Sacramento L5 Society Meeting

Saturday, July 11, 2026 · Zoom

Presentation Summary

Authentic Space Science in the Classroom

Presented by Lalitha Murali

Lalitha Murali, a Wisconsin STEM and gifted-and-talented educator and National Space Society ambassador, described how authentic space-related projects can transform students from passive learners into confident investigators, designers, and presenters.

Murali's involvement in space education began when the Wisconsin Space Grant Consortium invited educators to propose experiments connected with NASA missions. Her students had been measuring classroom carbon-dioxide levels with sensors and noticed that readings increased when more people occupied a room. They proposed adapting the experiment to study carbon-dioxide movement and possible leakage in a spacecraft environment.

Although neither Murali nor her students initially knew how to build the complete experiment, the proposal was accepted. Murali approached university students, professors, NSS representatives, and industry experts for assistance. The resulting community collaboration helped the students develop a multisensor Arduino-based experiment that Murali tested during a Zero-G parabolic flight.

A University of Wisconsin professor suggested using a specialized Teledyne FLIR camera capable of making carbon dioxide visible. Teledyne representatives visited the classroom with several cameras, allowing students to see carbon dioxide released by their experiment and by musicians playing wind instruments. The company subsequently provided an approximately $100,000 camera for the flight through an arrangement with NASA and appropriate insurance.

The project had a lasting effect on the participating students. A documentary team followed the project from its early brainstorming through the flight and later interviewed the students about its influence. Many of the students, now in high school, reported that they intend to pursue STEM-related studies and careers.

Murali emphasized that she does not present herself as the technical expert. Her role is to find opportunities, obtain resources, invite knowledgeable people into the classroom, and give students enough freedom to solve the problems themselves.

Classroom Projects

Murali reviewed a broad range of projects completed during the school year:

- **MushVroom Project—ExoLab 13:** Students grew mushrooms, studied fungal growth and cloning, and considered mushrooms as food, habitat material, and radiation protection for long-duration space missions.
- **Algae Academy:** Students cultivated and examined algae while studying oxygen production, carbon-dioxide removal, wastewater treatment, nutrition, biofuels, and possible closed-loop life-support applications.
- **Tomatosphere:** Students compared seeds exposed to spaceflight with control seeds kept on Earth and developed hypotheses concerning germination and plant growth.
- **World's Biggest Analog Mission:** Students performed exercises and plant-growth activities corresponding to those undertaken by an analog astronaut crew and recorded their physical responses.
- **ROADS from Earth to Venus:** Students completed mission activities involving planetary atmospheres, carbon movement, remote sensing, mission patches, drones, and robotic exploration.
- **LEGO SPIKE Prime rovers:** Teams designed and programmed rovers to traverse different terrain. When an initial design failed on a slippery ramp, students redesigned it rather than treating the failure as the end of the project.
- **Model rockets and powered paper airplanes:** Students learned about thrust, motion, lift, distance, and aerodynamic design through construction and testing.
- **Drone Academy:** Students built and flew drones and participated in a simulated emergency mission delivering small medical packages by parachute.
- **Future City and water-filtration projects:** Students applied engineering, agriculture, recycling, and systems thinking to the design of future communities.
- **Project Hail Mary Challenge:** Students designed and 3D-printed a rotating spacecraft concept intended to produce artificial gravity. Although their proposal was not selected, Murali considered the design and submission process itself a valuable success.

Students also visited university laboratories, worked with undergraduate and graduate students, and presented their work alongside university researchers. Murali regularly brings students to NSS conferences so they can practice public speaking, develop professional contacts, and take ownership of their work.

Central Themes

Murali identified several benefits of authentic space education:

Space projects connect mathematics, physics, biology, engineering, computer science, communication, and project management. They teach teamwork and demonstrate that failure is a normal and useful part of engineering. They also connect students with aerospace professionals and help build the future technical workforce.

For students in a Title I school, the opportunity to conduct work associated with NASA, universities, and aerospace companies can fundamentally change their view of what they are capable of achieving. Murali summarized her approach as bringing together students, opportunities, resources, and experts so that the entire community can help turn student ideas into reality.

Presentation Discussion

Members praised Murali's ability to locate programs and recruit university and industry partners. The discussion emphasized that a single successful experience can alter a student's educational direction.

Members discussed *Project Hail Mary* and *The Martian* as unusually useful science-fiction works because their stories progress through sequences of engineering problems, measurements, experiments, failures, and revised solutions.

Ed Kulis described the SacL5 balloon camera project and offered to help Murali's students learn Arduino development and create an experiment that could be flown on a high-altitude balloon. He explained that students should progress beyond copying kit instructions and encounter the productive difficulty of making an original device work.

The group also discussed Botball robotics competitions as a possible future activity. Members suggested that the chapter might eventually develop its own mission patch or other distinctive visual identity.

Murali was invited to continue participating in SacL5 meetings and to remain on the chapter mailing list.