AFRL
NEW MEXICO
STEM OUTREACH

Inspiring Future Scientists and Engineers

AFRL NM STEM ACADEMY

Star Date: April 2021
Volume XVIII, Issue 8

AFRL
THE AIR FORCE RESEARCH LABORATORY
LEAD | DISCOVER | DEVELOP | DELIVER

In This Issue...

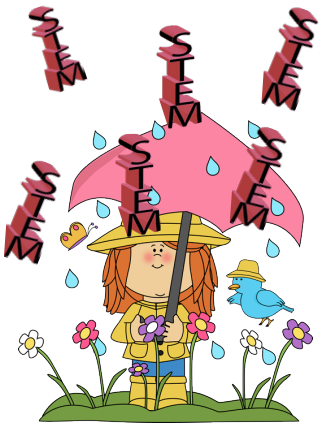
In partnership with:

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Collaborator:

DoD STARBASE
A Department of Defense Youth Program

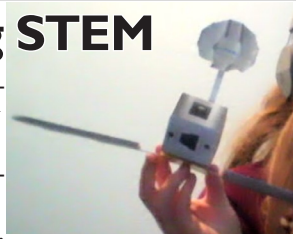
Reserving school buses for our activities will only be necessary if and when classes resume in our facility on base.



April Showers bring STEM Powers!

The Rocket Report

Raining STEM



April showers bring May flowers, but the weatherman must've miscalculated, because April was still about a week away when it started raining STEM around here!

On 24 March 2021, the STEM started pouring when fourth and fifth grade students attended our Central New Mexico (CNM) virtual Research Challenge event.

Maybe they were weather satellites? Using just *one* sheet of paper, *no* glue, *no* tape, *no* scissors, and three flexible metal sticky sticks, students discovered the simplicity and elegance of "fold'n'play" satellite construction when they assembled the body, solar panels, and antenna of a paper HexSat satellite.

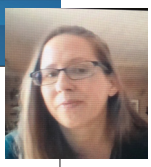
There must've been some lightning in those rain clouds, because students also got enough electricity flowing through their circuits to make a glow ball glow, and a paper circuit LED badge they made light up.

The STEM keeps raining in our missions, too. Just ask the middle school students who attended the Robotics Challenge Expo recently!

Mission to Mars

For Fifth Graders

Mars Hovering Observational Planetary Exploration System (HOPES) Mission 2020-2021



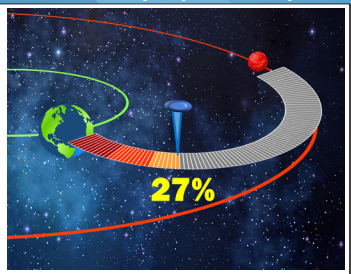
Fuel is Cool

A typical journey from Earth to Mars is about 300 million miles, and our virtual 2021 HOPES Mission **Link-Up Day** is fast approaching on Friday, 7 May 2021, 9:30–11:30 am. But do we have enough *fuel* to get there?!

To colonize Mars, we have to increase our knowledge of the planet and complete many tasks before we even set *foot* on a spaceship. We can think of this as another type of "fuel" for our trip.

We've created a metric that converts our Mission to Mars tasks completed and mastery of Mars facts into *fuel points*!

As of 12 April 2021, we have about **27%** of the fuel we need to get to Mars.



Students can earn more fuel points by:

- Completing mission tasks as outlined on the website and in the Mission Journal.
- Completing the weekly Mars Facts Fuel Point Challenge Kahoot! game.

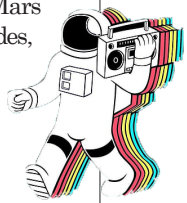
Visit our HOPES Mission web page each Monday until Link-Up Day to access the current Fuel Point Challenge game, as well as checking out our current fuel status!

Stream Team

At our Expert Talk on 13 April 2021, Ms. Julie Smith, AFRL/RV Senior Research Physicist, explained that right now, it would take about *8 hours* to transmit the Avengers movie to Mars using traditional radio waves.

But using lasers ("lasercom") to transmit the movie, she said it would take about *7 seconds*.

Sure, lasercoms are expensive and can get blocked by clouds and walls, but astronauts can't be expected to go to Mars without Netflix! Besides, have you ever tried to stream an Avengers movie on a radio?! See afrlnm.com/stem/expert-talks.



Your commitment to this mission is crucial to its success

DoD STARBASE NM

For Fifth Graders

Hi, Tech

Everything is so hi-tech these days! We're surrounded by more and more technology every day: Laptops, smartphones, microwave ovens, self-driving cars...

But what *is* "technology," and how did it start?

Technology is anything created by humans to solve problems and make life easier. It all started about 3.3 million years ago, when early human ancestors started solving problems and making their lives easier with *stone knives and tool technology.*

Things got cooking when early humans discovered the tools to make *fire*, and they really got rolling when they invented the *wheel.* You may not think the Flintstones were very hi-tech, but they were the Jetsons of their day!

Johannes Gutenberg helped press technology forward in the mid-1400's with his movable-type *printing press.*

Thomas Edison, who knew hundreds of ways *not* to invent a practical *light bulb*, and one *right* way, created the technology that made cartoon characters having ideas possible.

Personal computers pushed technology a little bit—actually, about 8 bits—further.

Technology

In DoD STARBASE NM Day 3, hi-tech technology is everywhere. Over Zoom technology, students use Paper Circuit technology to help Astro the Alien light up his spaceship technology.

Students in Day 3 also test *insulators* and *conductors* to see which make glow-ball technology glow better.

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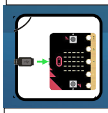
Did you know? Waving at the New Mexico Institute of Mining and Technology (NM Tech) is one of the most *Hi, Tech* things you can do!



TECH Mission

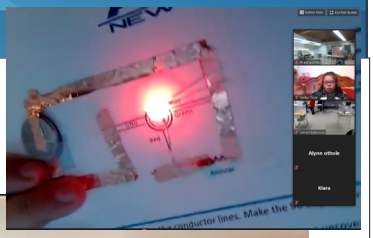
For Middle Schoolers

Technology and Engineering Challenges—Satellites Mission

TECH Light

Hi, TECH!

The TECH Mission has wrapped up all its classes for the year, so to keep it light, here are some bonus pictures of TECH Mission students tripping the light fantastic this year.



Robotics Challenge

For Middle Schoolers

Circle-T Expo

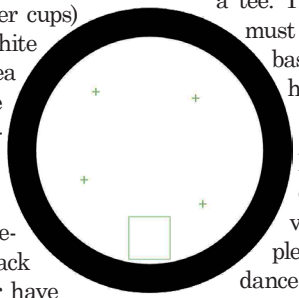
The 2021 Robotics Challenge Expo had a *virtual* spin to it this year. Over several weeks, students put their Maqueen robots to the test during the Expo, applying knowledge and skills gained through the Robotics Challenge tutorials and assignments.

Light Sensor Spin

Possible points: 15. Students write a program that makes their robot spin, or move in a small circle, and light up when it is dark in the room. When there is brighter light in the room, the robot should stop moving and turn off the LED headlights on top.

Clear the Circle

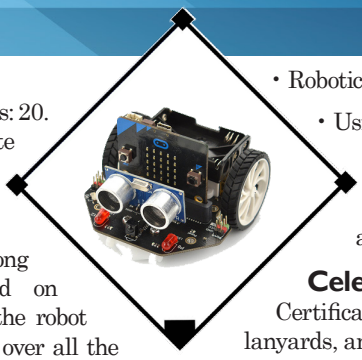
Possible points: 20. Students get the robot to push as many objects (paper cups) out of the white circle area as possible within 2 minutes.



The robot cannot go beyond the black circle area or have anything attached to it other than the *ultrasonic sensor.*

T Ball

Possible points: 20. Students write a program that makes a *robotic arm* hit a ping pong ball mounted on a tee. Then the robot must pass over all the bases and return to home plate. Home run!



Performance

Possible points: 10. Students submit a short video of the robot completing a performance or dance. Two points each were awarded for:

- Wheel movement
- Robotic arm movement.
- Using lights.
- Using sound.
- Using sensors and props.

Celebration

Certificates, T-shirts, lanyards, and pins were provided to all participants who completed one or more Expo assignments.

First, second and third place trophies were awarded to students with the highest overall point totals.

A celebration event took place on 16 April 2021.

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Website:
www.afrlnm.com/stem

YouTube Channel:
https://www.youtube.com/channel/UC-QuOSd1XTkYuXPONZwlAIHQ/videos

Important Terms and Acronyms

AF: Air Force

AFB: Air Force Base

AFRL: Air Force Research Laboratory

AFRL NM: AFRL New Mexico (AFRL/RD and AFRL/RV), on KAFB

AFRL/RD: The Directed Energy Directorate of the AFRL

AFRL/RV: The Space Vehicles Directorate of the AFRL

DoD: Department of Defense

KAFB: Kirtland Air Force Base, Albuquerque, NM

HOPES: Mars Hovering Observational Planetary Exploration System 2020-2021

MM: Mission to Mars

PRS: Phillips Research Site

S&Es: Scientists and Engineers

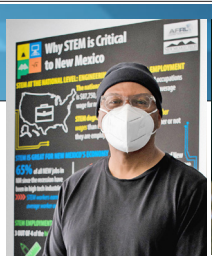
STEM: Science, Technology, Engineering, and Math

TECH: Technology and Engineering Challenges

USAF: United States Air Force

Remember, Teachers:
Get those EPA Modification forms in!

You Bet We're Continuing



AFRL NM STEM Academy staff member Larry Heard and a Homeschool parent during a STEM Packet Pickup. (U.S. Air Force photos/Macee Hunt)

Thanks, Santana: AFRL's **Santana Ortiz** recently wrote a nice article about us entitled: **"AFRL STEM Academy Continues Hands-On Learning During Pandemic"**:

"The Air Force Research Laboratory's STEM outreach program STEM Academy has started off the new year by distributing learning packets for homeschooled students around the Albuquerque community.

Since the beginning of the pandemic, STEM Academy has taken a novel approach to online learning. They have worked to ensure that students are getting a hands-on experience that is less common with the continuing online learning environments.

"We provide hands-on STEM activities to teach concepts in a way that's engaging for students," STEM Outreach Specialist Larry Heard said. "When the pandemic started, we were faced with the challenge of continuing to provide the same kind of experience when kids could no longer come into our facility. We've come up with lots of new curriculum and activities that we can send home with teachers and parents, and so far, it's been a great success."

The staff has been working with schools and homeschooled students for years and wouldn't let the pandemic keep that from happening; instead deciding to organize pick-up and deliveries of supplies to schools, teachers, and homeschool parents. They then arranged Zoom meetings with students to teach and walk through the process of using the supplies to learn about different STEM concepts.

"I'm just glad that they've figured out a way to do this with all the lockdowns," homeschool parent Stephanie Umpleby said. "The kids can still get some hands-on interactive science stuff that you can't really recreate as easily at home just as parents."

The Zoom classes last anywhere from two to three hours and students can learn concepts ranging from how to write code using Python — a coding language that's used in industry today — to building a paper satellite, while learning about the different parts that make up satellites, like those used by AFRL.

As parents of homeschooled kids across the city came in to pick up their packets, they voiced their excitement for the upcoming lessons.

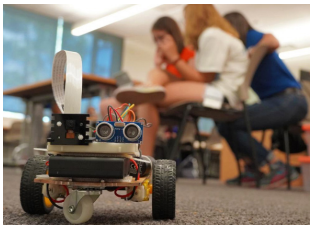
"I think it's going to be a great supplement and she's going to learn things that I certainly wouldn't be able to teach her," mother of an 11-year-old homeschool student Kimberly MacMillan said. "I appreciate AFRL doing this because it's really important nowadays to expose them to different learning styles. I'm sure I'm going to learn a lot too."

When area schools begin in-school learning, the STEM Academy will continue to provide resources in the way of supplies, and virtual science instruction to both homeschool families and in-school classrooms."

Future Moonshot Skills

Here are some STEM links and future skills to explore:

Intel® Future Skills



Intel® Future Skills–From Empathy to Innovation (see their website at www.intel.com) gives students the framework needed for a lifetime of problem solving and discovery through Science, Technology, Engineering, Arts, and Math (STEAM) learning.

It's more than a website; it's a resource hub for discovery and learning, brought to you by the minds at Intel. Through their platform, you can engage in over 25 projects, with more than 40 hours of content and projects that can be used at home, at school, or in a community setting.

Million Girls Moonshot

The *Million Girls Moonshot* (www.milliongirlsmoonshot.org) aims to engage 1 million school-age girls in STEM learning, through afterschool and summer programs, over the next five years.

The Moonshot will allow girls to envision themselves as future innovators, and increase the quality of out-of-school STEM learning opportunities for *all* young people, particularly underserved and underrepresented youth.

Coming Next Issue...

- HOPES Completed, Chemistry and Space, Celebrations, Symposiums, What a Year It's Been!

Watch for it!