VCU School of Education Partners with NASA to Connect & Engage Students with NASA's Missions though Performance Based Learning & Engineering Design Challenges!

The Center for Innovation in STEM Education (CISTEME) hosted a virtual teacher workshop for Richmond area middle school districts in collaboration with NASA Langley Research Center and the NASA Wallops Space Flight Facility this past summer. The first phase of this two-part experience provided an engaging virtual teacher professional learning experience August 28-30.

Approximately 27 middle school teachers and specialists from Colonial Heights, Petersburg, Henrico County and Richmond City participated in the offering. Dr. Al Byers, who leads CISTEME, worked closely with the following district science and STEM leads across the four school systems to ensure the experience met each district's unique needs, and was grade-appropriate and standards-aligned using the compelling context of NASA missions to facilitate deeper understanding of STEM science and engineering content and practices:

- Dr. Decardra Jackson, STEM coordinator, Petersburg City Public Schools
- Dr. Joe Douglas, instructional specialist, Colonial Heights Public Schools
- Dr. Eric Rhodes and Dr. Rachael Toy, Henrico County Public Schools
- Josh Bearman, science instruction specialist, Richmond City Public Schools

Dr. Byers shared his enthusiasm, saying: "We are excited for CISTEME to help provide this high impact experience in cooperation with our local school districts. Virginia is the only state in the U.S. besides California that has not one but two NASA centers, and the only other state besides Florida that launches payloads directly into orbit, resupplying the International Space Station from Wallops Space Flight Facility. It's imperative for us to draw upon NASA's authentic STEM content as an inspiring context for STEM learning across our region!"

Part of this experience made teachers aware of the many internships for teachers and students that are also available at both NASA Langley and NASA Wallops.

Extensive planning with the district coordinators and specialists occurred with insight and expertise from NASA that included the following individuals:

- NASA Langley Research Center: Office of STEM Engagement
  - Dr. Kimberly Brush, director
  - Dr. Anne Weiss, education specialist
- NASA Wallops Flight Facility: Education Directorate
  - Dr. Joyce Winterton, senior advisor for education and leadership development
  - Patricia Benner, education specialist
  - Victoria Danna, education support specialist

Across the three days, NASA's Artemis Program provided a compelling backdrop for hands-on learning at a distance with the sixth grade teachers. Artemis will land the first woman and next man on the moon by 2024, using innovative technologies to explore more of the lunar surface than ever before. There has never been a better time to inspire students to be the next generation of engineers, scientists and explorers! The workshop shared the latest developments of the Artemis mission with respect to the design challenges assigned to each NASA location, in addition to discussing the Commercial Crew Program, and the Global Learning and Observations to Benefit the Environment (GLOBE) citizen science program.

Dr. Brush elaborated on the importance of the Artemis Program.

"The Artemis Program is providing career opportunities in all areas of STEM, requiring creative and innovative people to fill new roles – some of which do not even exist yet. Teachers who are informed on NASA's work are our greatest allies in inspiring the students, who will become the workforce of the future. We are grateful for this opportunity to bring NASA subject matter experts, videos and classroom activities to teachers who are so excited to share NASA's work with their students," Brush said.

Teachers learned how to access and leverage NASA engineering design challenges and performance-based learning projects that addressed many sixth grade components of the Virginia Standards of Learning from biology, geology, environmental science and physics. Teachers working virtually learned first-hand from NASA scientists and engineers and participated in hands-on activities they could replicate for their students, including 2-liter rockets and engineering design challenges for life support systems that will soon be on the moon!

Dr. Winterton shared feedback from the teachers.

"The teachers reported that they will use the NASA information in their classes and that it will add a 'real-world' connection to their lessons. Middle school teachers are so important in helping students understand that STEM careers can be exciting and rewarding. It was a privilege for NASA to work with such dedicated educators," Winterton said.

CISTEME worked with their partner at the Science Museum of Virginia (SMV), Timshel Purdum, director of playful learning and inquiry. A virtual earth-moon and solar system tour by Justin Bartel, SMV's immersive experience manager and astronomer provided an online planetarium experience that may also be delivered to schools directly if desired.

At the end of the three-day workshop, Wallops Flight Facility's Benner awarded NASA professional development certificates documenting the teachers' contact hours for their effort. Educators report that they are already using instructional strategies learned this summer with their students while teaching virtually, posting videos of their experiences! The group hopes for a follow-up onsite experience before the school year is out. Stay tuned for more on this front as it launches.

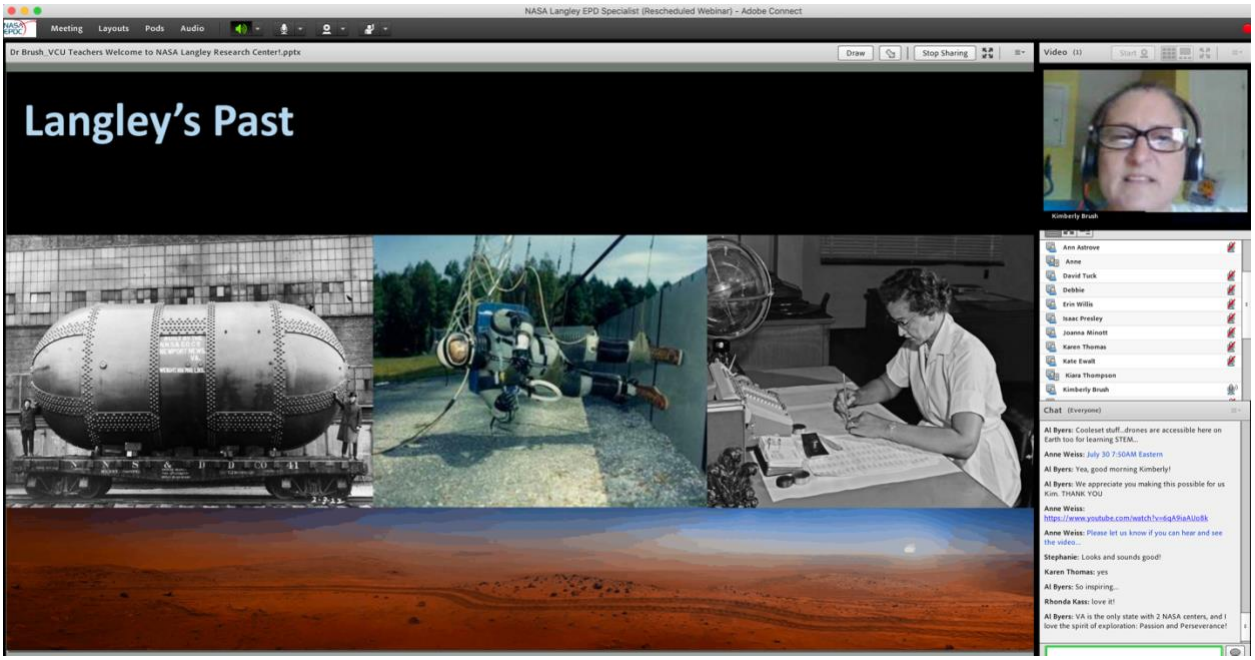
Many teachers provided wonderful feedback such as:

- Great job! Very informative! I can't wait to attend more NASA workshops for educators!

- Everything provided was very useful. Time flew by. Loved the videos that added excitement and just learning about what NASA is doing…I feel I can explain more to my students about what is going on in space exploration and get them excited!
- Loved it. Each day was better than the day before. Helpful workshop. You also modeled how to do virtual lessons and get students involved.
- This was great. It was content rich and I have a better understanding of the "How" and where we are going in the future. Thank you for the insight into how the Research and Pioneering Facility works. I hope to inspire my students to work at NASA in the future.
- My key take-away is how to incorporate the ENTIRE Engineering process in our Science Standards. These presentations encouraged soft skills as team--work, collaboration, creativity and to dream about the future. I got an idea of the work ethics and guiding principles of NASA's workspace (i.e. perseverance, failing forward, improve designs and keep trying). I'll also take away all the resources available to enhance and bring imagery, movement and activities to my instruction.
- Great organization and use of time! It honestly has been the most rewarding and useful PD I have had this summer.

URL SHARED BY Joanna Minott, Earth Science Teacher, Huguenot High School, Richmond City Public Schools (rocket from student at home with parents): https://drive.google.com/file/d/1--ej-0BJK4d3eiie61sd2UgiYkPDW7Jz/view

NASA Langley Research Center History, Artemis and STEM Careers: DR. Kimberly Brush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Langley's Past
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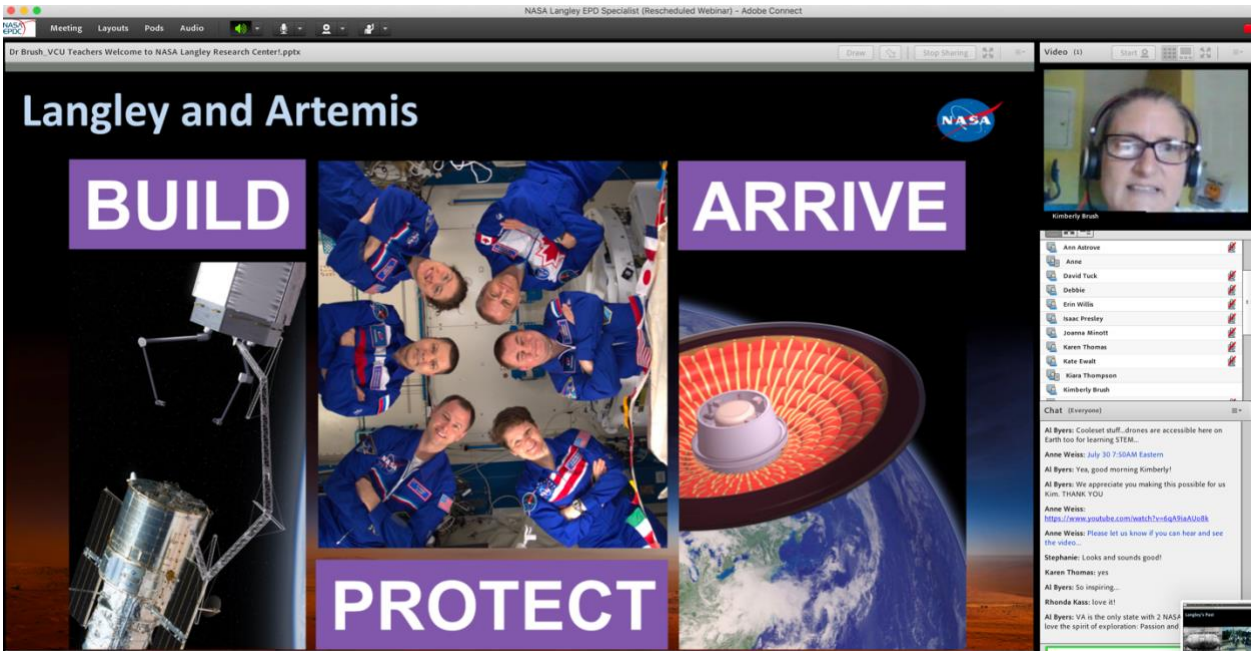
Kimberly Brush
Ann Astrove
Anne
David Tuck
Debbie
Erin Willis
Isaac Presley
Joanna Minott
Karen Thomas
Kate Ewalt
Kiara Thompson
Kimberly Brush
Chat (Everyone)
Al Byers: Cooleset stuff...drones are accessible here on Earth too for learning STEM...
Anne Weiss: July 30 7:50AM Eastern
Al Byers: Yea, good morning Kimberly!
Al Byers: We appreciate you making this possible for us Kim. THANK YOU
Anne Weiss: https://www.youtube.com/watch?v=6qA9iaAUo8k
Anne Weiss: Please let us know if you can hear and see the video...
Stephanie: Looks and sounds good!
Karen Thomas: yes
Al Byers: So inspiring...
Rhonda Kass: love it!
Al Byers: VA is the only state with 2 NASA centers, and I love the spirit of exploration: Passion and Perseverance!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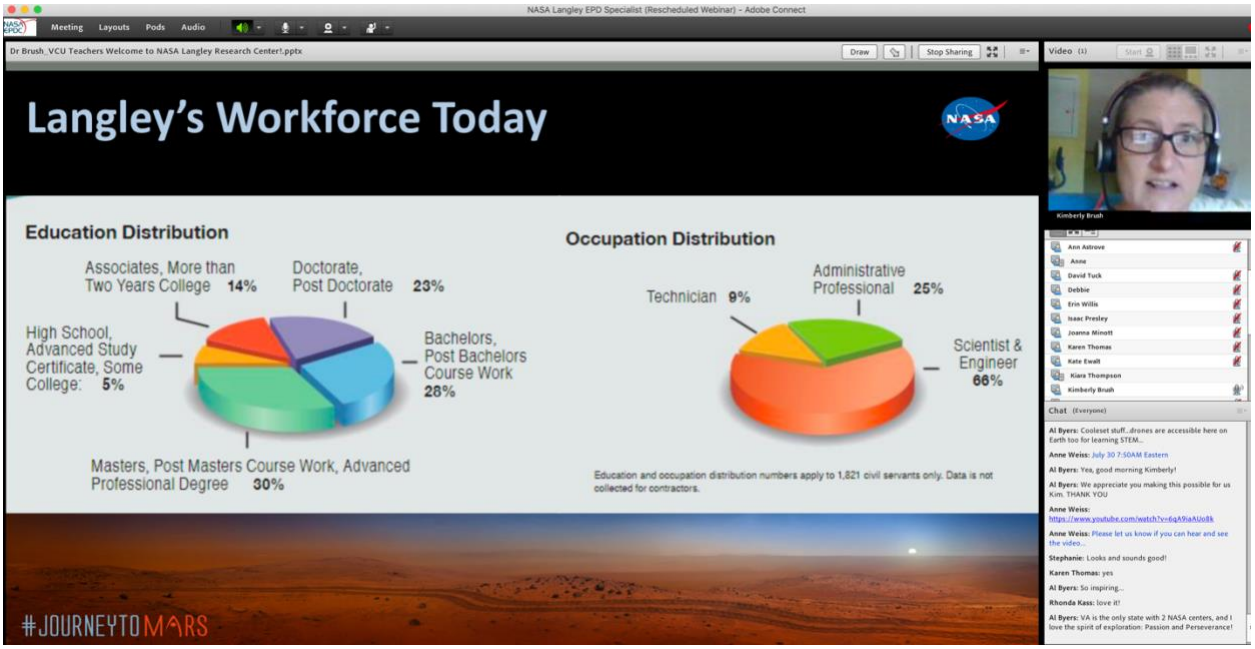
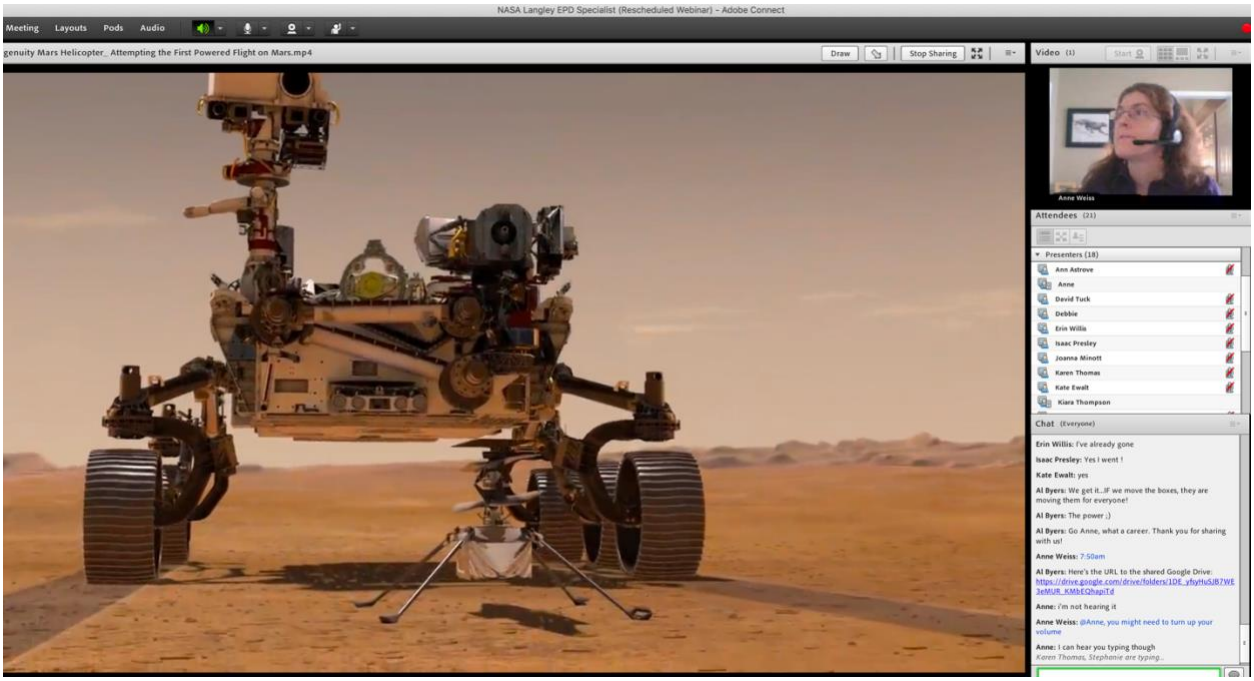
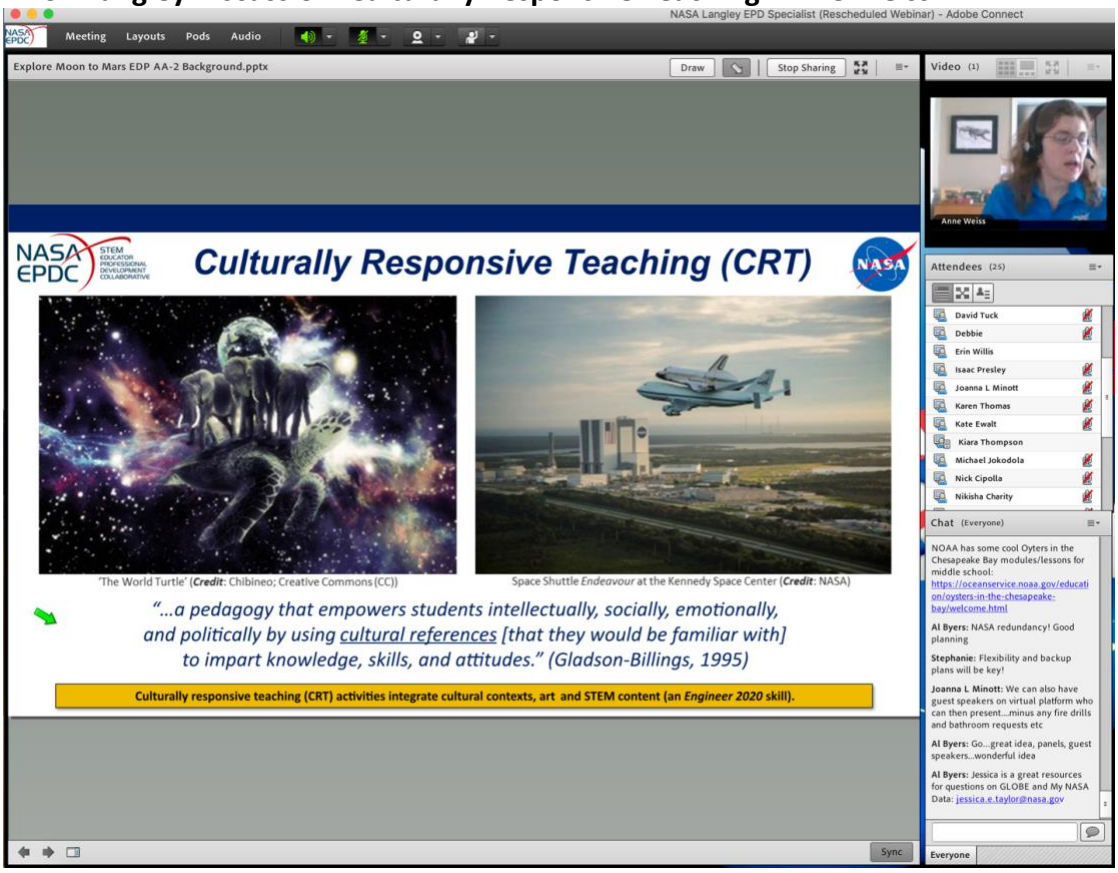


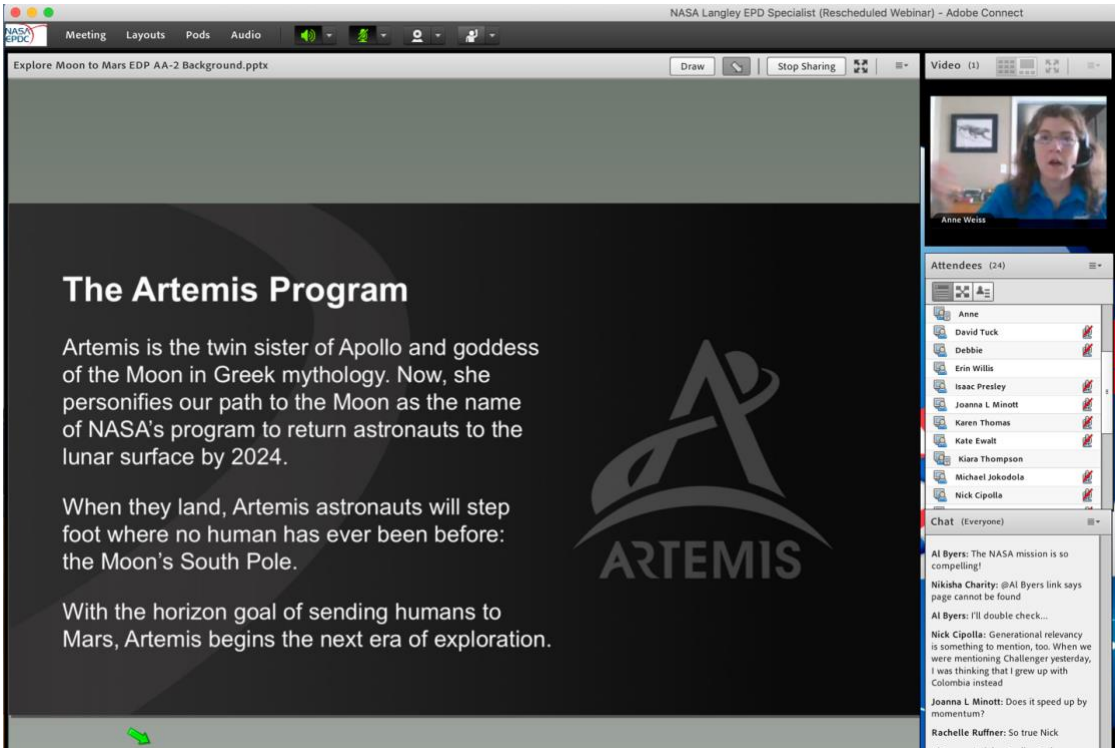
NASA Langley Content Research Discussion: Mars Helicopter Rover: Anne Weiss

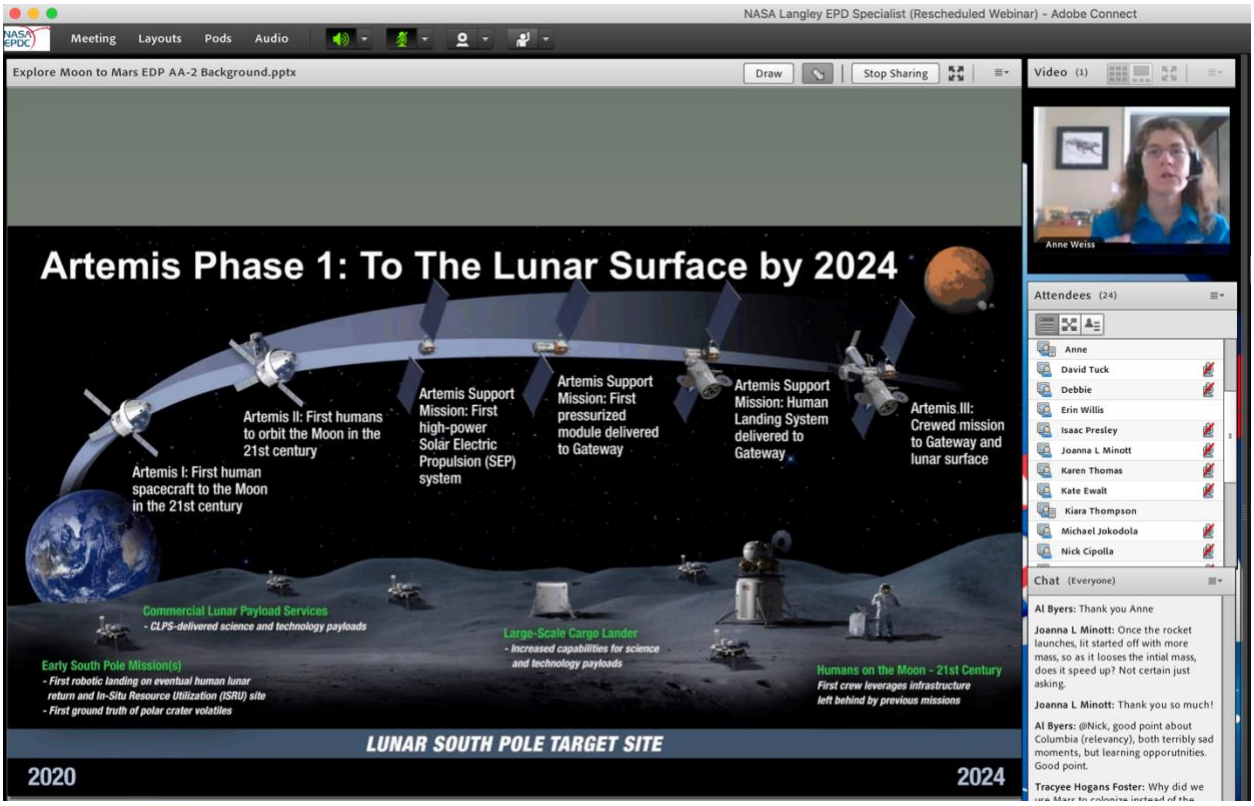


NASA Langley Discussion: Culturally Responsive Teaching: Anne Weiss

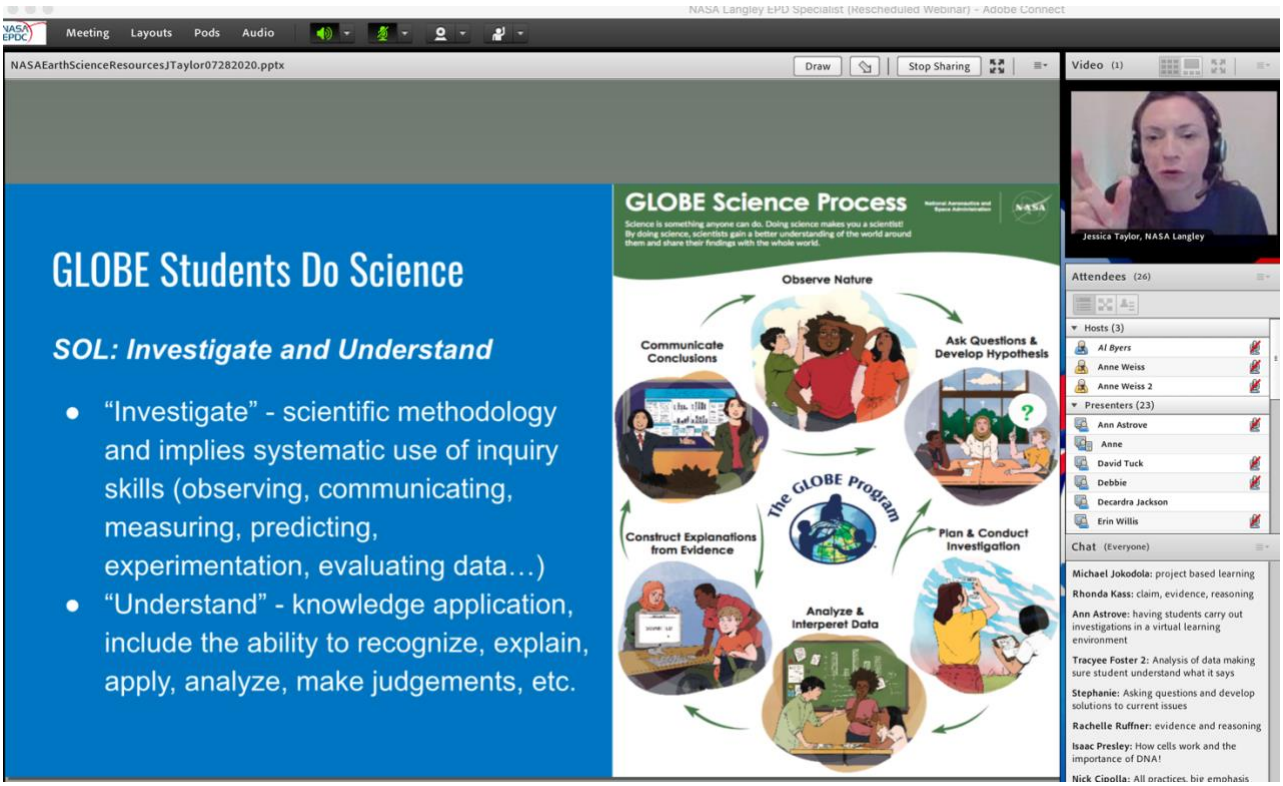


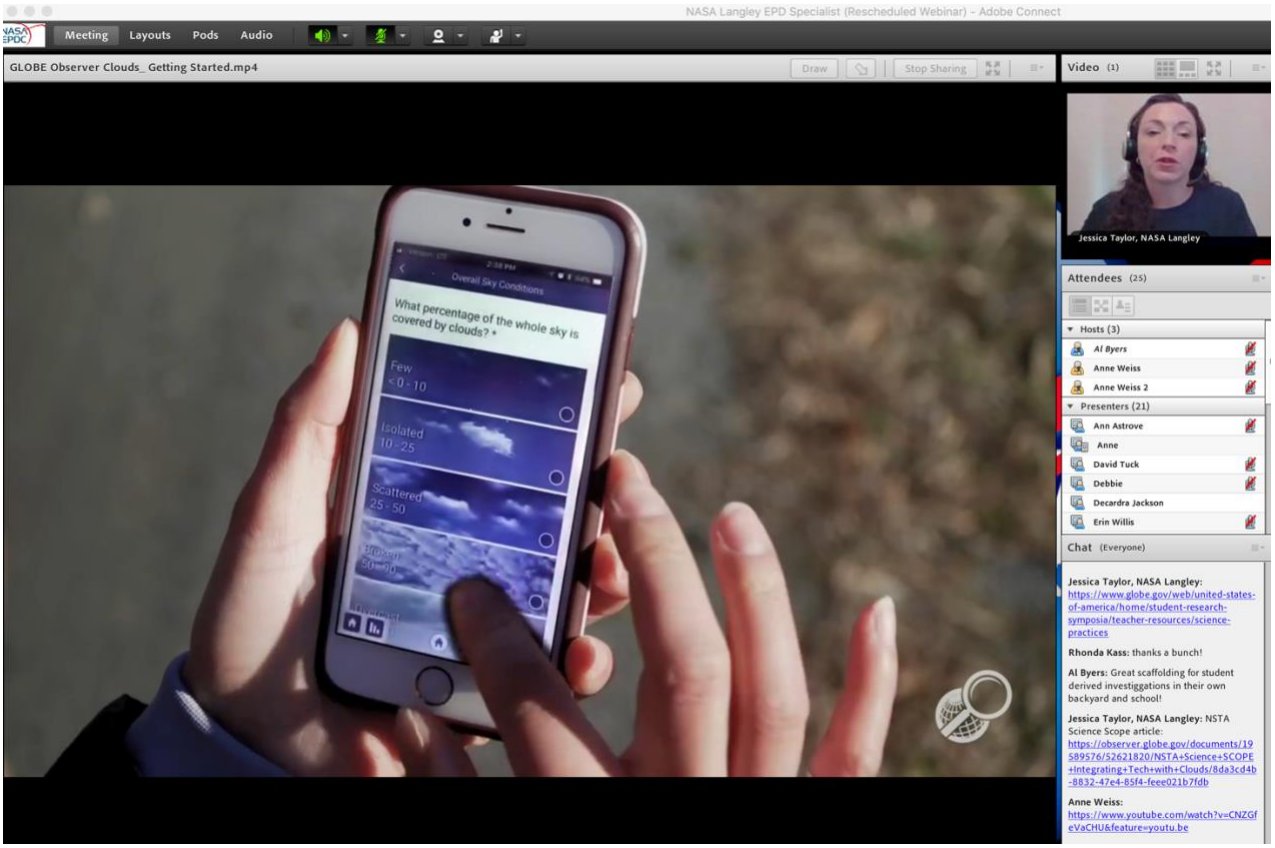
NASA Langley Artemis Mission Overview: Anne Weiss





NASA Jessica Taylor: GLOBE hands-on investigations for students





NASA Langley: Hands-On Lesson: Engineering Challenge-Rockets to the Rescue: Anne Weiss

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Original Challenge

Hurricane Dorian hit the Bahamas and eastern United States (Virginia) September 2019, resulting in catastrophic damage. There was little way of getting food and supplies to affected residents. In this activity, you are challenged to design, build and test a propulsion system and Food Transportation Device (FTD) that can safely deliver food to affected areas during future natural disasters. The food needs to arrive intact and fresh.

Video (1)

Attendees (25)

Nick Cipolla
Nikisha Charity
Rachelle Ruffner
Rhonda Kass
Sarah Baker
Shirlean Harris
Shirlean Harris 2
Stephanie
Sydney Mosley
Tracyee Hogans Foster
Participants (0)

Chat (Everyone)

the different atmospheric pressures? For example, Mars has a high amount of CO2 which is bad for us humans.

Michael Jokodola: But once NASA shifts their focus, will there be a safety not just profit by these compaines

Al Byers: Debbie's Question: So are we colonizing the moon?

Tracyee Hogans Foster: to help the health of the astronaunts artificial gravity through magnetic spacesuits. Have that improved the load bearing stregngth of the astronauts. They are so weeak when then come home

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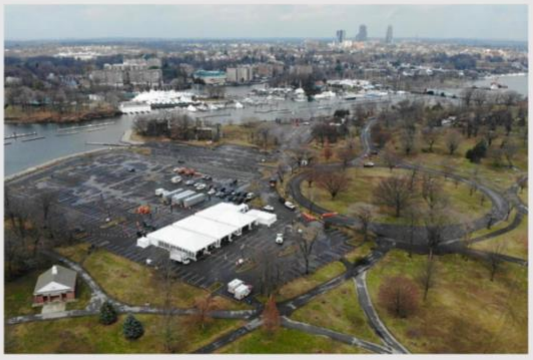
Alternate Challenge

The entire community of New Rochelle, New York, was shut down in early March 2020 in an attempt to contain the spread of Covid-19. Within a one-mile radius, no one could leave their home during a two week-span for food or supplies. In this activity, you are challenged to design, build and test a propulsion system and Food Transportation Device (FTD) that can safely deliver food to affected areas during future public health crises. The food needs to arrive intact and fresh.



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Materials

- Each team will receive:
  - » 2 sheets of 8 ½ x 11 cardstock
  - » 3 sheets of paper
  - » 10 rubber bands
  - » 1 plastic grocery bag
  - » 3 feet of string
  - » 4 cotton balls
  - » 1 rubber cork
  - » 4 straws
  - » 2 pipe cleaners
  - » 1 sheet of gift tissue paper
  - » 1 box of raisins

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Tracyee Hogans Foster: Sorry about the error hard to see

Michael Jokodola: Yes

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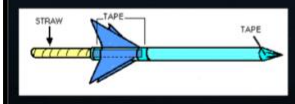
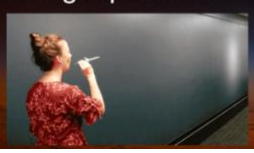
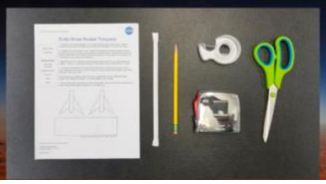


Alternate Activity: Straw Rockets

https://www.jpl.nasa.gov/edu/learn/project/make-a-straw-rocket/

- Uses paper cutout, tape, scissors, straw, pencil and tape measure
- Rocket is launched by blowing on straw
- Students are challenged to change one variable at a time (e.g., type of paper used, tail fin size, etc.) and observe what that does to the rocket's flight path and length





Chat (Everyone)

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Tracyee Hogans Foster: Sorry about the error hard to see

Michael Jokodola: Yes

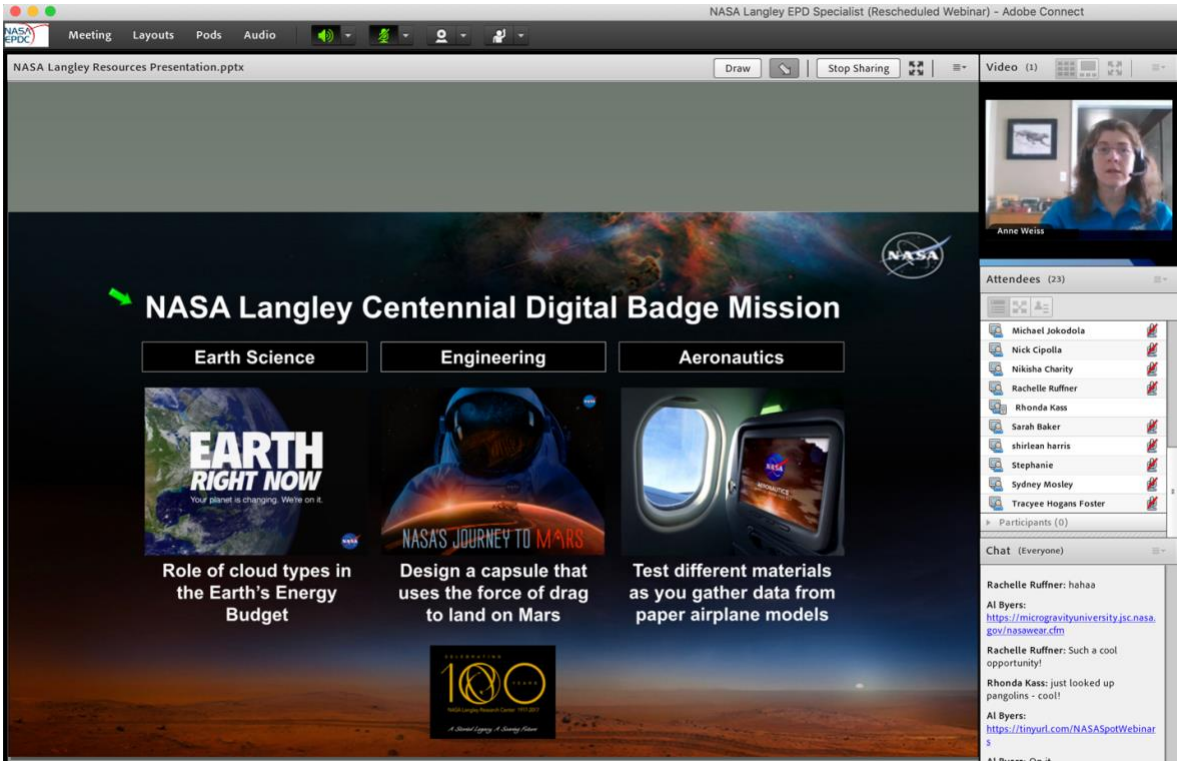
Joanna L Minott: Hi cat!

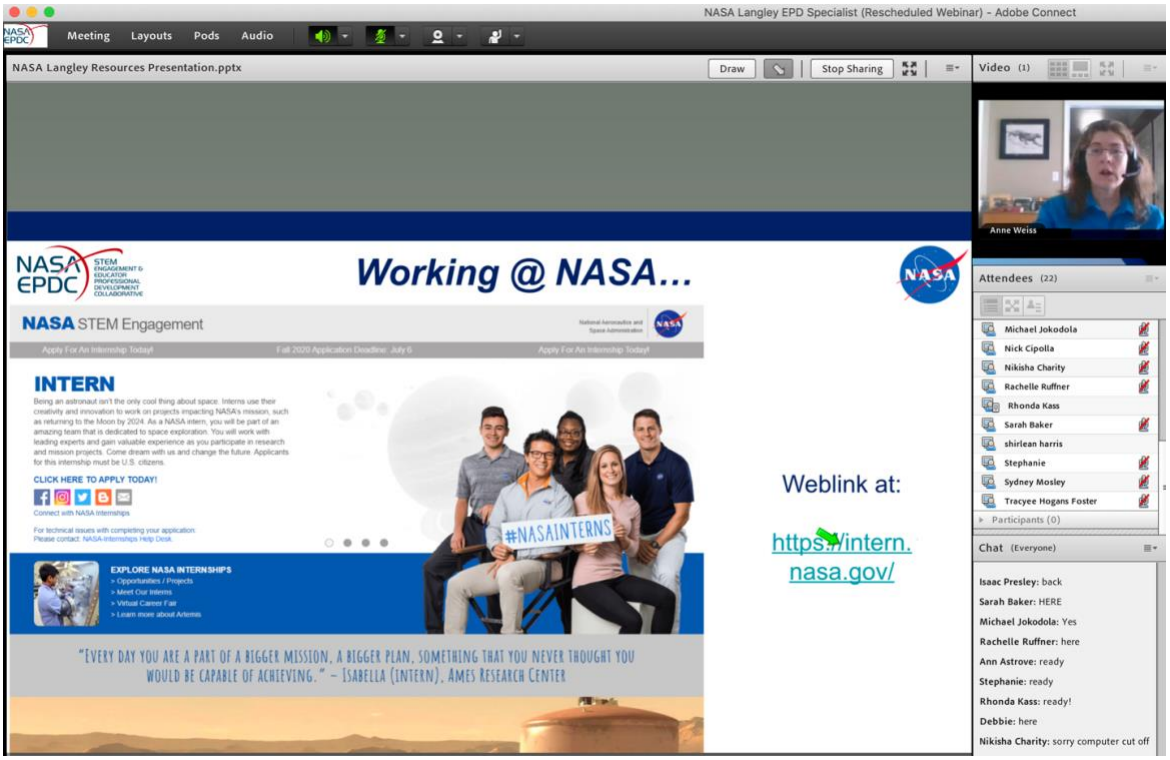
Al Byers: Nice application Anne

Joanna L Minott: Great connection and relevancy.

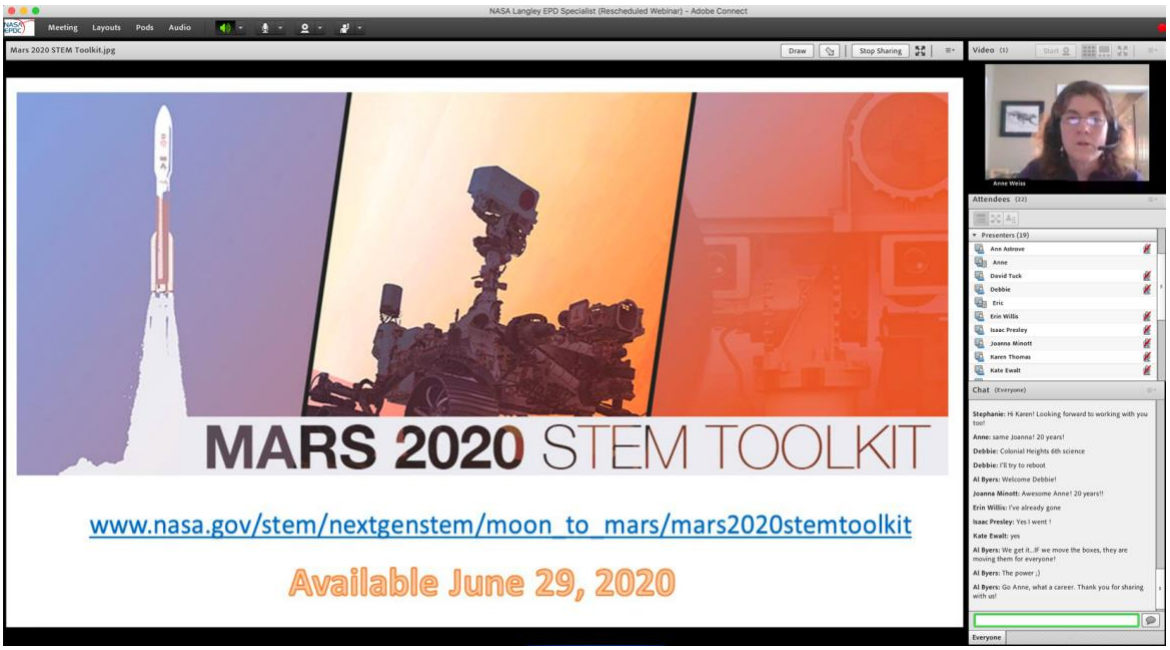
Al Byers: Appreciate this idea. Even in

NASA Langley: Student Teacher Engagement Opportunities: Anne Weiss

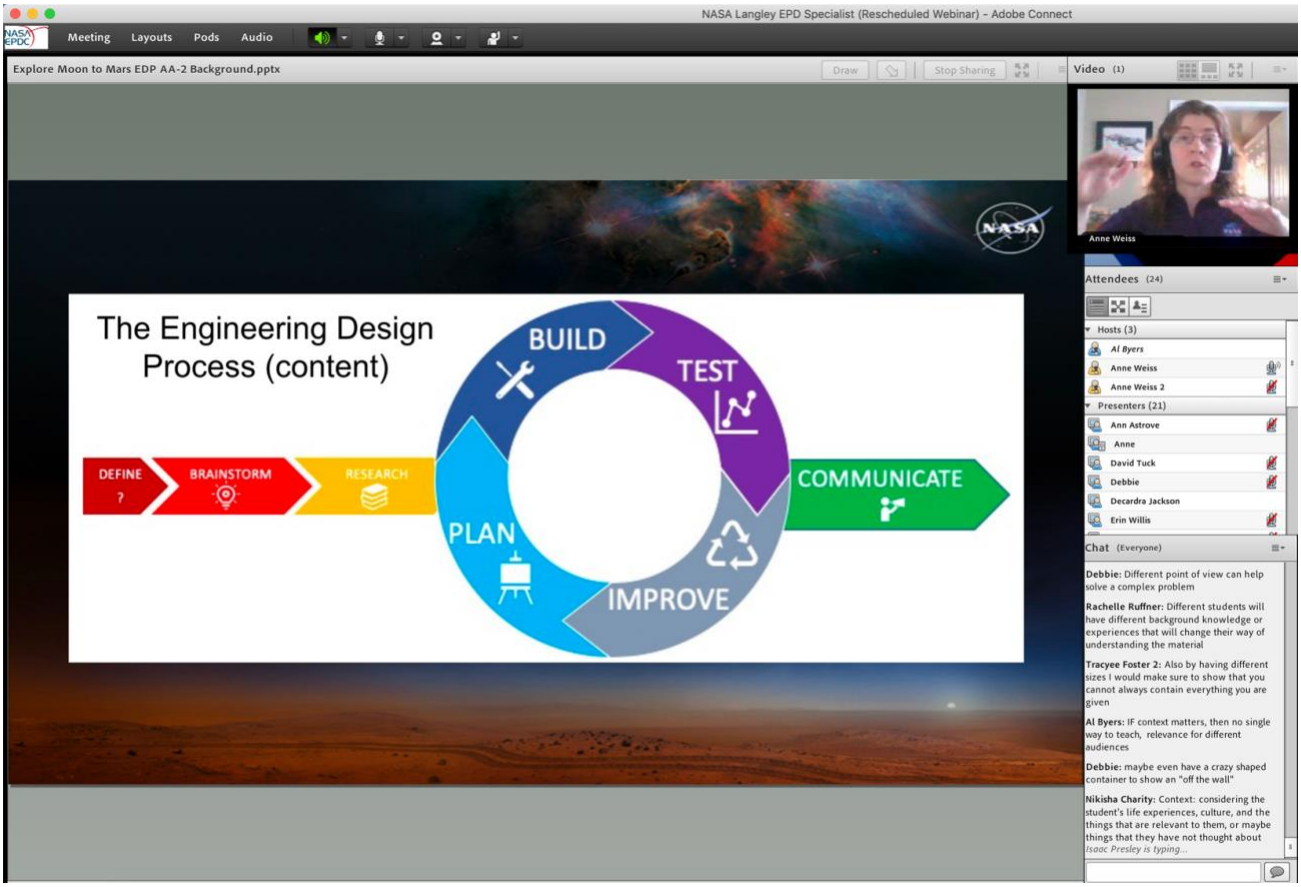


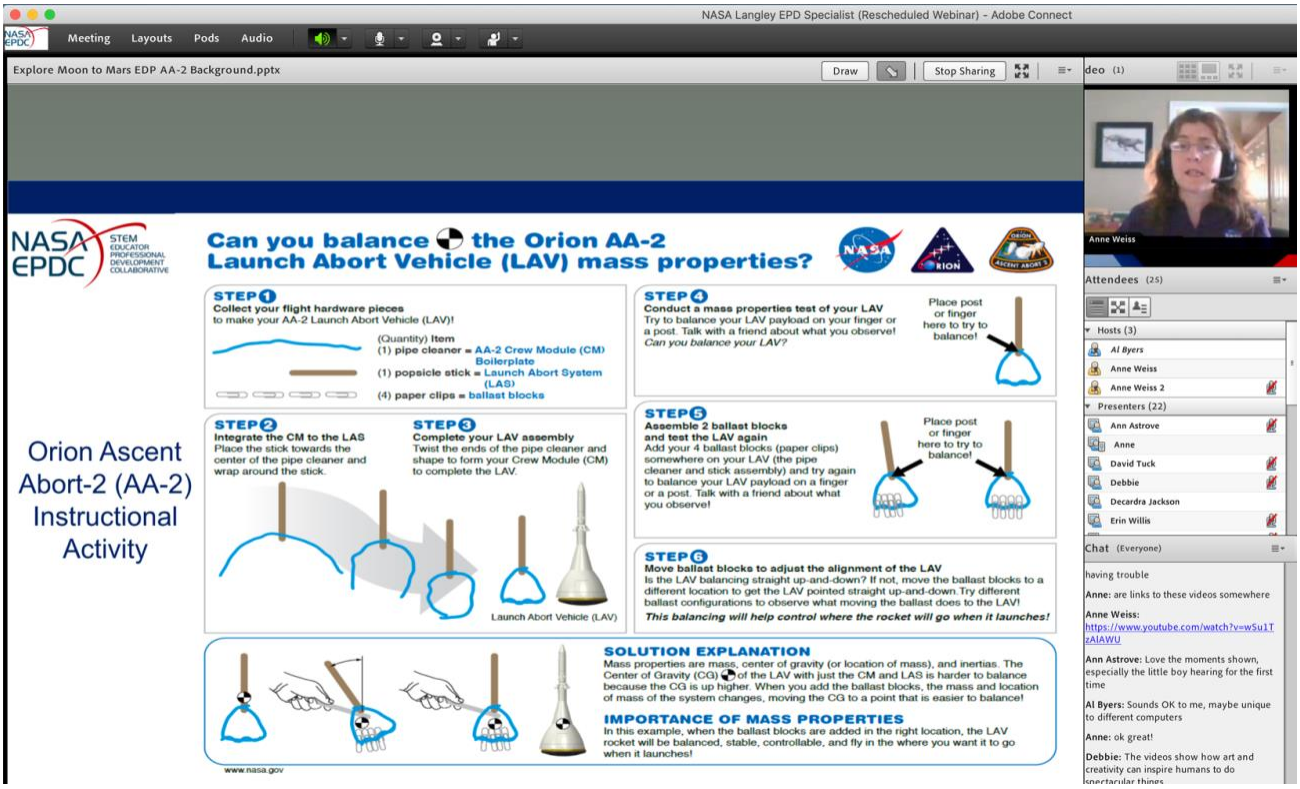


NASA Langley: STEM Resources: Anne Weiss



Virtual Hands-On Engineering Design Activity with Teachers: Anne Weiss

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NASA EPDC STEM EDUCATOR PROFESSIONAL DEVELOPMENT COLLABORATIVE
Can you balance the Orion AA-2 Launch Abort Vehicle (LAV) mass properties?
Orion Ascent Abort-2 (AA-2) Instructional Activity
STEP 1
Collect your flight hardware pieces
to make your AA-2 Launch Abort Vehicle (LAV)!
(Quantity) Item
(1) pipe cleaner = AA-2 Crew Module (CM) Boilerplate
(1) popsicle stick = Launch Abort System (LAS)
(4) paper clips = ballast blocks
STEP 2
Integrate the CM to the LAS
Place the stick towards the center of the pipe cleaner and wrap around the stick.
STEP 3
Complete your LAV assembly
Twist the ends of the pipe cleaner and shape to form your Crew Module (CM) to complete the LAV.
Launch Abort Vehicle (LAV)
STEP 4
Conduct a mass properties test of your LAV
Try to balance your LAV payload on your finger or a post. Talk with a friend about what you observe!
Can you balance your LAV?
Place post or finger here to try to balance!
STEP 5
Assemble 2 ballast blocks and test the LAV again
Add your 4 ballast blocks (paper clips) somewhere on your LAV (the pipe cleaner and stick assembly) and try again to balance your LAV payload on a finger or a post. Talk with a friend about what you observe!
Place post or finger here to try to balance!
STEP 6
Move ballast blocks to adjust the alignment of the LAV
Is the LAV balancing straight up-and-down? If not, move the ballast blocks to a different location to get the LAV pointed straight up-and-down. Try different ballast configurations to observe what moving the ballast does to the LAV!
This balancing will help control where the rocket will go when it launches!
SOLUTION EXPLANATION
Mass properties are mass, center of gravity (or location of mass), and inertias. The Center of Gravity (CG) of the LAV with just the CM and LAS is harder to balance because the CG is up higher. When you add the ballast blocks, the mass and location of mass of the system changes, moving the CG to a point that is easier to balance!
IMPORTANCE OF MASS PROPERTIES
In this example, when the ballast blocks are added in the right location, the LAV rocket will be balanced, stable, controllable, and fly in the where you want it to go when it launches!
www.nasa.gov
Anne Weiss
Attendees (25)
Hosts (3)
Al Byers
Anne Weiss
Anne Weiss 2
Presenters (22)
Ann Astrove
Anne
David Tuck
Debbie
Decardra Jackson
Erin Willis
Chat (Everyone)
having trouble
Anne: are links to these videos somewhere
Anne Weiss: https://www.youtube.com/watch?v=w5u1TzAlAWU
Ann Astrove: Love the moments shown, especially the little boy hearing for the first time
Al Byers: Sounds OK to me, maybe unique to different computers
Anne: ok great!
Debbie: The videos show how art and creativity can inspire humans to do


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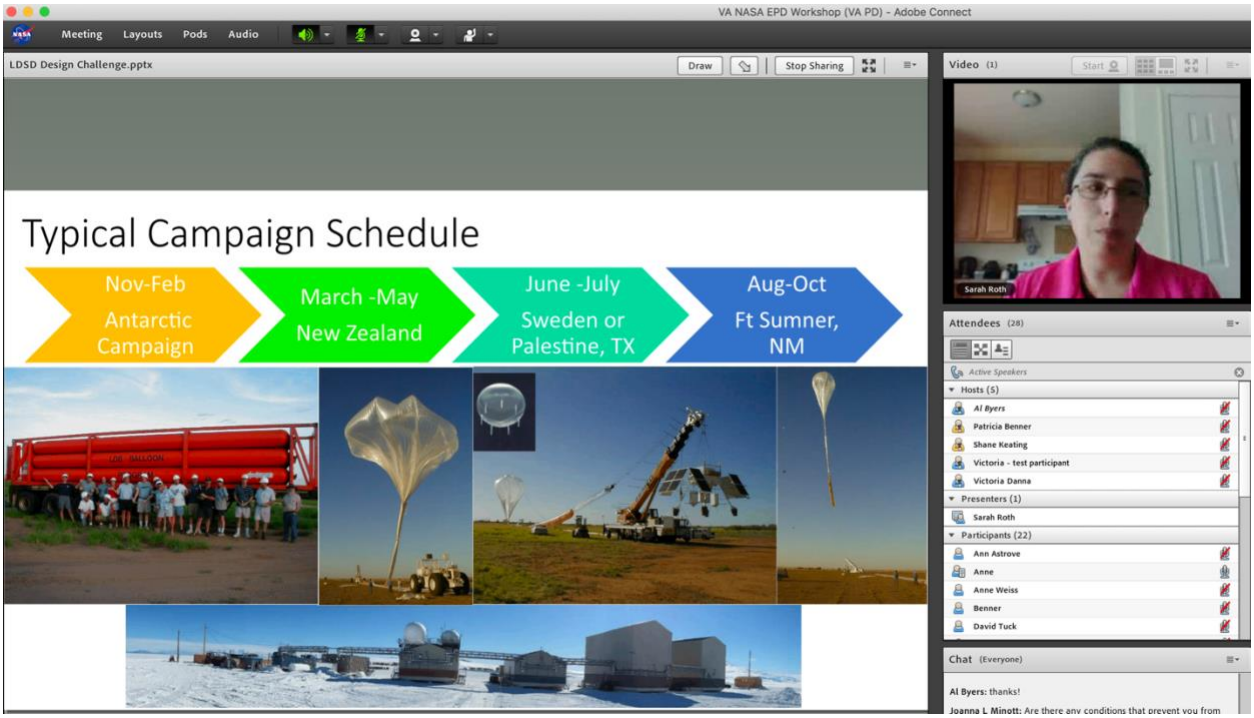
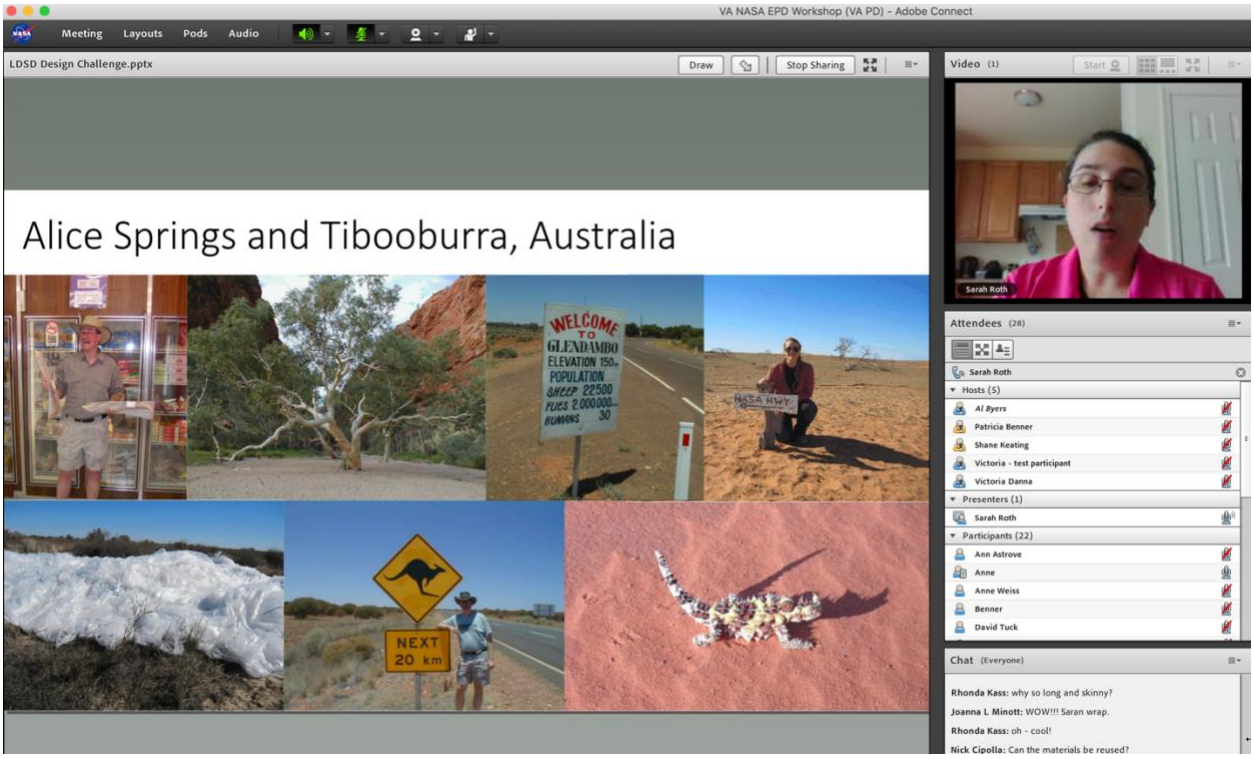
NASA Wallops Science Content: High Altitude Balloon Investigations: Sarah Roth



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Active Speakers
Hosts (5)
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Patricia Benner
Shane Keating
Victoria - test participant
Victoria Danna
Presenters (1)
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Participants (22)
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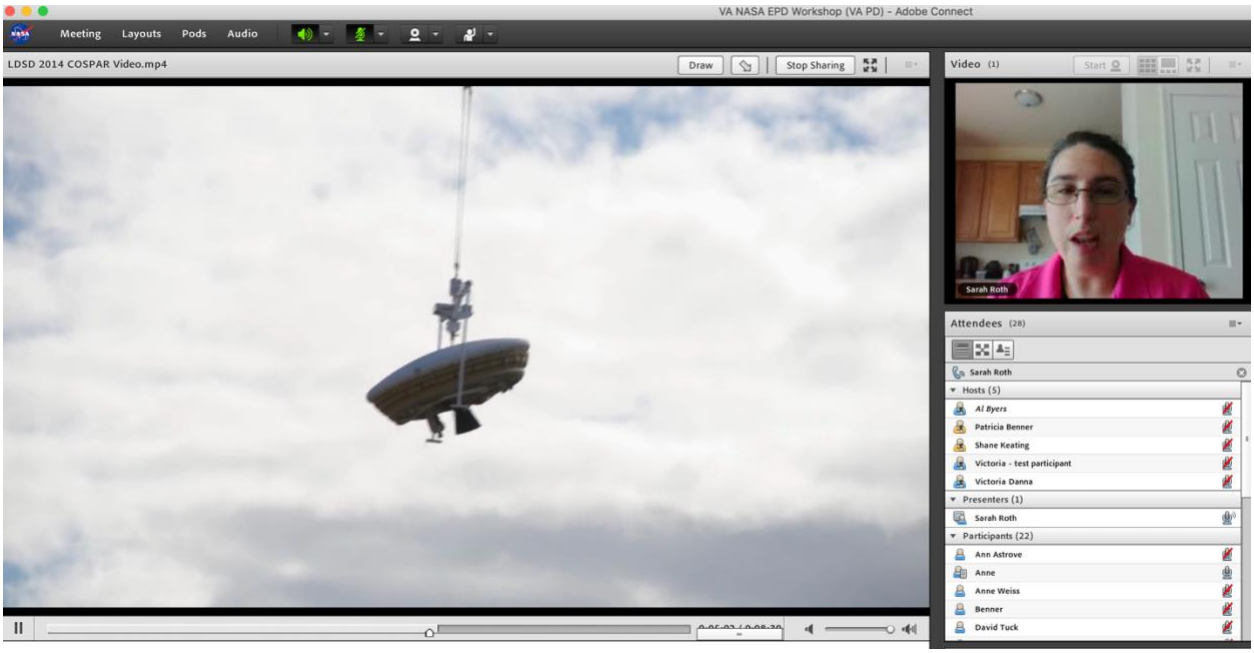
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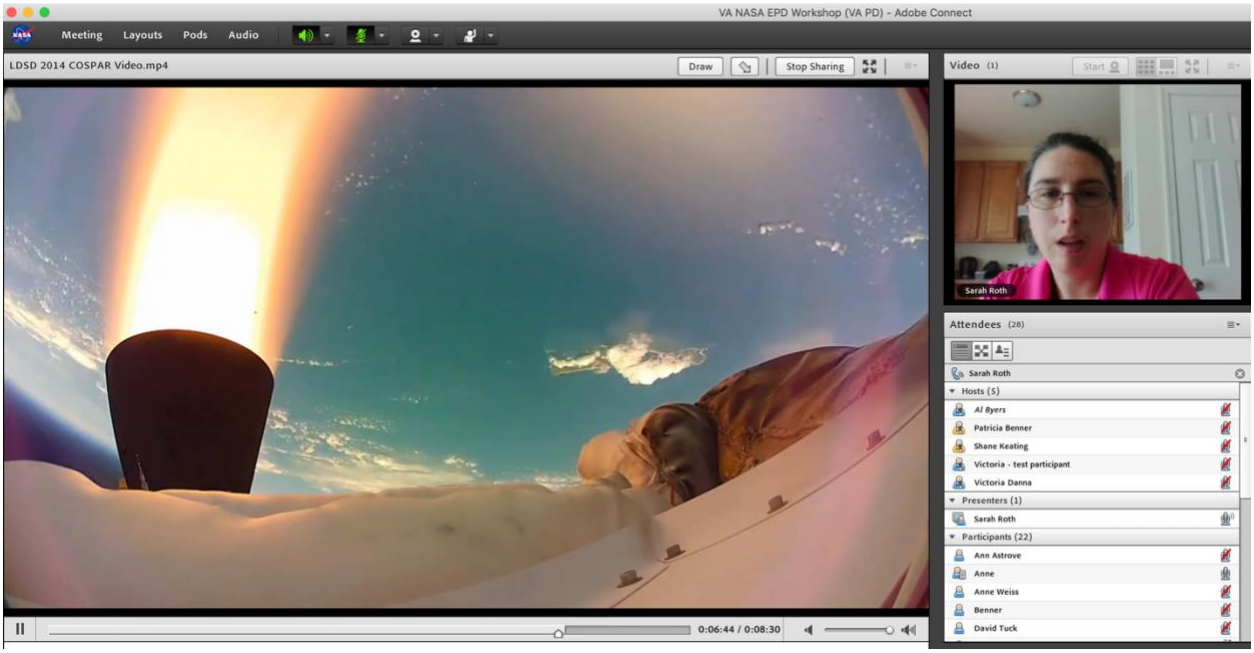
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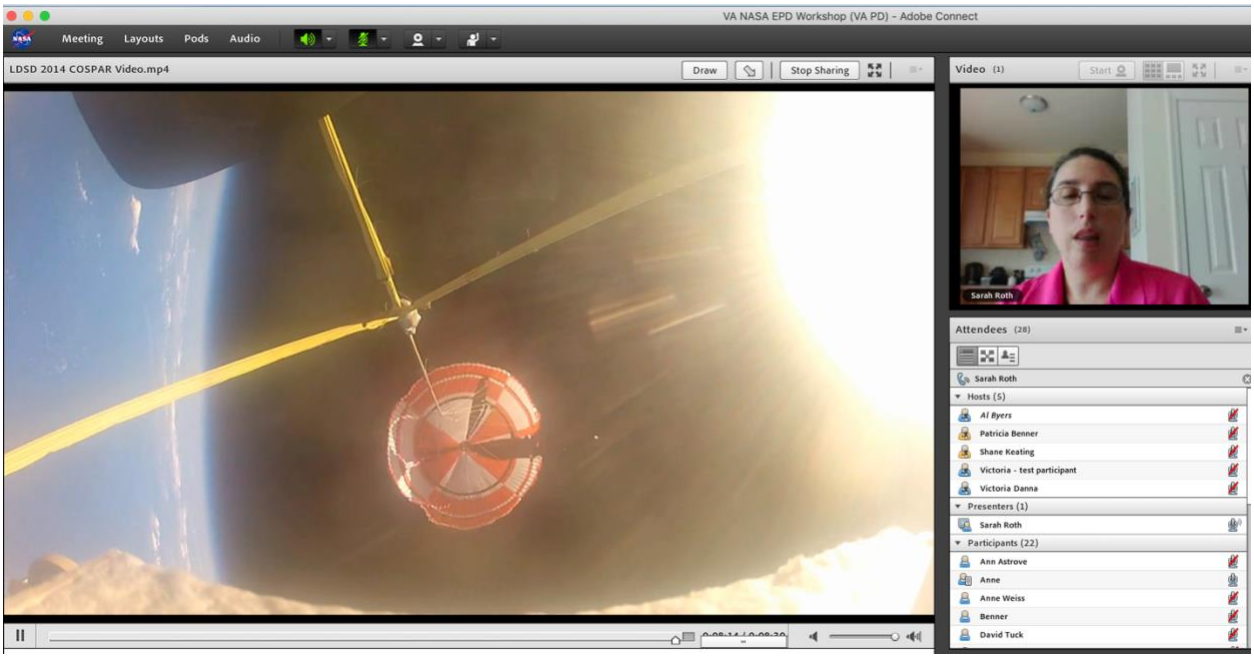
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Hosts (5)
Al Byers
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NASA Wallops Discussion of Designing Lunar Bases using online tools: Victoria Danna