

Integrated engineering on display

Steps toward modeling tech advances in musical performance, environmental protection and space exploration sprung from the School of Integrated Engineering's research challenge to students

by Joe Kullman

📅 January 16, 2025



[SIE](#)



Students examine a model of a biome structure that is part of the display to illustrate a project titled "Sustainable Biome: Life in Space." A team of students in the School of Integrated Engineering, part of the Fulton Schools of Engineering at Arizona State University, completed the project that illustrates ideas for

A portable, lightweight, affordable, wearable drum set designed to be playable anytime, anywhere. It features sensors, high-quality sound output and a design that enables adding future technical enhancements.

A metronome that lets saxophone players practice alone but incorporates tools to simulate performing with tools to simulate performing with a musical ensemble. It offers a wearable option of being easily worn and provides easy-to-use and transportable devices to enrich the musical practice and performance experience.

An array of simple but versatile devices that make it possible for musicians who are visually impaired to follow an orchestra conductor's directions. It includes programmable tools that interact with hardware devices using software programs.

These were three examples of prototypes on display at the recent Project Showcase, an exhibition event for students who developed projects to enrich musical experiences by applying engineering capabilities.

The event spotlighted work by several student teams in the [Ira A. Fulton Schools of Engineering](#) at Arizona State University, with most participants enrolled in the [School of Integrated Engineering](#), the newest of the eight [Fulton Schools](#).

Twenty-six students who took the Fulton Schools' fall 2024 offering of Introduction to Engineering course taught by Assistant Professor [Joana Sipe](#) at ASU's West Valley campus gathered for the showcase and demonstration event at [Changemaker Central](#).

The facility serves as a resource hub operated largely by students involved in academic and co-curricular activities that emphasize service learning, social entrepreneurship, civic engagement and community service. Its mission is to empower student-driven initiatives that promote positive social change.



The project RythmoGear involved devising ideas and designs to provide easily transportable technology to enable drummers to practice or perform in almost any setting or environment. The system would be cost-efficient, lightweight, provide quality percussion sounds, be battery powered and allow for future options to enhance its performance. Students Anes Murtic, Dayan Birwani and Luis Arroyo completed the project. Photographer: Erika Gronek/ASU

Enhancing healthcare, cultural and sustainability endeavors

Sipe describes the goal of this Project Showcase as challenging students to “implement engineering concepts through an integrated engineering lens,” giving them opportunities to engage in efforts aimed at making advances in three fields — health, music and sustainable engineering.

Sipe challenged students to conceptualize engineering-based solutions for one of three guiding premises: as a partnership with ASU’s forthcoming medical school; a project to create wearable music inspired by the work of [Seth Thorn](#), an assistant professor in ASU’s [School of Arts, Media and Engineering](#); or a sustainable engineering project aimed at reducing waste.

One of the directives challenged students to come up with ideas for advancing music performance and enabling more people to experience participating in it.

The drum set project was the work of computer systems engineering student Anes Murtic and computer science students Dayan Birwari and Luis Arroyo.

The saxophone metronome project team members were computer science student Hadia Abujbarah, microelectronics engineering students Abinay Jandarajupali and Kevin Shepard and engineering science and business student Peyton Osborn.

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and similar musical instruments. The team was comprised of electrical engineering student Cassie Watson, mechanical engineering student Tyler Sellito and microelectronics students William Zhuang and Vik Bellur.

Going beyond engineering's technical aspirations with new applications

Engineering science and business students Magali Bautista and Yarenci Soto Martinez worked with Eknoor Kaur, a computer science student, to develop an attachable tuner for guitar players.

Kaur engaged in various aspects of three projects featured at the showcase event, each of which she says provided her valuable learning experiences.

For one effort, Kaur conceptualized the design of a detailed model of ASU's forthcoming medical school. What began as a cardboard model was later translated into a version that can be visualized on a computer. The project "highlighted the balance between technical work and creativity," she says.

Her team's project and others, she adds, "helped me grow as a leader, learn to set boundaries, learn the meaning of fair teamwork and time management, and not to give up when things seem impossible."



Professor Todd Sandrin (center), vice provost of ASU's West Valley campus and dean of ASU's New College of Integrative Arts and Sciences, joined School of Integrated Engineering Interim Director Shawn Jordan (right) and Assistant Professor Joana Sipe (left) to discuss future collaborations between their respective schools. Photographer: Erika Gronek/ASU

Putting sustainable engineering into practice

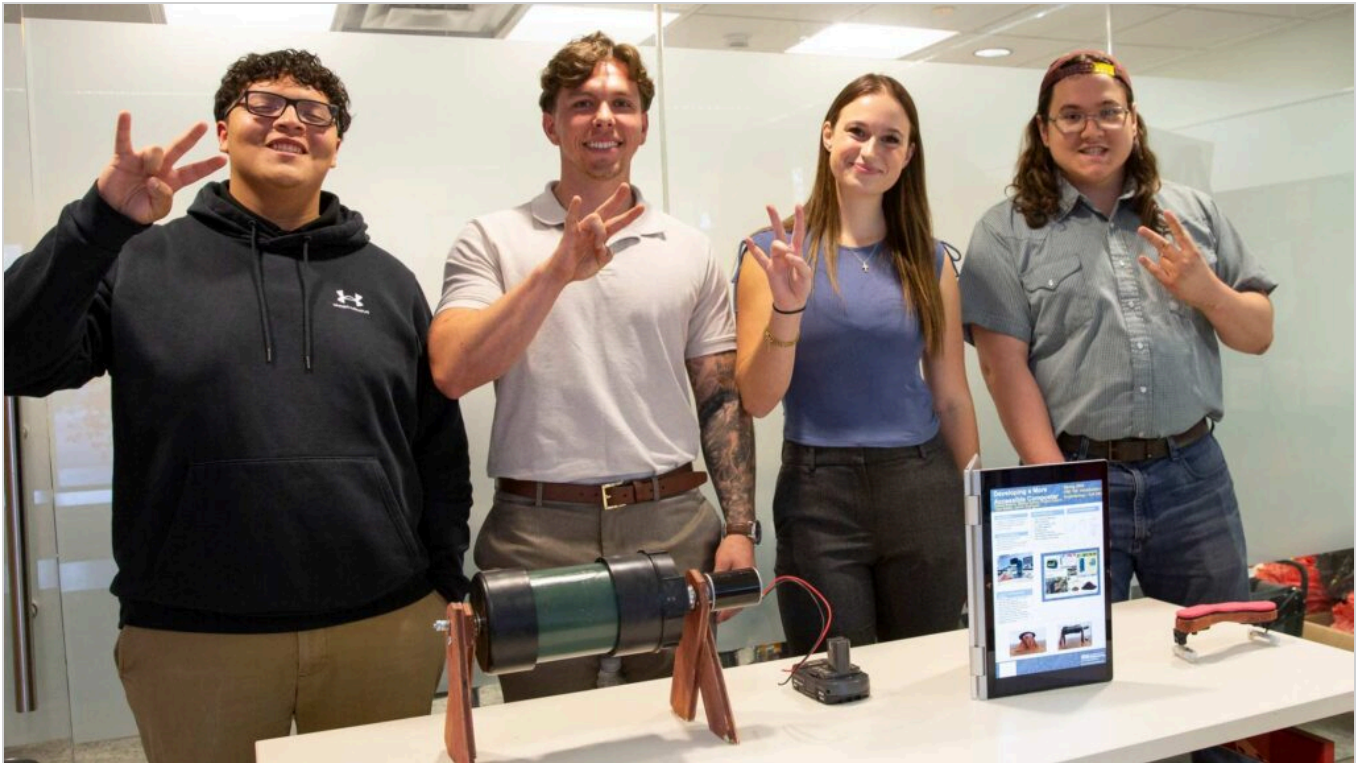
A student team involved in the Developing a More Accessible Composter project designed a machine that creates and maintains compost. The soil-like material is created by breaking down organic materials through a biological process, providing a way to recycle organic materials and return nutrients to the soil at ASU's West Valley campus.

The project's goals included providing an effective process for composting in a moist, heated environment to ensure the quality and efficiency of the material. The multidisciplinary team included electrical engineering student Cassie Watson computer science student Matthew Arroyo, engineering science student Peyton Osborn and mechanical engineering student Tyler Sellitto.

Sellitto says the experience of working on both the musical instrument shoulder rest and the composting projects was an exceptional educational experience that went beyond the technical aspects of engineering projects into the economic and business aspects of the field.

"I've gained knowledge about how to get a better understanding of the needs of the customers for new technologies and how to ask them the important questions, such as what exactly are their needs and expectations for the performance of the product," he says.

“It can give us real-world experience in dealing with the array of peoples’ needs and how to respond to them in productive and effective ways,” he says.



A composting machine with features enabling people to grow food in harsh climates not conducive to robust agriculture — like on other planets — challenged the creative skills of Fulton Schools students Cassie Watson, Tyler Sellito, Adrian Rodriguez, Mathew Arroyo and Peyton Osborn. Photographer: Erika Gronek/ASU

Eyeing entrepreneurial pathways

Also among these efforts was a project titled “Sustainable Biome: Life in Space,” by Magali Bautista, Yarenci Soto Martinez, Mia Sedano, Eknor Kaur, engineering business-science student Vina Chalabee, software engineering student Tony Doan, and mechanical engineering student Jaylon Henderson.

Their mission involved designing a biodome to help enable humans to inhabit Mars. It included developing ideas for creating life sustaining environments that would enable producing and recycling food, water and oxygen. It would also protect humans from the planet’s dangerous radiation and harsh climate and provide ways to also help ensure the psychological well-being of the astronauts and other explorers.

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students but for those who attended,” Hawes says. “Students were able to share what they created and I witnessed them talking proudly about their projects. Having opportunities to get feedback from faculty and staff and guests is essential to the continued success of their work.”

[Shawn Jordan](#), director of the School of Integrated Engineering, had a similarly positive view of the Projects Showcase outcome.

“Students were really enthusiastic about their projects, and it was impressive that they gave thought to many technical and creative aspects of their project designs. They also had good answers to questions about how they would move their work forward and pursue entrepreneurial pathways and create startup ventures,” Jordan says.

“They came up with a lot of creative and thoughtful solutions to problems. In our integrated engineering program, we want to prepare students to solve problems in partnership with many different kinds of communities,” he adds. “That’s the approach I think was reflected in the results of what these the project teams came up with.”

Jordan now plans to make the showcase event a part of every fall and spring semester that will be open to the entire ASU community as well as the general public.

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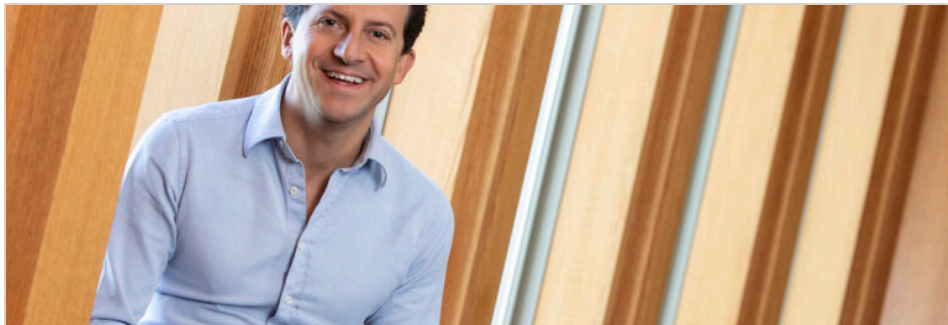
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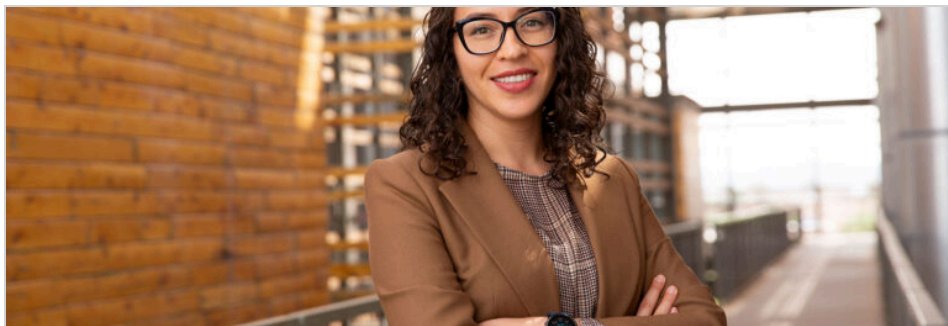
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