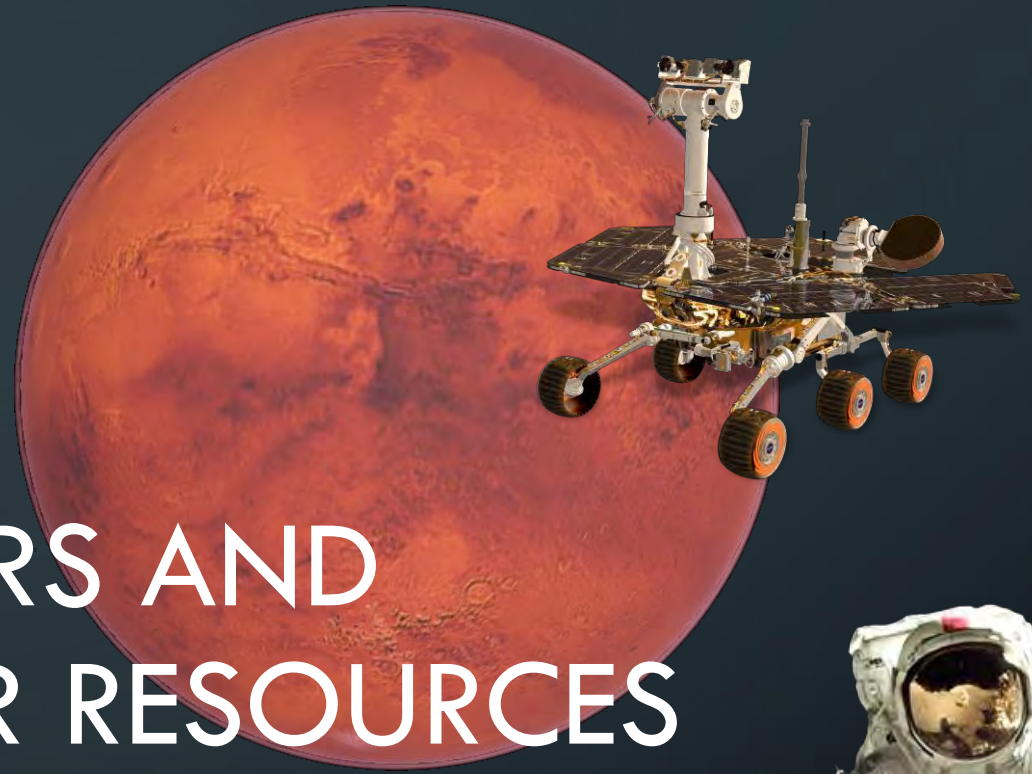


$$E=mc^2$$



MISSION TO MARS AND NASA EDUCATOR RESOURCES

JUNE 8, 2017

CAITLIN NOLBY, MARISSA SAAD, ANGIE BARTHOLOMAY, AND SHAE SKAGER

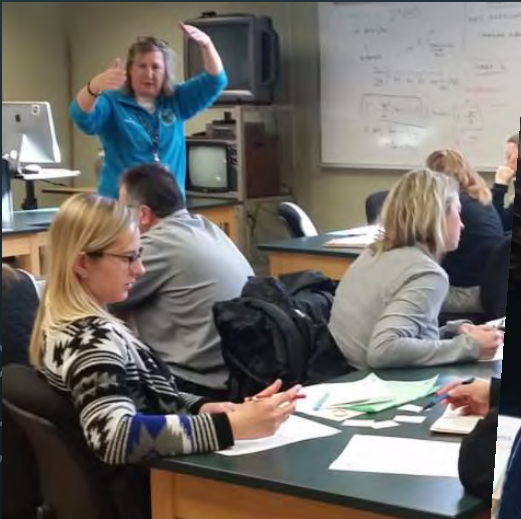
ROBIN HALL, UNIVERSITY OF NORTH DAKOTA



MEET THE SPACE GRANT TEAM!



- Affiliate Professor, **Angie Bartholomay** (Dakota College at Bottineau)
- Director of Space Grant, **Jim Casler** (UND)
- Deputy Director, **Caitlin Nolby** (UND)
- Coordinator, **Marissa Saad** (UND)
- STEM Ambassador, **Shae Skager** (UND)



AGENDA

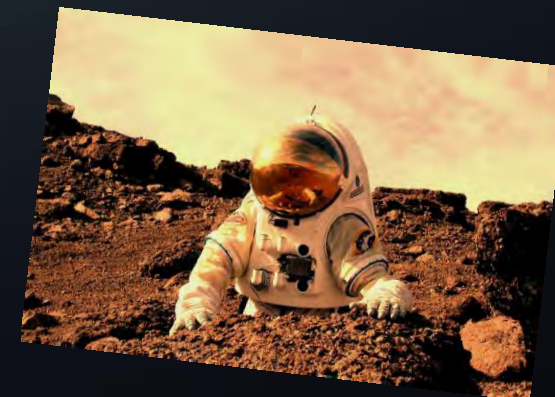


- 11:00 - 11:15am Workshop Objectives and Agenda Overview
- 11:15 - 11:45am Introduction and Networking Activity
- 11:45 - 12:00pm Educator Pre-test
- 12:00 - 1:00pm Investigation: Strange New Planet
- 1:00 - 1:15pm **Break**
- 1:15 - 2:00pm Working Lunch: SciGirls Seven Strategies
- 2:00 - 2:30pm Crew Selection and Mission Design
- 2:30 - 3:30pm Investigation: Stomp Rockets
- 3:30 - 3:45pm **Break**
- 3:45 - 4:45pm StarLab: Planetarium Show
- 4:45 - 5:00pm **Break**
- 5:00 - 5:30pm Investigation: Apollo 13
- 5:30 - 6:30pm Investigation: Washing Water
- 6:30 - 7:15pm **Working Dinner:** Space Grant Resources
- 7:15 - 8:15pm Investigation: On Target!
- 8:15 - 8:30pm Wrap up: Reflection on Investigations and Teaching Strategies

WORKSHOP GOALS

You will be able to:

- **Engage students in areas of space exploration** and general science, by using effective instructional strategies and educational resources, with inspiring content.
- Promote the effective use of **SciGirls®** investigations and **NASA-developed resources** through integration of space science content with the SciGirls style of inquiry.
- Highlight milestones and challenges in a crewed **Mission to Mars** through hands-on investigations completed in teams.



WORKSHOP OBJECTIVES

You will be able to:

- Develop a comprehensive understanding of the **SciGirls Seven** by the end of the workshop.
- Modify **existing lesson plans** using the SciGirls Seven by the end of the workshop.
- **Confidently teach space sciences** through an increased knowledge of space-related topics, with an emphasis on a mission to Mars.
- Effectively **conduct investigations** presented during the workshop (and modified lesson plans) in their respective classrooms, utilizing their understanding of the SciGirls Seven and space sciences during the 2017 academic year.



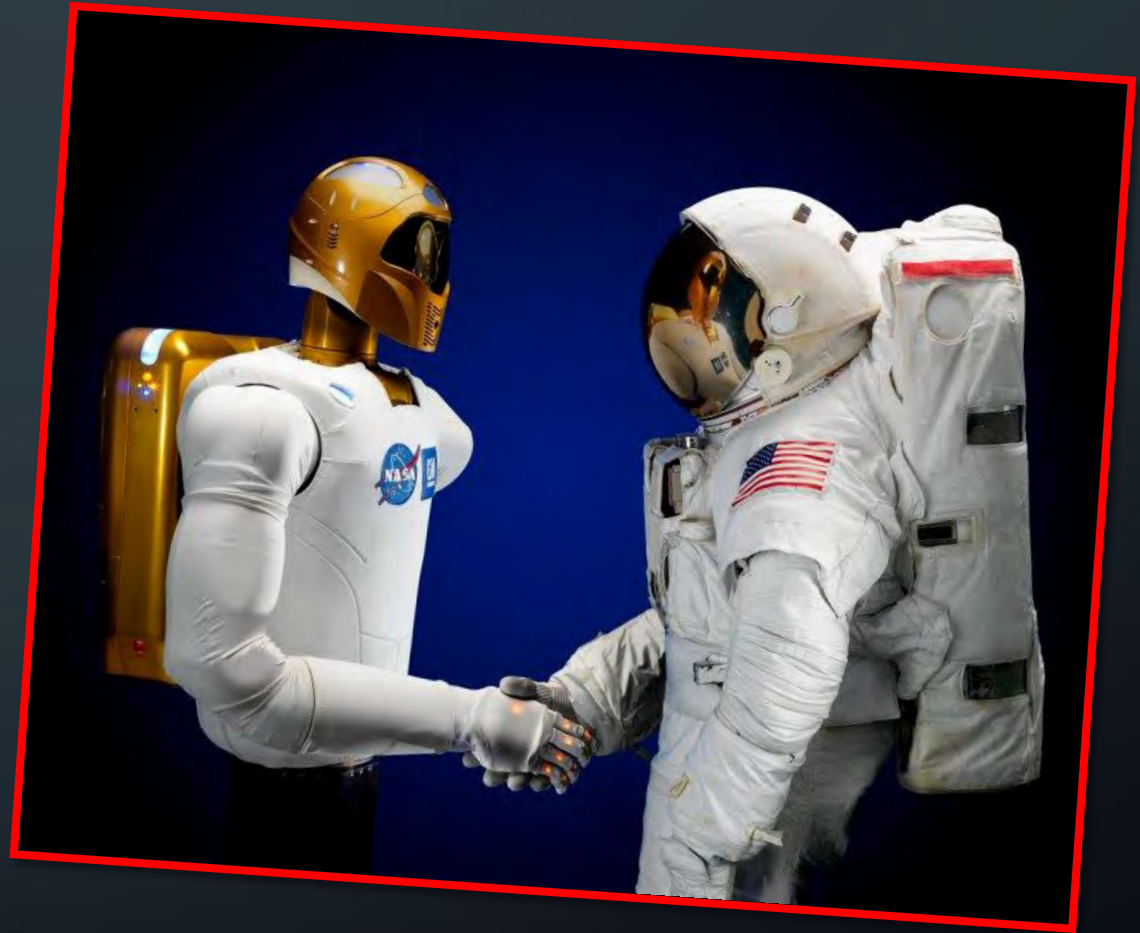
LOGISTICS

- Grading = S/U
- Register by June 16th for PD Credit
- Travel Reimbursement
- Binder Overview
- NASA Media Release Forms
- Downloads on Space Grant website



INTRODUCTIONS

- Name
- Town/School
- Favorite movie
- Expectation for this workshop?
- One thing you want to learn about Mars.



4 CORNERS ACTIVITY

- Sweet, Savory, Salty, Spicy
- Summer, Fall, Spring, Winter
- Science, Technology, Engineering, Math



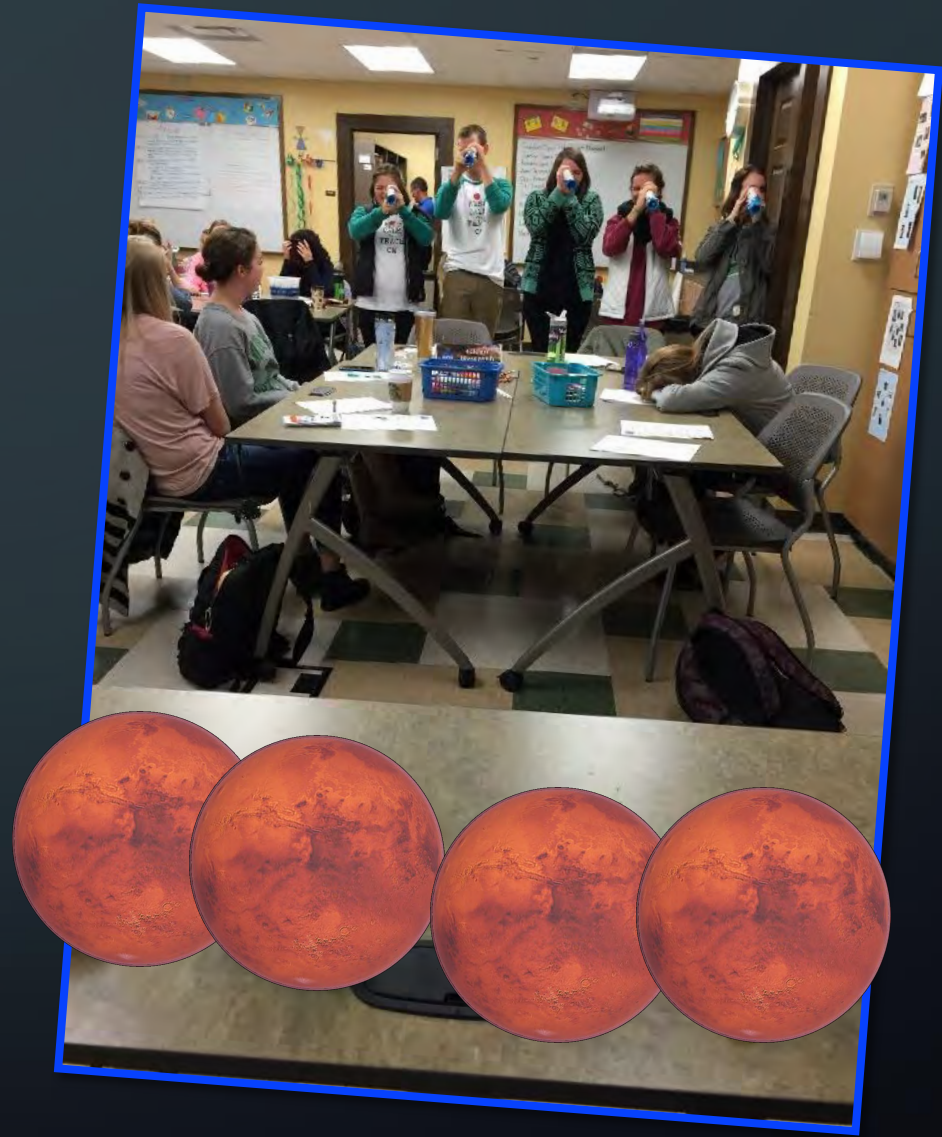
FORMATIVE ASSESSMENT



<https://goo.gl/vnFrrQ>

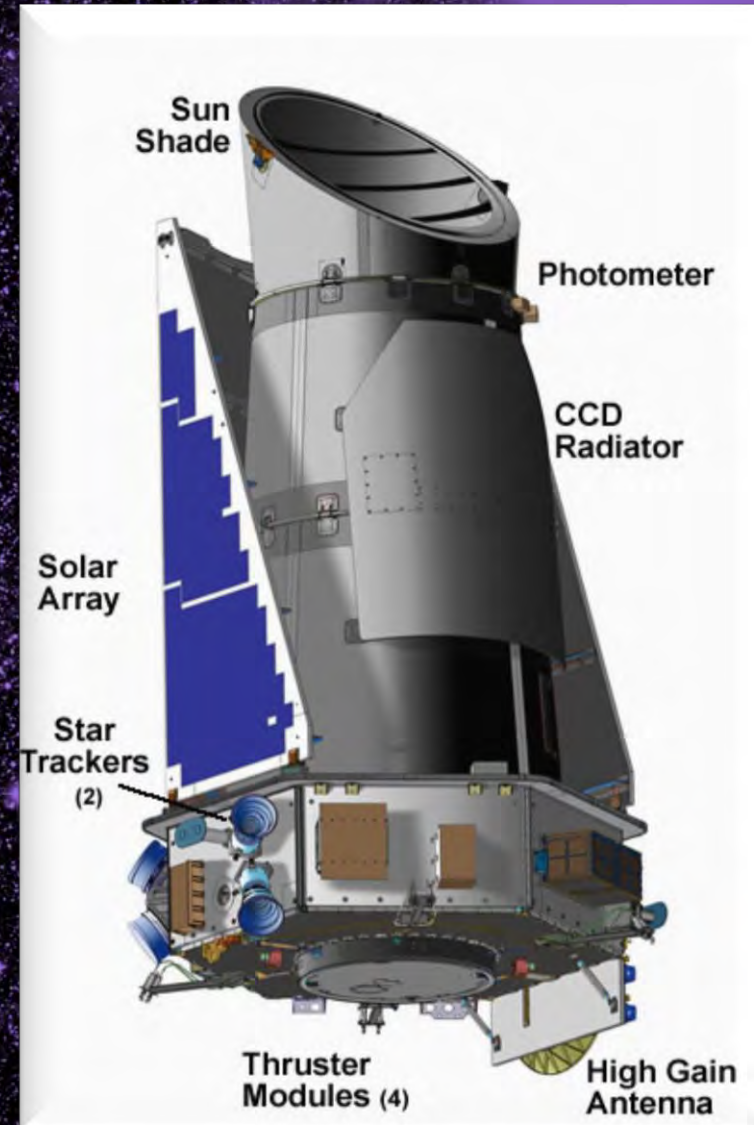
- Pre-Survey on Space Science **Confidence**
 - Voluntary and anonymous
 - IRB certified
 - Your choice of a paper-copy or electronic survey
 - <15 min of your time
- Post-Survey following the conclusion of the workshop
- Secondary post-survey at the **end of 2017**, during the academic year

STRANGE NEW PLANET



STRANGE NEW PLANET

- Work in NASA teams to collect data to plan missions and explore new worlds!
- [How Kepler Works](#)
- [NASA Spacecrafts](#)
- Sort students by NASA Center
- Assign student roles

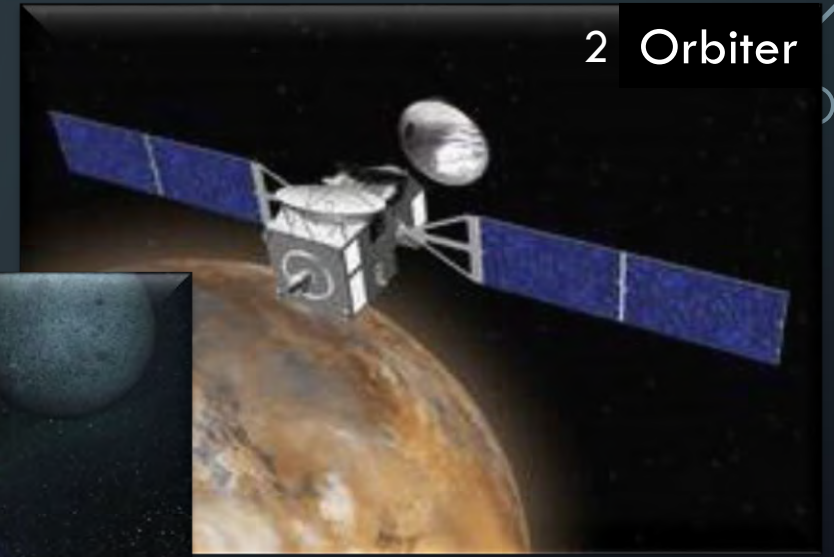


YOUR ROLE ON THE NASA TEAM

Astronomer



2 Orbiter



3 Mission Control



Flyby spacecraft



4



Satellite

BREAK UNTIL 1:15 PM

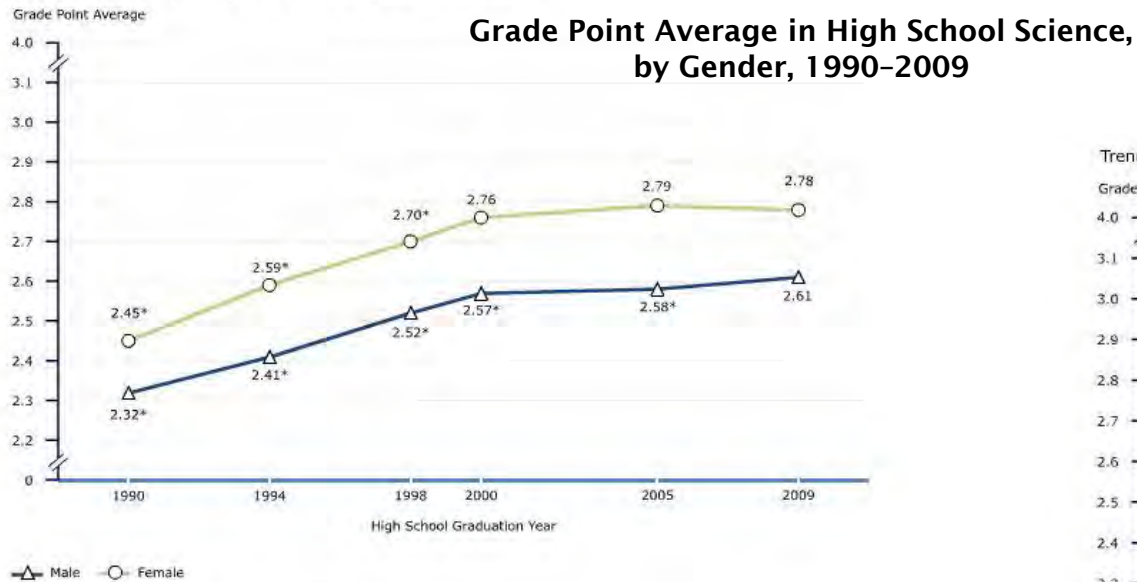




The Big Idea

To change how millions of girls (ages 8-13) think about STEM

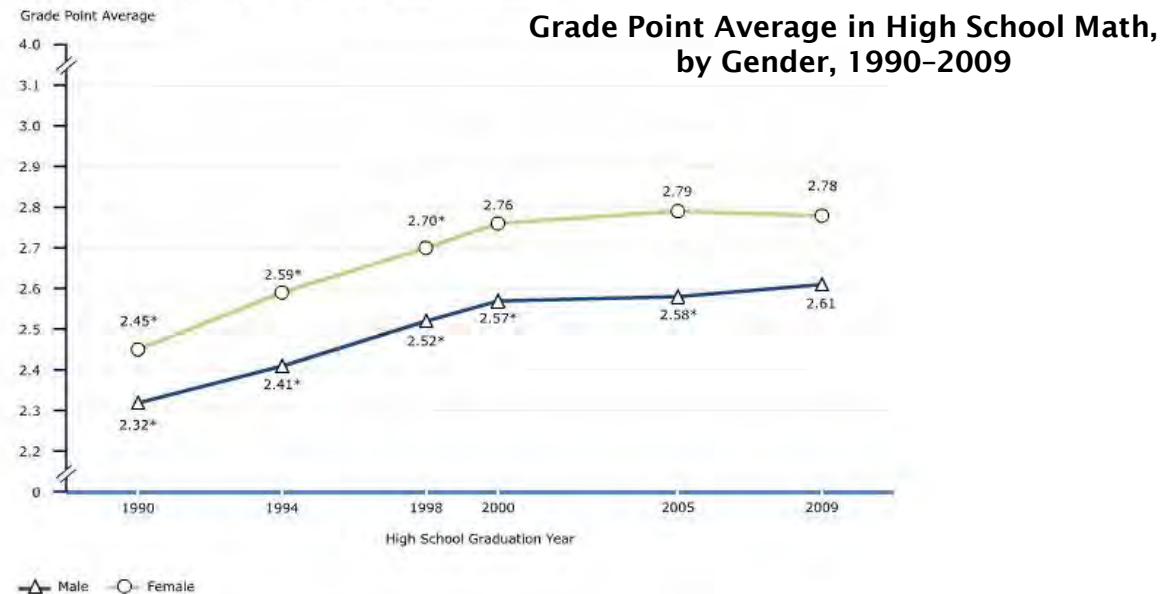
Trend in Grade Point Average in science, by gender: 1990-2009



* Significantly different ($p < .05$) from 2009.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), various years, 1990-2009.

Trend in Grade Point Average in science, by gender: 1990-2009



* Significantly different ($p < .05$) from 2009.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), various years, 1990-2009.

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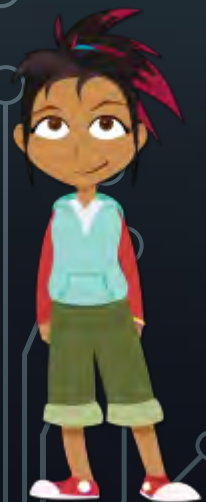


Additional Support from:



PPG Industries Foundation

The Mosaic Company Foundation





The Approach

- ★ On TV
 - national PBS Kids series
- ★ Online
 - safe, social networking website
- ★ On the Ground
 - activities and professional development



Produced by:

NATIONAL
PRODUCTIONS

Made Possible by:

NSF

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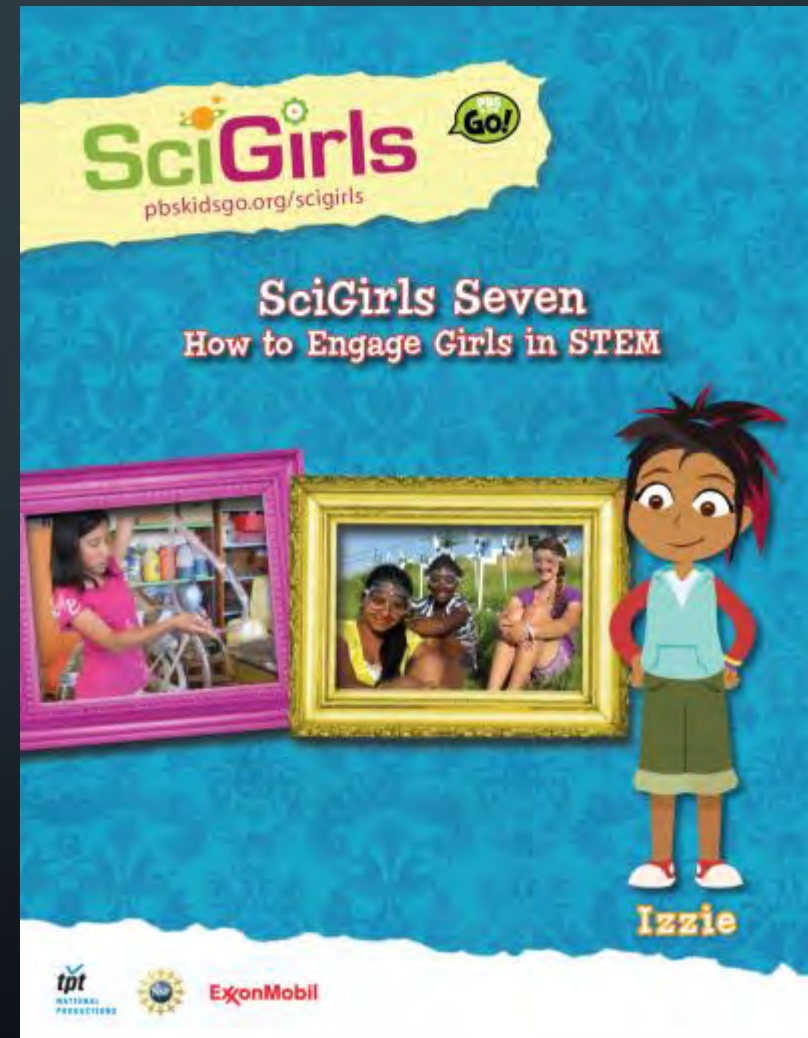
NORTHROP GRUMMAN
Foundation


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- ★ Rationale/Research
- ★ *SciGirls Seven*: Strategies to engage girls in STEM
- ★ Tips for using the *SciGirls Seven*
- ★ Applying the *SciGirls Seven*





1. **Girls benefit from collaboration, especially when they can participate and communicate fairly.** (Parker & Rennie, 2002; Fancsali, 2002)
2. **Girls are motivated by projects they find personally relevant and meaningful.** (Eisenhart & Finkel, 1998; Thompson & Windschitl, 2005; Liston, Peterson, & Ragan, 2008)
3. **Girls enjoy hands-on, open-ended projects and investigations.** (Chatman, Nielsen, Strauss, & Tanner, 2008; Burkam, Lee, & Smerdon, 1997; Fancsali, 2002)



4. **Girls are motivated when they can approach projects in their own way, applying their creativity, unique talents and preferred learning styles.** (Eisenhart & Finkel, 1998; Calabrese Barton, Tan, & Rivet, 2008)

5. **Girls' confidence and performance improves in response to specific, positive feedback on things they can control – such as effort, strategies and behaviors.** (Halpern, et al., 2007; Zeldin & Pajares, 2000; Blackwell, Trzesniewski, & Sorich Dweck, 2007; Mueller & Dweck, 1998)



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6. Girls gain confidence and trust in their own reasoning when encouraged to think critically.

(Chatman, et al., 2008; Eisenhart & Finkel, 1998)

7. Girls benefit from relationships with role models and mentors.

(Liston, et al., 2008; Evans, Whigham, & Wang, 1995)



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MISSION TO MARS



1. Crew Name (*decide as a group*)
2. Select individual mission roles (*Note: You **cannot** select the STEM subject you chose in the 4 corners activity!*)
3. Mission Objective: *each group will select one of the 4 topics listed in the first column. You may refer to **mars.nasa.gov** for ideas!*
4. Each team will draw their spacecraft that will venture to Mars, highlighting your mission objectives.
5. Each group will design their own **mission patch**!

NASA'S JOURNEY TO MARS



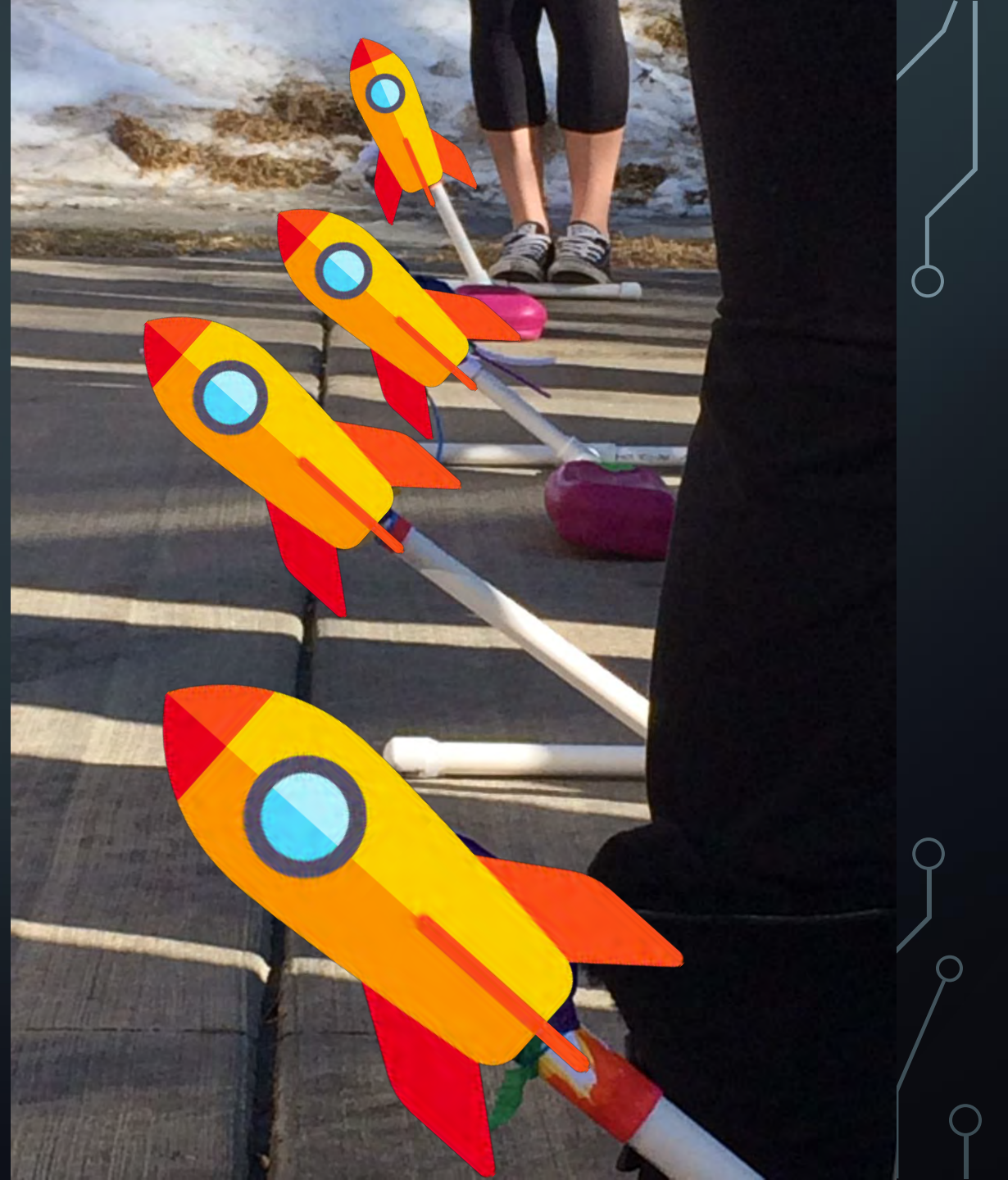
ROCKETS TO THE RESCUE!







Construct your rocket
Design your payload
Launch into the ellipse
Protect your cargo!





Adaptations

Protractors

Angles

Variables

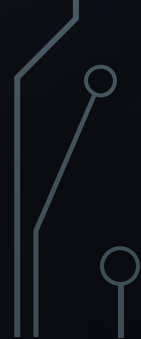
Repetition

BREAK UNTIL 3:45 PM





STARLAB



BREAK UNTIL 5:00 PM





Apollo 13 Mission

Communication

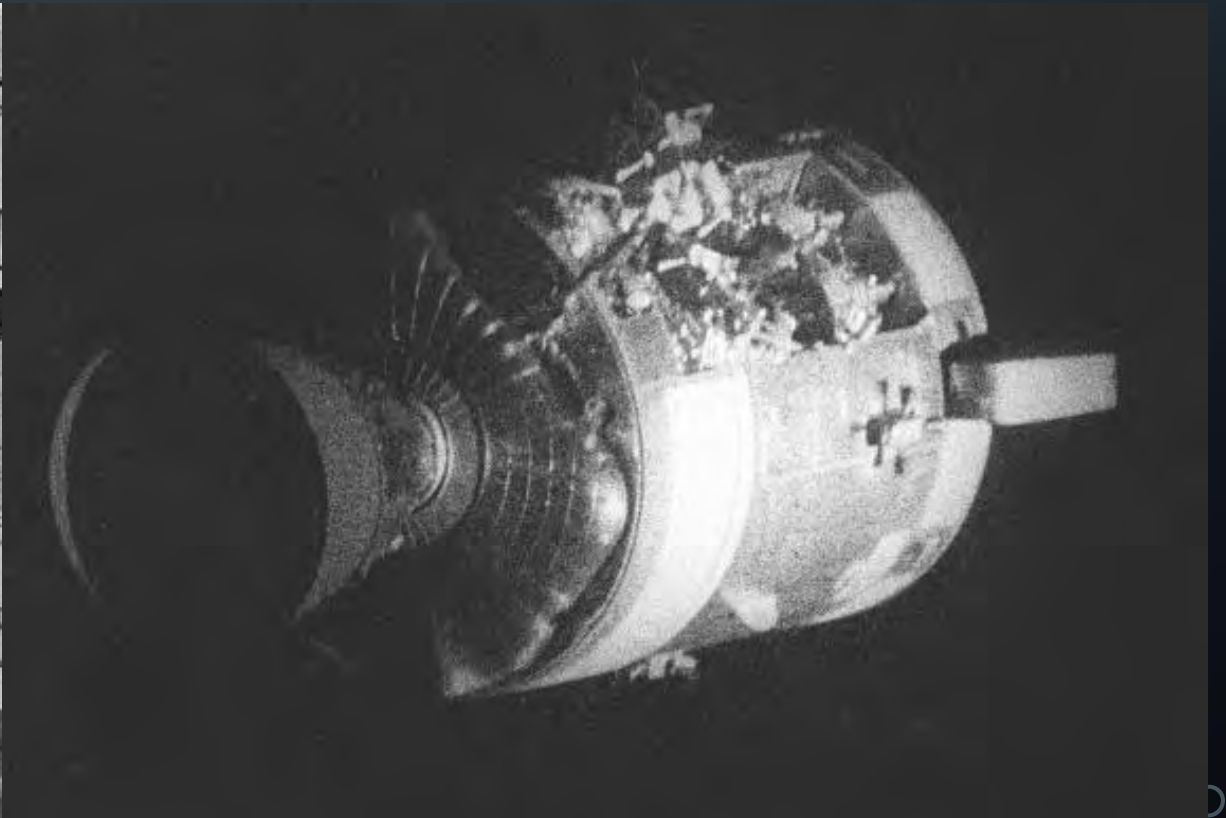
Team collaboration

Decision Making

Performance under Pressure

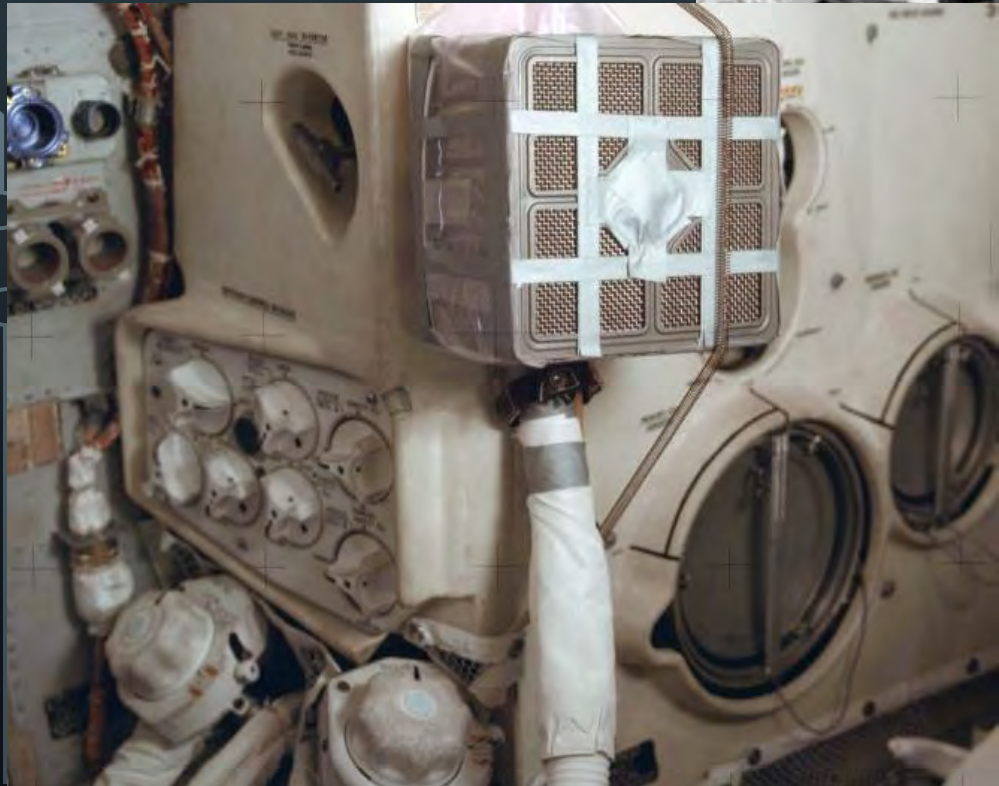


HOUSTON, WE'VE HAD A PROBLEM!



<https://youtu.be/kAmsi05P9Uw?t=35s>

ENGINEERS



<https://www.youtube.com/watch?v=C2YZnTL596Q>

ASTRONAUTS



APOLLO 13 MISSION RULES

- You may not cross, look, or transfer anything over the divider. (Remember, you are over 200,000 miles away!)
- Your round CO2 scrubber *must* connect to the square filter
- Your final product must have a filter that allows air to flow through it
- You have 15 minutes to design your filter, replicate it, and save the astronauts!

FAILURE IS NOT AN OPTION



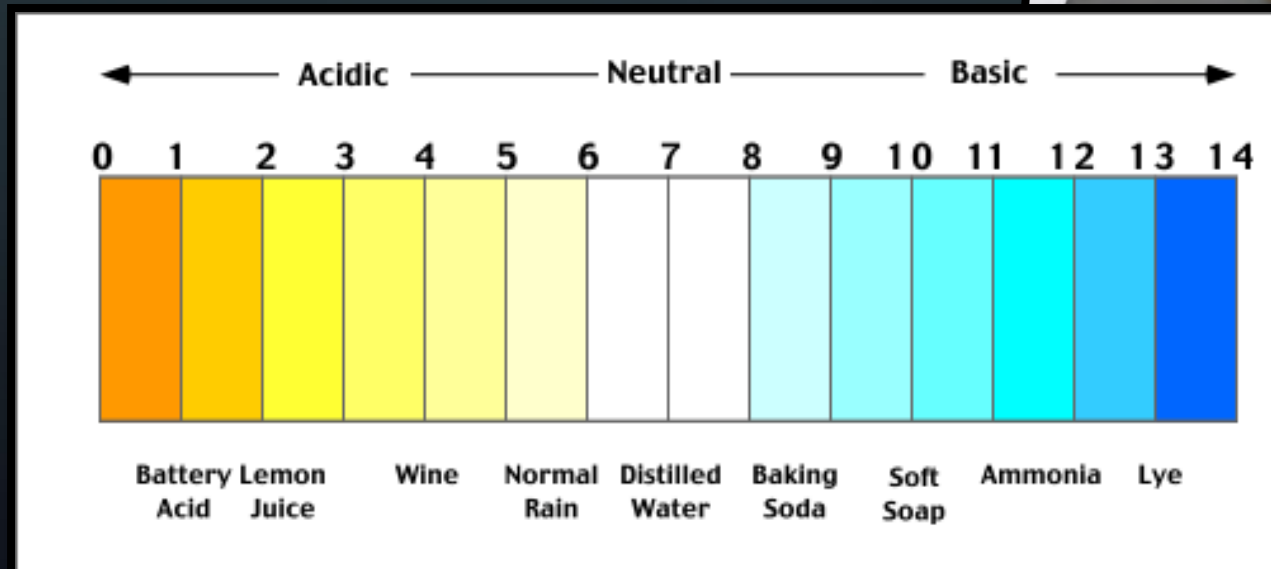
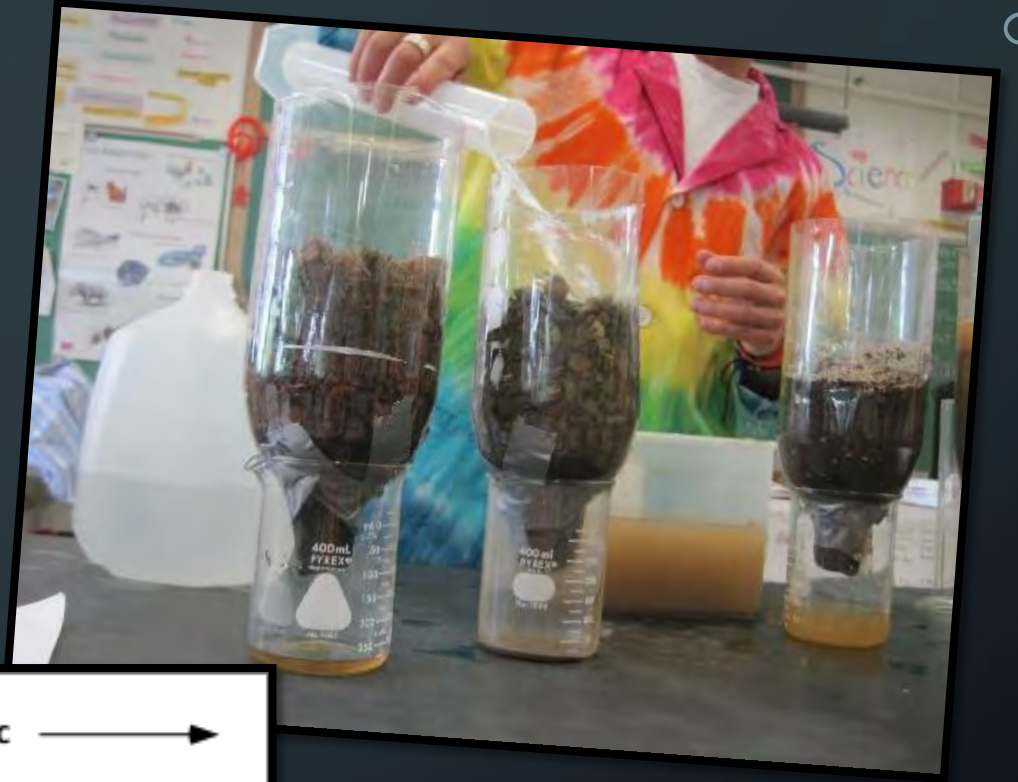
Smithsonian
National Air and Space Museum




Alternate teaching methods:


- Increase separation (radios, string cup, etc.)
- Increase design requirements
- Thorough reflection (ex: students didn't succeed? 5P essay to the astronauts' families)

WASHING WATER



NASA EDUCATION

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For Educators

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[Informal Education](#)

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Space Station

NASA Astronauts Headline Public Events in Washington Area




EXPRESS

Subscribe: Weekly Email Highlighting Education Opportunities



Current Opportunities for Educators

Browse the STEM-related professional development opportunities, webinars, workshops, and ways for you and your students to get involved with NASA.




Search Educational Resources

Search hundreds of resources by subject, grade level, type and keyword. These lesson plans and teaching materials support your STEM curriculum.

[A-Z List of Publications](#)


[A-Z List of Websites](#)

[Educator Resource Centers](#)




Benefits to You

NASA, UN Photo Competition Highlights #WhySpaceMatters on



Journey to Mars

NASA Celebrates Martian New Year in Mars, Pennsylvania



K-4

Educators K-4

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[Grades 5-8](#)[Grades 9-12](#)[Higher Education](#)

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[All Topics A-Z](#)

Explore This: Planetary Exploration



NASA Kids' Club



Explore This: Technology



Now in Space!
Expedition 44

Expedition 44 is part of a special mission. Scott Kelly and Mikhail Kornienko are staying on the space station for one year!

Planet of the Month: Jupiter -- King of the Planets

[Text Only Site](#)

Ready For A Challenge?

Exploration Design Challenge



Join Now!


Mars FunZone



Start Exploring



Space Math at NASA


National Aeronautics and Space Administration
Goddard Space Flight Center

Flight Projects | Sciences and Exploration

Space Math @ NASA

Home
Problem Books
STEM Modules
Inquiry

Math by Grade Level
Math in Science
Math in Engineering
Math in Press Releases
Math by NASA Mission
Articles

Space Math @ NASA

SpaceMath@NASA introduces students to the use of mathematics in today's scientific discoveries. Through press releases and other articles, we explore how many kinds of mathematics skills come together in exploring the universe.

Partnering NASA Missions

Astrophysics:

- Chandra - [Click here](#)
- Kepler - [Click here](#)
- James Webb ST - [Click here](#)

Earth Science:

- SAGE-III - Under development

Heliophysics:

- Hinode - [Click here](#)
- IMAGE - [Click here](#)
- MMS - [Click here](#)
- RBSP - [Click here](#)
- THEMIS - [Click here](#)

Planetary:

- Cassini - [Click here](#)
- Dawn - [Mission Math](#)
- EPOXI - [Click here](#)
- InSight - [Click here](#)
- Juno - [Click here](#)

Partnering NASA Programs


- Eyes on the Solar System - [Click here](#)

SpaceMath@NASA News Updates


March: NASA Press Release about SpaceMath@NASA- [\[Read Press Release\]](#)
July: New math guide to Mars Exploration and the Curiosity Rover - [\[Click Here\]](#)
August: Expanded and updated math guide on Black Holes posted- [\[Click Here\]](#)
November: SpaceMath@NASA served 6,000,000th math problem at the website!
December: New multi-media Grade 6 Math Modules added- [\[Click Here\]](#)
February: New multi-media Grade 8 Math Modules added- [\[Click Here\]](#)
April: The 7 millionth Space Math problem is downloaded

Math in the News


A behind-the-scenes look at the math in NASA press releases




Problem 517: A Distant Supernova Remnant Discovered
Students explore the size and speed of a distant supernova remnant nebula and compare it to the speed of the International Space Station. (PDF)



Problem 516: Hinode Observes Solar Eclipse from Space
Students use the geometry of a solar eclipse to estimate the distance to the sun using simple proportional reasoning. (PDF)




Problem 515: Telling Time on Mars
Students learn about the difference in time between a martian day and an Earth day, and use this to explore how work schedules change for scientists working with the Curiosity rover on Mars. (PDF)



Problem 514: Solar Flares and the Stormy Sun
Students use simple averaging to explore the sunspot cycle and our sun's changing activity levels in 2012 and 2013. (PDF)

Multi-Media Math Modules




Grades 6, 7 and 8: Standards-based, multi-media math resources featuring NASA eClips video segments, readings from NASA press releases, online interactive resources, and of course math problems! [\[click here\]](#)


Problem Archives

- I - Problems 1 to 38
- II - Problems 39 to 64
- III - Problems 65 to 101
- IV - Problems 102 to 148
- V - Problems 149 to 233
- VI - Problems 234 to 342
- VII - Problems 343 to 428
- VIII - Problems 429 to 478
- IX - Problems 479 to Current

(More problems from 2012-2013)

International Space Station - Live!


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International Space Station

Space Station Overview Images Videos Media Resources

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Space Station Topics

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Space to Ground

One-Year Crew

SpaceX

Orbital

Commercial Crew Program


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Space Station Tour

Related Topics

Commercial Resupply

Space Station Updates



Station Science Ongoing as SpaceX Launch Slips to June 28
3 days ago

The three inhabitants of the International Space

INTERNATIONAL SPACE STATION

OFF THE EARTH, FOR THE EARTH

6058 : 10 : 19 : 10

Station Time in Orbit

Tweets

Follow

Scott Kelly

@StationCDRKelly

1h

#MondayMotivation

Color your world.

Good morning from

@Space_Station!

#YearInSpace


pic.twitter.com/gp5sC

Retweeted by Intl. Space Station

Tweet to

@Space_Station

Commercial Resupply



TV Coverage Set for Seventh SpaceX Resupply Mission to Space Station

Who's on the Space Station Now?



Expedition 44 & One-Year Crew

Commander Gennady Padalka

Scott Kelly


Mikhail Kornienko


One-Year Mission



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Videos

Social Stream

Say something...

jojokitten

minertyler100: no problem there's more ahead

12 minutes ago

minertyler100

darn missed the sunrise

18 minutes ago

minertyler100

WOOOAH

18 minutes ago

jojokitten

love a good sunrise!

27 minutes ago

orion

Pedro1961: you have right

FLIGHT


ASTRONAUTS

INTERNATIONAL SPACE STATION

RESEARCH

[ESA > Our Activities > Human Spaceflight > International Space Station](#)

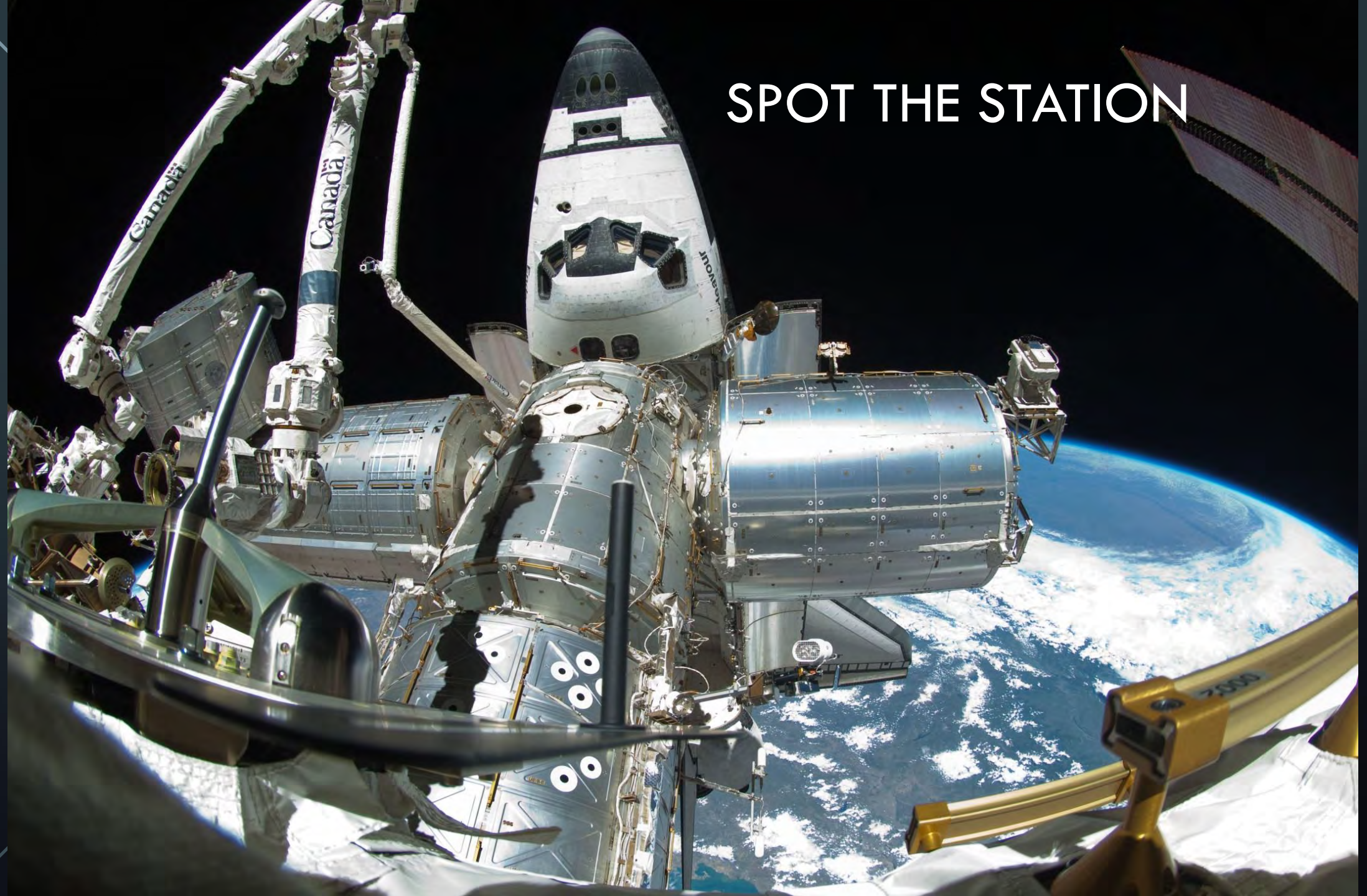
WHERE IS THE INTERNATIONAL SPACE STATION?



human spaceflight and operations

ces

SPOT THE STATION



Mars Curiosity Rover



NASA – Lunar Reconnaissance Orbiter

NASA National Aeronautics and Space Administration
Goddard Space Flight Center

Flight Projects | Sciences and Exploration

Home The LRO Mission Images and Multimedia Science and Data Education and Outreach

LRO KIDS!

Get animations, streaming video, cartoon characters, audio narration, interactive games!

SPACE OPERATIONS LEARNING CENTER

Explore! Marvel Moon

Discover our scientific, cultural, and personal understanding of Earth's

NASA | Wall-E Learns About Proportions

Moon Concentration
How Good is Your Memory?

Moon Quiz
Is it a big hunk of cheese? Take a quiz and find out!

Moon Cookies
Make these tasty cookies (no baking required)

Unscramble
Take the Challenge!
Unscramble Moon-related graphics

Wordsearch
Help Us Find Our Lost Lunar Words

Moon Calculator
How much would you weigh if you lived on the Moon?

Crossword Puzzles
Answer clues and solve the puzzle

Ask Dr. Marc
Dr. Marc answers questions asked by visitors about the LRO and other topics.

Lunar Cryptograms
Decode these important

Welcome to the
Space Operations Learning Center (SOLC)

Back to Home

SPACE OPERATIONS LEARNING CENTER

About Us
Teacher Info
Contact Us

BEGINNER

Kids Zone 2 Earth Science
Kids Zone 3 Space Station
Kids Zone 4 The Moon
Kids Zone 5 The Sun
Kids Zone 6 Comets, Meteors and Asteroids

ADVANCED

Launch & Deployment
Space Communication
Flight Dynamics
Information Processing
Mission Operations
Spacecraft Disposal

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Goddard Space Flight Center
Computing Environments and
Collaborative Technologies Branch /
Code 585

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SCaN

SciGirls Activities



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Activities

SciGirls has made a commitment to providing quality, gender-equitable, inquiry-based STEM activities that are fun for all! Check out the activities under the following topic areas:

[Earth & Space](#)
[Engineering](#)
[Health](#)
[Life & Environmental](#)
[Physics & Chemistry](#)
[Technology](#)

Download the complete guides from Season Three:



SciGirls Participate: Citizen Science Adventures
 Public participation in scientific research, also known as citizen science, engages ordinary people (kids and adults) in the collection of data for use by research scientists. The activities in this book support and prepare your girls for participation in citizen science.

Download the complete guides from Season Two:

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SciGirls CONNECT

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or [Sign In](#)

SciGirls on Facebook

Like

SciGirls on Twitter

Tweets

Follow

PBS LearningMedia
@PBSLrnMedia

8h

What kind of stuff is preserved in a bog?
 @SciGirls activity/video describes functions of unique wetland environment.



Lunar and Planetary Institute



Teachers and Faculty

LPI K-12 Teacher Workshops, Institutes, and Field Trips

Exploration of the Moon and Asteroids by Secondary Students

LPI Summer Intern Program

Humans in Space Youth Art Competition

Educator Resources

Education Newsletter

LPI Higher-Education Faculty Programs



Find upcoming LPI teacher trainings in Earth and space science topics, and connect to resources from past workshops and field trips.

Explore!

NEW AND UPCOMING



Cosmic Explorations: A Speaker Series
The Universe is Out to Get Us and What We Can (or Can't) Do About It



Solar System Exploration Pre-Service Teacher Institute
June 23-27, 2014
Application deadline: June 2



Mars Through Time Workshop
July 8-11, 2014
at the University of New Mexico

NASA Summer of Innovation

What to Consider When Selecting Content

Themed Units



Grades 4-6

Life Science

- Body
- Food
- Life Out There?
- Plants
- Survival

Physical Science

- Aeronautics
- Force and Motion
- Gravity
- Properties of Matter
- Waves and Optics

Grades 7-9

Earth and Space Science

- Climate and Seasons
- Destination Mars
- Earth Moon Systems

Engineering

- Aeronautics
- Challenges
- Design Process

Themed Camp Guides



Aeronautics Camp

This camp centers on the mathematical and design principles of flight design.



Designing for Space Camp

This camp centers on developing an appropriate learning progression that focuses on the concepts necessary to learn about engineering.



Life Science Camp

This camp centers on the characteristics of living things, astrobiology, exoplanets and adaptations to the space environment.

NASA Discovery Program



Space School Musical

Hannah is trying to finish her science project - a model of the solar system. But there's a problem: it's due tomorrow, she's not finished yet, and it's past her bedtime. How will she get it done? With a little help from her friends - the most talented troupe in the Milky Way!

SONGS

WATCH VIDEOS & SING ALONG

ACTIVITIES

CROSS-CURRICULAR & FUN

GALLERY

PHOTOS & VIDEOS

PRODUCE

YOUR OWN MUSICAL



Watch ★ Laugh
★ Learn ★ Perform ★

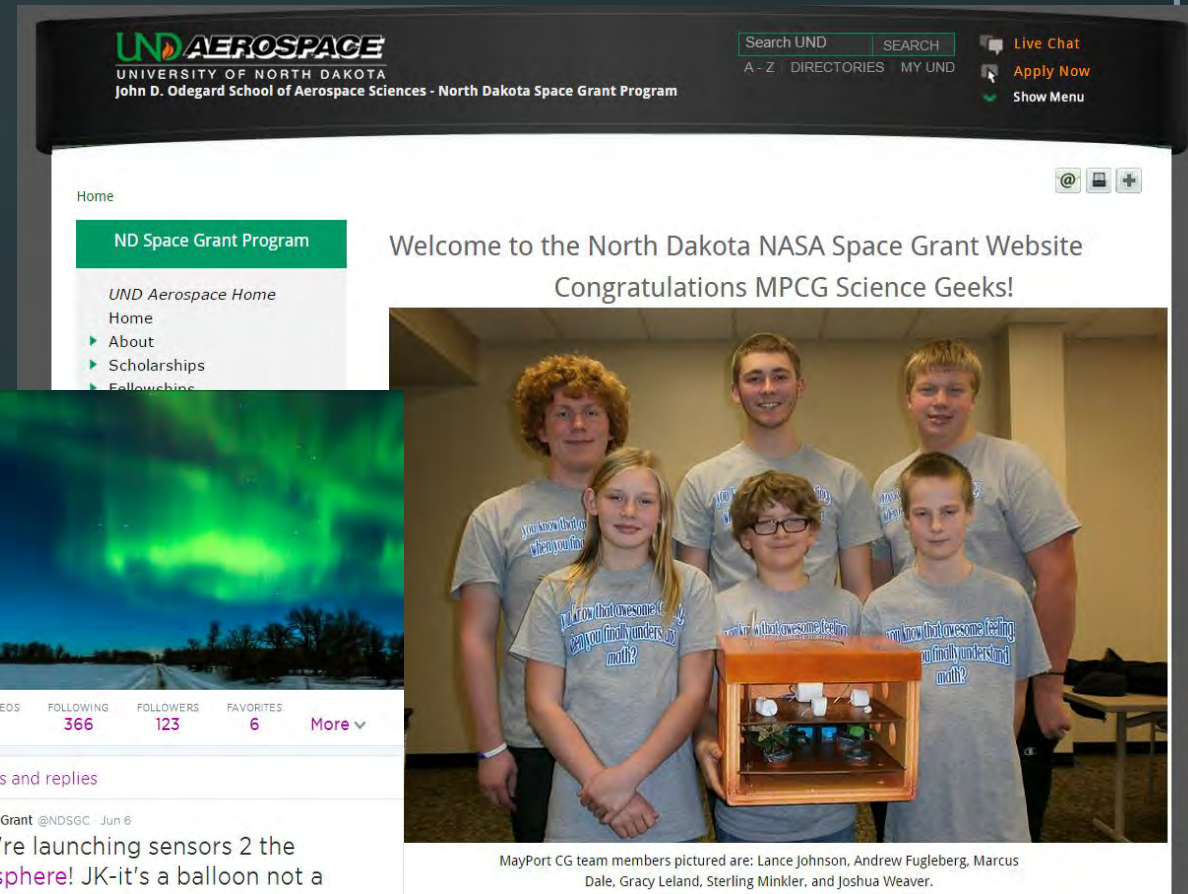
Join Hannah on a trip through the solar system in this ultra-cool edu-tainment "hip-opera" that is out of this world! Move and groove along with the planets, moons, meteors, comets, asteroids and even some rockin' scientists as they sing, dance and serve up the freshest facts in the galaxy. *Space is definitely one cool place.*



North Dakota Space Grant Consortium



Facebook page for the North Dakota Space Grant Consortium. The page features a cover photo of a satellite launch and a profile picture of the consortium logo. The timeline shows a post from June 18 at 4:11pm in Grand Forks, ND, titled "Rockets for 200 kids at Grand Forks Public Library! We survived!". The post includes a collage of photos showing children and adults participating in a rocket launch event. The page also has a "Promote Your Page" section and a "PHOTOS" section with a grid of images.



Website for the North Dakota NASA Space Grant Program. The header includes the UND Aerospace logo, a search bar, and navigation links. The main content area features a welcome message and a photo of the MayPort CG team members. The team consists of five students and one adult, all wearing matching t-shirts. One student is holding a small model of a spacecraft.

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA
John D. Odegard School of Aerospace Sciences - North Dakota Space Grant Program

Search UND SEARCH
A - Z DIRECTORIES MY UND

Live Chat
Apply Now
Show Menu

Home

ND Space Grant Program

UND Aerospace Home
Home
About
Scholarships
Fellowships

Welcome to the North Dakota NASA Space Grant Website
Congratulations MPCG Science Geeks!

MayPort CG team members pictured are: Lance Johnson, Andrew Fugleberg, Marcus Dale, Gracy Leland, Sterling Minkler, and Joshua Weaver.



Twitter profile for NASA ND Space Grant (@NDSGC). The profile features a cover photo of the aurora borealis and a profile picture of the consortium logo. The bio states: "Part of NASA Space Grant program promoting STEM education and research throughout North Dakota through K-12 and college programs and public outreach efforts." The location is listed as North Dakota, and the website is ndspacegrant.und.edu. The profile shows 64 tweets, 3 photos/videos, 366 following, 123 followers, and 6 favorites. A tweet from June 6 reads: "2mrw we're launching sensors 2 the #thermosphere! JK-it's a balloon not a spaceship! #spacejoke #cyaninthe stratosphere". The tweet includes a photo of a balloon launch.

NORTH DAKOTA
SPACE GRANT CONSORTIUM

NASA ND Space Grant
@NDSGC

Part of NASA Space Grant program promoting STEM education and research throughout North Dakota through K-12 and college programs and public outreach efforts.

North Dakota
ndspacegrant.und.edu

3 Photos and videos

TWEETS 64 PHOTOS/VIDEOS 3 FOLLOWING 366 FOLLOWERS 123 FAVORITES 6 More

Tweets Tweets and replies

NASA ND Space Grant @NDSGC · Jun 6

2mrw we're launching sensors 2 the #thermosphere! JK-it's a balloon not a spaceship! #spacejoke #cyaninthe stratosphere



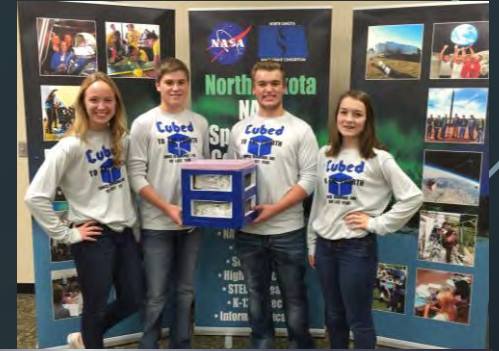
• NDSGC K-12 Educator Email Listserv

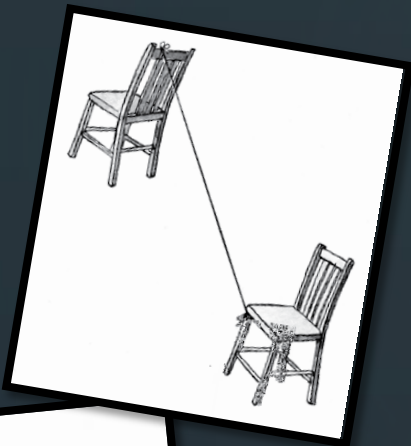
- Workshop opportunities
- New STEM education resources for the classroom
- NASA student contests/team competitions
- Professional Development opportunities
- Emails ~once a week



NEAR-SPACE BALLOON COMPETITION

- Annual competition each fall semester
- Open to student teams grades 6-12
- Middle and high school students create their own science/engineering project
- Launches on a 1500-gram balloon, reaching 100,000 feet





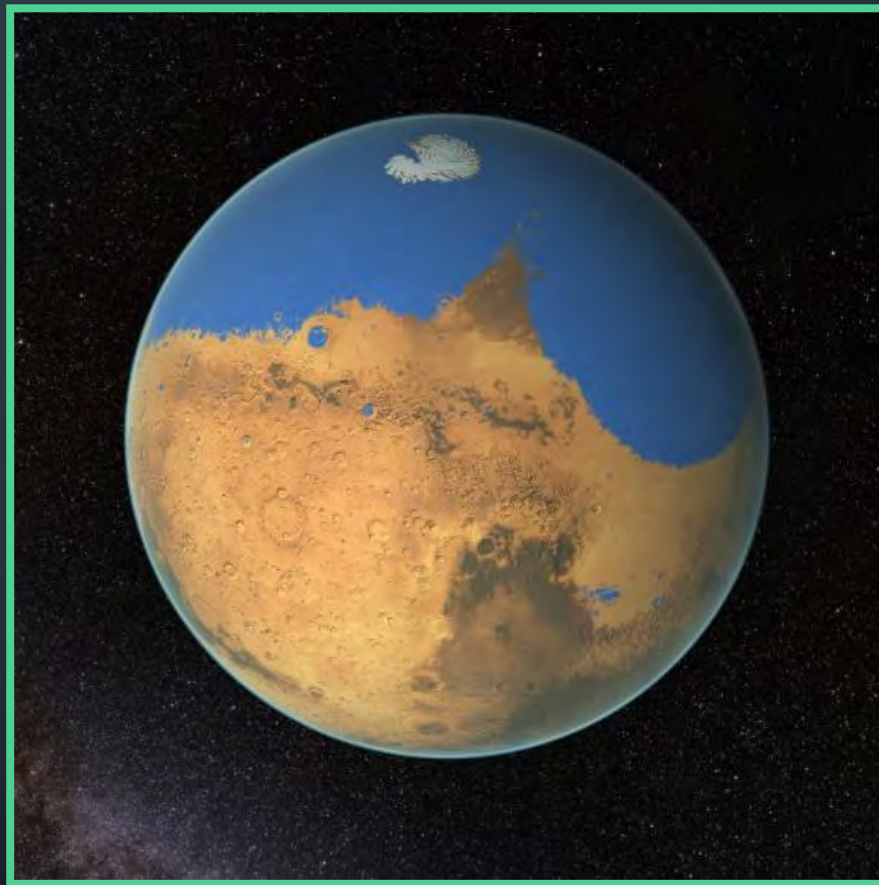
ON TARGET






REFLECTIONS ON
INVESTIGATIONS AND TEACHING STRATEGIES

MARTIAN WATER





THANK YOU!

- Have a great night!
 - See you tomorrow at 8:15 AM for light continental Breakfast
 - Sessions start at 8:45 sharp.
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