



A Flex Factor class on AP Environmental Science from Abraham Lincoln High School in San Jose, California, pays a visit to the DuPont Silicon Valley Technology Center in February 2019. Teacher: Michelle Morella-Bennett (R).

Engaging the Future of Advanced Manufacturing: NextFlex and DuPont in Silicon Valley and Beyond

Feature by Brynt Parmeter and Emily McGrath
NEXTFLEX

It is no secret that there will be a surge of career opportunities in advanced manufacturing over the coming years. One of the most critical challenges facing the manufacturing industry is how to showcase the potential of this field to attract the next generation of talent—Generation Z—into the workplace. Fortunately, organizations like NextFlex and companies like DuPont are forging powerful partnerships to create the future of advanced manufacturing by engaging youth with the innovation driving this sector.

DuPont, through their new Silicon Valley Technology Center, is the latest company to join NextFlex's flagship education and workforce development program—FlexFactor. NextFlex, America's Flexible Hybrid Electronics Manufacturing Institute, is an industry consortium with a mission to advance the manu-

facturability and commercialization of flexible hybrid electronics and catalyze the next-generation workforce. FlexFactor was designed to achieve NextFlex workforce development goals by engaging young people with the full range of opportunities in the advanced manufacturing and technology sectors. Working with future-thinking industry partners like DuPont, NextFlex is driving the development and commercialization of flexible hybrid electronics (FHE) and facilitating the creation of the next generation workforce.

FlexFactor addresses the complexities of workforce development by bringing the educational and industrial communities together. Through strategic partnerships between academic and manufacturing stakeholders, the program provides students with experiences and knowledge to understand what a career in advanced manufacturing looks like. The program also helps identify pathways for students leading into the field. Driven by a project man-



Flex Factor program student participants from Abraham Lincoln High School take in the displays at the DuPont Silicon Valley Technology Center on February 11, 2019.

ager who handles local coordination activities, FlexFactor acts as a hub for K-12, higher education, and the industry to easily plug-in and work together.

Through seven linked activities spread over a month, FlexFactor uses a project-based learning approach to engage students with advanced technologies and entrepreneurship. During the program, small teams of students are challenged to identify a real-world problem, conceptualize an advanced hardware product to address the issue, build a business model around it, and pitch their idea to a panel of representatives. Along the way, students engage with both industry professionals and higher education to inform their product concepts and learn about education and career pathways in the technology sector.

The program is designed to work within existing classroom structures and absorb subject-learning objectives. When layered over an English class, the program can be used to study rhetoric, messaging, and oral presentation. In environmental science classes, the program can be used to study how advanced technologies address environmental challenges. Robotics classes can expand the program out for additional weeks and use the extra time to build prototypes of their products.

FlexFactor's unique curriculum enables this STEM- and entrepreneurship-based program to

align with non-STEM and business subjects. Through video modules and workbooks, program materials illuminate the conceptual underpinnings of hardware design, functional electronics, advanced materials, market needs, and business finance. The logic-driven materials enable students of any background to grasp the cardinal points of each discipline.

The resulting understanding helps students create a knowledge framework that allows them to identify and map critical relationships between a variety of subjects that are usually

taught in isolation. This conceptual scaffolding provides a foundation into which specific STEM and business skills, such as design principals and statistics, can be embedded later. This approach inspires the next generation of engineers and technologists to be cross-functional thinkers who can readily engage business themes, such as market needs, as they iterate through product development cycles, ensuring technical features are not developed in isolation of user requirements. This type of global thinking will become more and more critical to employer and employee success across the range of manufacturing enterprise activities that define Industry 4.0.

FlexFactor is successful because student teams define their own topics, ensuring they are fascinated by and passionate about their focus areas. Themes like business statistics and basic material properties, generally compelling for only a select few primary school students, take on new meaning and relevance when studied as a means to address infant mortality in the third world. For example, how would a company go about resourcing, designing, manufacturing, and distributing a baby bottle integrated with bacteria-killing LEDs that could be used by families in parts of the world where drinking water is routinely contaminated? Complex practical and ethical dimensions are brought into the fold as teams struggle to

decide whether a large profit margin that will attract critical investors is an acceptable moral tradeoff when affordably priced products will save additional lives, for instance.

Because teams are challenged to determine their project focus, the program enables students to dig deep into their passions and interests in a way that conventionally-defined curriculums frequently don't allow. By providing this degree of agency over educational experience, the program simultaneously generates interest in STEM-based subject areas and channels that interest into the pathways that bring FlexFactor students back to our industry partners as future talent.

FlexFactor's class-based structure also allows the program to circumvent common issues that plague conventional STEM-based initiatives, such as lack of gender and racial diversity. By eliminating self-selection as a criterion for participation, the program engages populations of students who had not previously considered tech-based careers, catalyzing and orienting a diverse pipeline of talent and a new generation of industry leaders.

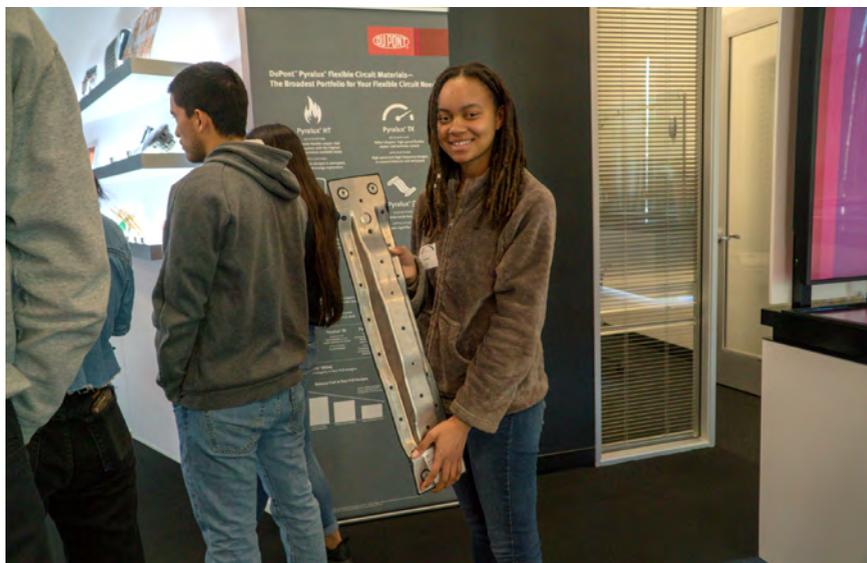
The program's high-impact touchpoints include field trips to both an industry partner, such as DuPont, and a college or university. Through active engagement with cutting-edge technology and higher education, students go through enduring and transformative experiences that translate the idea of a career from an esoteric concept to a visualized goal with a path to achievement.

DuPont's Silicon Valley Technology Center in Sunnyvale, California, hosts FlexFactor students every few weeks throughout the school year. Boasting an Innovation Center that showcases DuPont materials and interactive prototypes alongside operating application labs that can be opened for touring, the Center is the perfect venue to draw students into the incredible potential of the advanced manufacturing sector. Through a combination of personal en-

gagement and immersion in the fascinating world of advanced technologies, the Center and its team bring advanced manufacturing to life.

Diverse and formidable topics—such as product design, material properties, environmental testing, and manufacturing processes—become approachable and understandable through the humanizing combination of engineers and showroom prototypes. Advanced drones created with lightweight polymers, hybrid-electric and autonomous vehicles, and other example products help students understand the purpose behind advanced materials. Over several hours, students are pulled into the potential of DuPont's advanced materials that can transform the way we build, travel, and communicate.

The most often-asked question by the end of the day is, "What do I need to learn to work here?" And after their industry tour, each class visits a college or university to learn exactly that. After spending a day touring a campus, meeting student ambassadors and instructors, and learning about STEM and business programs related to the advanced manufacturing field, students depart with the understanding they need to chart their own education pathways towards their career goals. "FlexFactor allows us to contextualize education pathways for students, and college becomes a tool for them to achieve concrete career objectives," explained Dean of Workforce Development at





Evergreen Valley College Dr. Maniphone Dickerson.

FlexFactor was piloted in the fall of 2016 with an English class of eight students in San Jose, California, at Evergreen Valley College. In the subsequent two and a half years, the program has expanded to 3,500 students across three replication sites, including Lorain County Community College (LCCC) in Ohio, and Calhoun Community College and Drake State Community and Technical College in Alabama. Working with industry partners, such as DuPont, Boeing, Jabil, Lincoln Electric, Thygos, Agri-Nomix, A.J. Rose Manufacturing, Fetch Robotics, BD BioSciences, and others, the program is expanding across labor markets throughout the United States to address workforce development gaps.

With FlexFactor's scalable framework and materials, each ecosystem in which it is deployed develops unique DNA that reflects local industry needs and opportunities but produces the same empowered and motivated students who become the architects of their own futures.

Overall, FlexFactor's agile approach to building the advanced manufacturing workforce of tomorrow is resulting in a wave of students who are aware of and responsive to the variety of technical, business, socioeconomic, and environmental factors that inform the successful design, manufacture, and sale of next-generation products. Through applied and immer-

sive learning techniques, FlexFactor promotes initiative and comprehension, entrepreneurialism, awareness of the connections between disciplines, and the type of deeply analytical and creative thinking the advanced manufacturing sector is seeking in current and future employees.

For more information about DuPont's Silicon Valley Technology Center, visit www.dupont.com. For more information about how NextFlex's workforce development programs can help your community, visit www.nextflex.us/learning-programs/. **PCB007**



Brynt Parmeter is the director of workforce development, education, and training at NextFlex, and has a diverse background in both the public and private sectors. Before joining the private sector, Brynt served nearly 25 years as an infantry officer in the U.S. Army, rising to the rank of colonel.



Emily McGrath is the deputy director of workforce development, education, and training at NextFlex, and has a diverse background that includes experiences across government, industry, and education sectors. She attended Colgate University and Portland State University where she holds degrees in geography and GIS.