

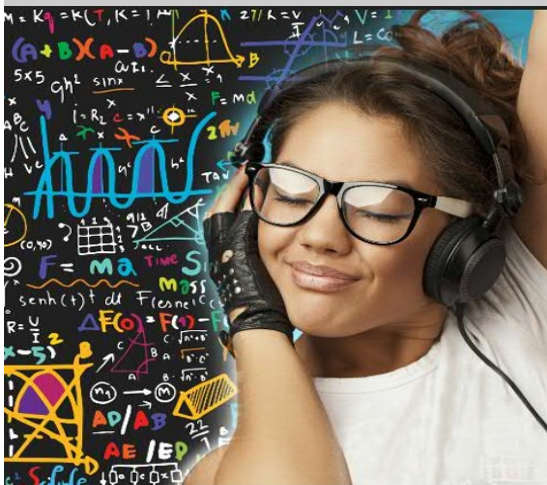


Approved for Public Release

# STEM@Home Volume 3 Issue 5

## Welcome to STEM@Home!

The STEM@Home Newsletter is intended to be a resource to provide engaging and educational activities that can be done with minimal materials and a whole lot of imagination. To learn more about C5ISR Center Community Outreach, visit [C5ISR Center U.S.ARMY CCDC | Student Programs Overview](#)



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## Math Moment:

Logic is a part of most math curriculums. Even if it doesn't seem like logic is a math problem, critical thinking is a skill everyone needs. For the square below, you must fill in each empty square with a number from 1 through 4. The numbers in each row must multiply to the total in the shaded square on the right, and the numbers in each column must multiply to the total in the shaded square at the bottom. (From *Brain Games: Ultimate Brain Booster Puzzles*, 2010, p. 178)

	4	5	3	2	240
	3	3	5	5	225
	3	1		4	96
	2	5	4	1	120
	3	4	2	2	48
12	216	300	480	80	

Answer on Page

The C5ISR Center Community Outreach Office would like to take the time to thank our volunteers who supported our programs throughout the month of December.

#### STEM Programing at CYS

Holly Nathaniel

#### Coding Hour

Joseph Fellner

#### NSTEP Robotics

Alex Canfield, Lee Carlson and ManHong (Andrew) Wong

If you would like to participate in the C5ISR Center Outreach Program, register at <https://submit.link/Fe>



Visit the C5ISR Center on Facebook to post a photo of your child completing one of the STEM@Home Activities.

[Facebook.com/DEVCOM.C5ISR](https://www.facebook.com/DEVCOM.C5ISR)

## SME Feature



**Mich'a Gary**

*General Engineering  
Product Team Lead– 3  
years  
C5ISR Center*

**Education:**

Bachelors of Science in  
Aerospace Engineering,  
Tuskegee University

**1. What is your job and how does it support the US soldier?** I am the team lead for one of the communication and networking products within the Program Executive Office Command, Control, Communications-Tactical (PEO C3T). The system that I collaborate on helps our U.S. soldiers safely and securely communicate in their time of need. My job requires the ability to work in small and large teams, and manage the time, money, resources, and integrated tasks to ensure our soldiers have networking and communication capability when they need it.

**2. What drew you to the STEM field originally?** I have always loved science; it has been my favorite subject since elementary school. Every year while in grade school, I looked forward to learning about the different topics covered in my science classes. I also enjoyed doing the various science projects on these topics, both in school and at home. I was particularly intrigued by space science due to my deep interest in the sun, planets, stars, and rocketry. I don't know if it was the "glitz" of the stars that fascinated me most, but either way this love led to a greater interest in astronomy and astronautics. Because of this, I eventually pursued an undergraduate degree in Aerospace Engineering, with a focus on Astronautics and Aeronautics.

**3. What is the most important STEM related innovation you've witnessed in your career?** It is said that necessity is the mother of invention. With half of my career in STEM being covered by the Covid-19 pandemic, the need for technological advancements and innovation has never been greater. Because of this need, the entire world had to operate as a collective, and use our minds to get even more creative in order to survive a threat unlike any we have faced before. In my

professional and personal communities, I witnessed several examples of this, including virtual reality, augmented reality, advanced driving assistance systems (ADAS), the mRNA vaccine, virtual conferencing while working from home. We, as a nation and as a species, have made huge strides in innovation and technology in all of these categories and I know there is still much more ahead.

**4. Why is STEM important to our national security and our national future?** STEM is very important to our national security because STEM is the backbone of the innovations that keep us safe. The fighter jets that support our air superiority, the defense systems that provide intelligence and protect us from foreign attacks, the naval ships that have nuclear capabilities, and the communication tools that enable us to stay connected; all of these are only possible through STEM. STEM is not only important, but foundational to our national security. The achievements through STEM are what enable us to defend our country, build alliances, and deter enemies. With continued progression in STEM, our nation will further develop and become better, smarter, faster, safer.

**5. What should students be engaging in order to further their interests in a STEM field?** Students should look and inquire about STEM-related projects, contests, and activities in general, inside and outside of school (i.e. STEM related conferences and fairs). Students should read about different topics that interest them and seek conversations around these topics. Students should take on challenges and ask questions that others may be too embarrassed to ask; staying inquisitive is a very important part of STEM. Although it's important for students to seek STEM related opportunities and communities, it is also vital for older generations to create systems, structures, and opportunities that enable the brilliant minds of our nation to pursue STEM and contribute to the various STEM fields.

# STEM Challenge

## Build a Sled



*The town of Snowville is hosting a sled competition at their community park down a large hill. The town is encouraging businesses and people in the community to compete. Snowville has decided on the following criteria for the race: sled must be made by the participant (no store-bought sleds), the sled that travels the farthest without falling apart will win, participants must submit a prototype of their design with their applications.*

### Materials:

- Popsicle sticks
- cardstock, or cardboard, cereal box
- Recycled materials
- Paint
- Small plastic cups/bowls
- Aluminum foil
- String
- Paint
- Pipe cleaners
- Straws
- Tape
- Glue
- Paper towel rolls
- Wood scraps
- Other useful items in your home

**Mission:** Simba’s Exotic Treats has hired you as engineer to design a sled on behalf of their company to enter in the sled race. The company is allowing you to be creative in your design if you follow the requirements outlined by the town of Snowville. The owner of Simba’s Exotic Treats has requested that you provide with data showing the average speed after 3 trials. This means that you will need to build a ramp in order to test your sled prototype design.

### Design Process:

**ASK:** What is the problem you need to solve? A sled that will be able to go the farthest distance possible that can compete in a sled race.

**RESEARCH:** Research what products or solutions already exist and find technologies that might be adaptable to your needs when thinking about your sled design.

**IMAGINE:** Brainstorm and decide on one idea. How will you sled be able to travel the farthest distance possible?

**PLAN:** Draw a picture of your device. What will your sled design look like?

**CREATE:** Use the materials to create a prototype of your sled. Remember to design a ramp to test your sled design on.

**IMPROVE:** Use materials to test your sled design. How could you improve your sled design?

### Questions to ask:

If you had more choices of materials, what would you use and why? Will your sled be able to travel the farthest distance possible?



**You Must Have Adult Supervision To Complete This Activity.**

### Requirements:

- The sled must be hand-made.
- Travel the farthest distance possible.
- Data must be provided showing the average of three trails.

**What do you call a dance party when it’s snowing?**

**-- A snowball**



## Now is a great time to get involved in STEM...

The C5ISR Center Educational Outreach Program is a collection of kindergarten through college-level programs designed to give students access to educational and extracurricular opportunities in STEM. For more information about our STEM Outreach Programs, visit us on the web: [https://c5isr.ccdc.army.mil/student\\_programs/](https://c5isr.ccdc.army.mil/student_programs/)

To reach our office, you can email us at [usarmy.apg.devcom-c5isr.mbx.outreach@army.mil](mailto:usarmy.apg.devcom-c5isr.mbx.outreach@army.mil)

## STEM in our World

### Nuclear Fusion Breakthrough

On December 13, 2022, scientists with Department of Energy announced a major breakthrough in the field of nuclear fusion. For the first time ever, researchers were able to create a reaction that produced more energy than what was used to start the reaction. This is called a “net energy gain” and, in this particular case, the gain was over 50%.

Who is working on this? Lawrence Livermore National Laboratory’s National Ignition Facility in California. The breakthrough happened on December 5. In addition to the group here in the United States, other researchers and scientists have been working around the globe, including in France at the International Thermonuclear Experimental Reactor (ITER) where thirty-five countries are collaborating.



What is fusion? Fusion is the energy found in the stars and the sun. When two atoms of hydrogen combine into one atom of helium, that’s fusion, and the fusion creates energy. Nuclear fusion is the man-made process that we use to try to replicate what happens naturally in stars. In fact, scientists and researchers have been working for decades to try to replicate that energy.

Inside the canister used for the experiment was an element called deuterium, which is a type of hydrogen atom. Hydrogen is found in water, and we know that Earth is about 70% water. The amount of deuterium in a glass of water could power a house for a year, so just imagine how much potential energy we have at our fingertips.

What was different this time? According to Marv Adams, the beginning of the experiment – shooting lasers at a capsule in order to produce a reaction – had been done hundreds of times before. This time, however, was different. The experiment used approximately 2 megajoules of energy but produced more than 3 megajoules of energy. The end result was a net energy gain of more than 50%. To put this in perspective, the resulting energy could boil about 2.5 gallons of water. However, the overall energy needed to run the experiment, including all of the lasers and equipment was about 300 megajoules. This means that scientists needed 100 times more energy to run the equipment than what the experiment produced, so they have a long way to go before we see this in everyday life.

There is no immediate societal impact with this breakthrough – this is merely the next big step in a very long process. The United States does not have the infrastructure in place, nor the means to reproduce this on a larger scale, for this to change our energy in the near term. However, in the long term, this is an important step in the overall move toward clean energy.

#### Resources:

<https://www.cnn.com/2022/12/13/nuclear-fusion-passes-major-milestone-net-energy.html>

<https://www.cnn.com/2022/12/13/us/energy-officials-announce-nuclear-fusion-climate-scen/index.html>

<https://www.cnn.com/2022/12/12/us/common-questions-nuclear-fusion-climate/index.html>

<https://www.sciencenews.org/article/nuclear-fusion-breakthrough-energy>



The Army Education Outreach Program (AEOP) eCYBERMISSION registration is open for students, team advisors, and volunteers!

eCYBERMISSION is a web-based STEM competition that helps students grades 6-9 learn about real-life applications of STEM. Learn more at <https://www.usaeop.com/program/ecybermission/>.

**THE NEXT  
GENERATION OF  
INNOVATORS**



# STEM Experiment



## Snowstorm in a Jar

Winter is a time for snow showers and fresh blankets of snow on the ground. This fun experiment shows how a snowstorm works while showing a simple chemical reaction that shows changes in liquids and other materials.

### Directions:

1. Add a small squirt of paint into 3/4 cup of water and stir until it is mixed well. You will want the water to be a white saturated color.
2. Place your water/ paint mixture into your large glass or jar.
3. Pour your oil in almost to the top of the container creating a layer on top of the water. You will want to make sure you have more oil than water in your glass.
4. Break up the Alka Seltzer tablet into pieces. Then, drop two to three pieces into the jar.
5. Observe the reaction that takes place. You will see the white water bubble up through the oil creating a snowstorm in a jar.

### Materials:

- Clear jar or tall glass
- Vegetable oil or baby oil
- Alka seltzer tablets
- White paint
- Glitter (optional)

### How Does This Work?

There are a few science concepts going on in this simple but fun experiment. First, this snowstorm in a jar experiment offers a unique way to explore how water and oil are immiscible, meaning that they do not mix. This is because the force of attraction between the individual liquids is greater than the force of attraction between water and oil. They will always separate back into separate layers.

Another factor that comes into play in this experiment is the density of the liquids. The oil is less dense than the water allowing it to create a layer on top of the water where it exerts pressure down towards the water.

The last dimension to this experiment that ties everything together is the chemical reaction that takes place. The Alka Seltzer has both sodium bicarbonate (baking soda) and citric acid in it, and when they are mixed with water, they form bubbles of carbon dioxide. This is what you see rise up to the surface through the oil. However, when the carbon dioxide is released into the air, the remaining water falls back down to the bottom because the water is denser than oil.

When the carbon dioxide rises up, it carries some of the water and pain mixture up with it. You are able to see these bubbles in the oil because water and oil are immiscible. If this experiment was done without any oil, you would only have a fizzling jar of water. You would not be able to see the snowstorm effect of the white bubble particles falling up and down.



**SAFETY FIRST!**  
**You Must Have Adult Supervision To Complete This Activity.**

**Did you know?**  
 Snow can affect sound. Freshly fallen snow absorbs sound waves, which gives its surroundings a hushed quiet ambience after a flurry.



**Answer to Math Problem:**

2	4	5	3	2	240
1	3	3	5	5	225
2	3	1	4	4	96
3	2	5	4	1	120
1	3	4	2	2	48
12	216	300	480	80	