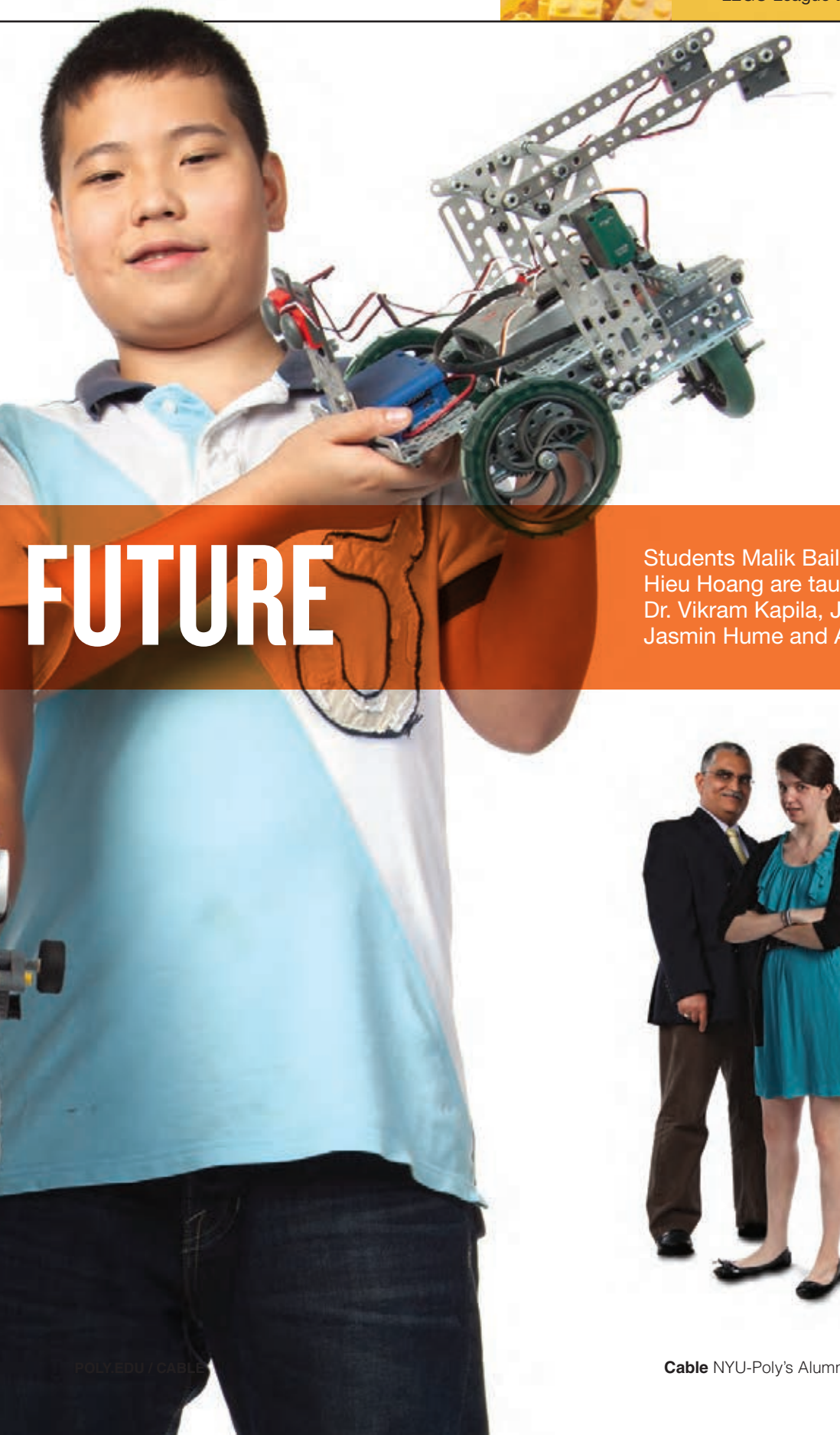
STEM: FOCUSING ON OUR

NYU-Poly graduate fellows mentor 16 FIRST LEGO League teams in Brooklyn.



FUTURE

Students Malik Bailey, Theory Cogbill and Hieu Hoang are taught by NYU-Poly's Dr. Vikram Kapila, Jennifer Haghpanah, Jasmin Hume and Andrew Cave.

Dr. Vikram Kapila (below left) is a principal investigator of the Central Brooklyn STEM Initiative.

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-Vikram Kapila, professor

A 21st century education requires much more than the classic three Rs. In order to keep pace with the ever-evolving technological arena, every child, from pre-K through high school, must have STEM (Science, Technology, Engineering and Mathematics) education as the cornerstone of their educational experience.

Unfortunately, the reality of our educational system is very different and as a result inadequate academic preparation closes people out of scientific careers at a young age, even though our 21st century economy depends on people well-trained in these subjects.

Another issue: good education costs money. "Some say you can deliver it on the cheap, but is that any great service to the students?" asks Vikram Kapila, professor, Mechanical and Aerospace Engineering, who has been involved in many STEM projects at NYU-Poly. "Students need to experience science the way scientists do."

Progress at Poly

Long before President Obama launched his Educate to Innovate initiative in January 2010 to boost STEM education, NYU-Poly faculty, graduate researchers and undergraduate students were collaborating to improve teacher preparation in STEM disciplines. For close to a decade, with the support of federal, state and foundation grants, a variety of programs have provided professional development for elementary, middle and high school teachers; put NYU-Poly engineering students in classrooms to co-teach; and given children science experiences that prepare them to be able to choose a STEM career.

Kapila has just completed the third year of the SMART (Science and Mechatronics Aided Research for Teachers) project, which educates teachers on using robotics-based lessons and activities. He has also brought middle and high school teachers to NYU-Poly, and sent NYU-Poly students to teach in city high schools. He had high school students performing summer research alongside graduate and undergrad students, in a program called YES (Youth in Engineering and Science). "What needs to happen at a national level is happening on a small scale here, with pilot programs leading to a much richer, much deeper professional development program," he says.

NYU-Poly STEMulus project introduced underprivileged high school students to new science topics and technology.

Another NYU-Poly effort last summer was the STEMulus Project, a four-week life-sciences course for a dozen high school students from the Urban Assembly Institute for Math and Science for Young Women, which serves mostly underprivileged students. Covering biology, chemistry and technology on the topics of cancer, diabetes and HIV/AIDS, it was designed and taught by three NYU-Poly graduate students under the direction of Jin Kim Montclare, assistant professor, Chemical and Biological Sciences. "They were exposed to technology they wouldn't otherwise have access to," says Montclare. "My grad students learned a lot, too. Being in the classroom compelled them to learn how to handle a group of students and how to teach."

NYU-Poly's Cybersecurity Awareness Week (CSAW) competition is a nationwide forensics challenge for high school students. Using digital evidence, such as a broken USB stick, they extract data in order to solve a murder mystery. "We were amazed how good the kids were—they solved challenges we didn't expect them to," says

▼ NYU-Poly's Central Brooklyn STEM Initiative pairs local teachers with graduate fellows.

President Obama's "Educate to Innovate" campaign was launched in 2010 to increase STEM literacy.

The Mechanical Engineering Lab at NYU-Poly is always filled with robots of every shape, size and function—even camera-equipped iPad and iPhone controlled ones (top).

Nasir Memon, professor, of Computer Science and Engineering. "You make it exciting enough and they'll do it, especially if we can provide resources and companies that will sponsor and mentor local schools." A fun challenge like this is also a way to attract girls and students who may not normally be inclined to science, he adds.

Maurizio Porfiri, associate professor, Mechanical and Aerospace Engineering, is involved in a number of K-12 outreach efforts. He recently supervised a program at the New York Aquarium, which mixed the aquarium's animals with state-of-the-art, bio-inspired robotics for "a fun science day, where elementary and middle school students were exposed to fundamentals of fish swimming and robotics, then designed a fish tail to propel a robotic fish," he says. In addition, every year his laboratory hosts two teachers to work on research projects in underwater mechatronics; his students in turn take their research experience and leadership into the classroom.

A Fellows program sends NYU-Poly graduate students into city classrooms every year. This year 14 Fellows will go to 23 schools in Brooklyn, where they will work with 2,000 to 3,000 kids, in classrooms with the Fellows or in after-school robotics. "We hope to be in 36 schools by next year, and eventually, 50 to 75," says Ben Esner, director of K-12 STEM Education at NYU-Poly.

Esner would like to see preschool kids getting STEM ed, too. "No child is too young to do science," he says. "We're working on a project that involves a preschool. Four-year-olds like to knock things over, so we do physics."

Esner has also applied for a Change-Maker Award from the Ashoka Foundation with a proposal to involve industry professionals in STEM education. "Our grads leave NYU-Poly making more than $60,000 in their first job. They're unlikely to become K-12 teachers, because their long-term earning potential is so high," he points out. "How then do we get a STEM professional to teach? I'd like them to feel they have an obligation to teach or mentor as part of their career path. More near-term, we are trying to build partnerships with industry to release their employees into schools for a couple of weeks a year."