

Supporting K-12 STEM Education to Create the Foundations for Innovation: A Conversation with Detroit Area Pre-College Engineering Program's (DAPCEP) Michelle Reaves



Michelle L. Reaves serves as the Executive Director of the Detroit Area Pre-College Engineering Program (DAPCEP) and is the chief architect of several DAPCEP initiatives including the popular Pre-K to 3rd grade Explorers Program, the annual STEM Day held at the Michigan Science Center, GEAR-UP student programming, the bi-annual DAPCEP Student Showcase, and the STEM In-State and Out-of-State College tours. Michelle has over 20 years of experience in providing enrichment opportunities for students in STEM fields. Prior to DAPCEP, she was the Assistant Director of the Pre-College and Outreach programs in the College of Engineering at Wayne State University. Michelle graduated from Western Michigan University with a Bachelors' degree in Business Administration and earned an MBA from Wayne State University. She is also a member of the Great Lakes (MI) Chapter of the Links, Incorporated, and serves as a volunteer for the Detroit Alumna Chapter of the Delta GEMS.

She participated in a panel during GUIRR's February Workshop titled "Encouraging Science-Based Economic Development Through Regional Education Programs." Following her presentation, she engaged in a Q&A session with GUIRR Director, Michael Nestor, further delving into her research and offering valuable insights from her distinctive perspective to the GUIRR community. More information regarding DAPCEP's programming can be found at www.dapcep.org.

When you describe your dedication to STEM education, you quote author Ayesha Siddiqi: "Be the person you needed when you were younger," How do those powerful words reflect your organization's mission?

DAPCEP exists because we know the path to succeeding in STEM requires early engagement in academic preparation and exposure to the opportunities available in STEM. Youth, at an early age, often have a limited view of what their futures could be. This can be especially true for the target population we serve, which is children from racial and ethnic backgrounds underrepresented in STEM.

Across the board, we consistently hear from those who have succeeded in STEM that there were people, experiences, and education they received along their pathway that made a critical difference in informing their decisions. This, in turn, informs how our organization serves youth. We know that how we engage students in their youth impacts the choices they make in the future, so our programs are designed to provide exposure and awareness of quality educational experiences.

Who is your science icon and who would you most like to invite to speak to the kids in DAPCEP's classrooms?

One of my science icons is the late Dr. A. Oveta Fuller. Dr. Fuller was a virologist and also an associate professor of microbiology and immunology at the University of Michigan Medical School. Much of her research studied the pathogenesis of herpes and HIV/AIDS viruses. In 2020 and 2021 she was also a member of the Food and Drug Administration (FDA) vaccine and biological products advisory committee and played a role in the committee's review and eventual approval of the COVID-19 vaccines for emergency use.

In 2021, we honored Dr. Fuller with an award our organization presents annually to outstanding adults making a local impact in STEM. When accepting the award, Dr. Fuller made a commitment to helping students and their families understand the importance of making informed choices about their health. She was an extraordinary person with a true passion for youth and we were glad that she did, in fact, have the opportunity to speak to DAPCEP students before she passed away in late 2022.

How can government, industry, and academia better partner with organizations like yours to serve the K-12 STEM community?

Collaboration with organizations like DAPCEP is central to impacting K-12 STEM education. In our experience, collaboration in program and curriculum development, in addition to offering experiential learning opportunities for our students yields students who have increased their awareness of what it means to succeed in STEM. Funding from these entities is also key. With funding, we increase the number of students we can serve and can deepen the saturation of program models.



As we train tomorrow's scientists, some educators say we should talk far more openly about the critical role of failure in scientific innovation. You offer a class called "The Science of Risky Business." How does learning about risk management better prepare students to thrive in STEM careers?*

We find that students often enter our courses intimidated by the subject matter, while at the same time hesitant to express that they don't understand some of the topics covered. They are inherently wired to believe that being right, or correct, is the priority destination. Often, education in STEM concepts primarily focuses on getting to the "right" answer. Certainly, we know that in many scenarios, (for example, medical diagnoses and prescription dosages or materials constraints for engineered products) accuracy is critical. However, in our classes, students learn that risk is part of the foundation of innovation. They learn that risk management is a part of the process of exploration and when protocols are followed – it is entirely acceptable to

fail and that in fact, failure is a natural experience in the process of discovery.

Our students learn to expand their perception of what thriving in STEM *actually* looks like, including making mistakes and learning from them as acceptable experiences.

Surveying the K-12 STEM education landscape in 2024, what efforts look promising and potentially scalable?

There appear to be more initiatives in the education landscape that give students an opportunity to showcase their learning publicly in either scientific competitions or festival-style events. Students are finding more opportunities to learn how their peers are applying their understanding of academic concepts to conduct research and discover new approaches to solving challenges. Our organization focuses on ensuring local students are prepared and provided the required support from educators to compete on a national level. To ensure national competitions are inclusive and equitable access is provided to students from diverse backgrounds, we are hoping for an equal investment of funding and resources from state and regional entities to ensure all students can compete.

From your conversations with DAPCEP program alumni, what insights have you gained as to how innovation education impacts their trajectories?

Our alumni consistently share that exposure to innovation at an early age made a critical difference in the paths they pursued beginning as early as high school. From the extracurricular programs they chose to the sequence of courses they took, their awareness of the opportunities available to them in STEM was a determining factor. When the time came for them to make decisions about their future, the exposure they experienced in their early years contributed to the vision of their future self and led them to make choices to achieve that vision.

They also credit exposure to individuals who looked like them as a significant factor in their trajectories. In our programs, students see educators, real-world practitioners, and post-secondary individuals who look like them and have experienced successfully traversing the same path they could ultimately pursue. Our alumni say that seeing someone who looks like them be successful in the STEM opportunities we expose our students to play a strong role in helping them persist on their STEM pathway.

* <https://www.science.org/content/article/why-i-teach-my-students-about-scientific-failure>