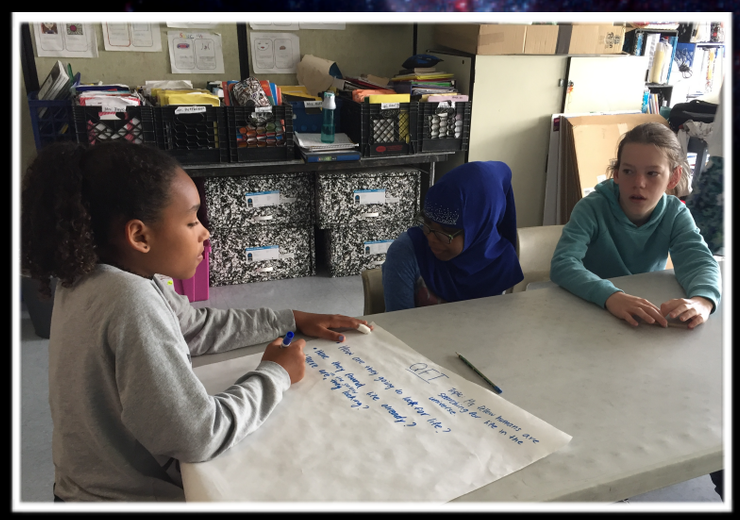
Life in the Universe

You are here.

An extended learning time experience for middle school students, in partnership with the Harvard Education Portal

HARVARD ED PORTAL
Learning without limits

John Templeton Foundation



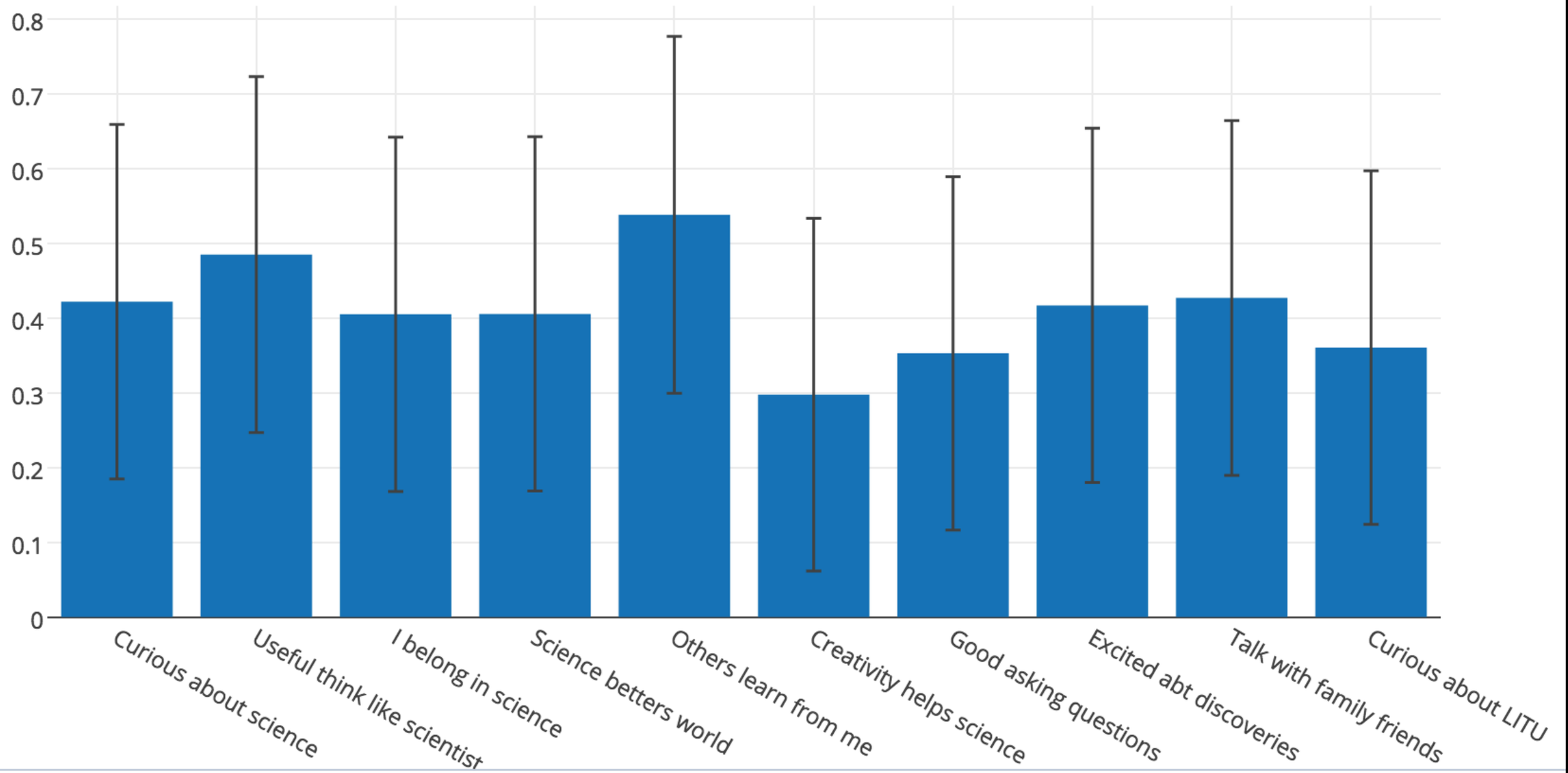
Big Questions

- Could humans ever find, and communicate with, sentient life on other planets?

- Should we be looking?

- What would it mean for us if we found life elsewhere?

Life in the Universe
Pre-Post Likert Effect Sizes




"Thank you so much for teaching us about the universe - there was so much I didn't know! It was one of the best experiences of my life. Thank you for this opportunity"
"Thank you for teaching me about astronomy and the possibility of finding life in the universe"
"We all had a great time and learned lots of new things. P.S. I'm a future scientist"