
Students Explore Robotics, Crashes at GWU Science and Engineering Day

By Alex Bahr

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Hundreds of Loudoun County Public School students got an up close and personal look at many high tech professions available in today's job market at the fifth annual Science, Technology and Engineering Day held in partnership with George Washington University.

Students explored the technology and engineering behind the investigation and reconstruction of airplane crashes at the National Transportation Safety Board with an in-depth look at a famous crash from the 1990s. With the help of Paul Schuda, director of the NTSB Training Center, the students examined what goes into the investigation of a plane crash, from determining the cause of the incident to reconstructing the physical wreckage.

Just down the road, students tried their hands at developing an integrated robotics system, designing autonomous rovers to navigate a marked path through a maze and obstacles using infrared sensors; microswitches to correct their robot when it encountered an obstacle; and computer programming to allow the robot to function entirely independently.

Phineas Ben-Tzvi, a professor of the university, was on hand along with several graduate students to assist with building the robots, which required not only assembling the mechanical aspects of the rover, such as its motors and wheels used for propulsion, but also installing an on-board computer capable of receiving input from the IR sensors and providing the necessary commands to the motors and wheels.

Ben-Tzvi said real-life applications of the students' projects can be found in many professions, ranging from robotic health systems that allow doctors to operate on patients from hundreds of miles away, to search and rescue missions in disaster areas, planetary exploration and caring for the elderly-"the sky is the limit," he said.

While robots have featured prominently in industrial applications, such as in the automotive industry where stationary units perform programmed repetitive tasks like welding, today robots are "rolling out of the factories and into other applications with new challenges," Ben-Tzvi said. Some of those include intelligently interacting with the environment and using problem solving to overcome obstacles, as with the students' rovers.

Kyle Jefferies, who returned to the program for a second year and attends Park View High School, said the rover project presented him with new challenges. While he has worked with computer programming before, learning to integrate circuit boards into the robot was a new experience and a challenge, albeit one he welcomed.

"It's great because it exposes us to different fields," he said. "I think robotics is something I could really get into, and it's cool to get a hands-on feel for such a broad aspect of education."

At GWU's Exploration Hall, another group worked with Randa Samaha, director of advanced research at the National Crash Analysis Center, to study the cause and effect of motor vehicle crashes by examining real-life cases. Once broken up into teams, the students examined the circumstances behind a crash, including the environment at the time, driver reactions and the results of the crash, to look at new ways of making vehicles safer.

Samaha said 1.3 million people per year are killed in automobile crashes-that translates to 3,500 every day, or one person every 24 seconds, with an estimated cost of \$11 billion per year, according to the Centers for Disease Control.

After studying the crashes, students reported back to the group at large on their findings. In two of the incidents students found alcohol to be a factor-in another, speed and inattention led to a side-impact crash. Students suggested several safety features that will actually appear in new vehicles in the coming year, such as electronic stability control systems to counter driver overcompensation when attempting to avoid a crash and lane detection systems similar to those found in current Mercedes models that alert the driver when they are in danger of crossing into another lane.

Loudoun County High School physics teacher David Stark said the program provides great opportunities for students and teachers alike, providing the former with experiences and technology not found in standard high school science labs, and the latter with the opportunity to spur greater interest in science and engineering. Stark joked that at Loudoun County, it is almost a competition between the AP science teachers to recruit kids into their programs.

George Washington also benefits from the program, Chief Academic Operating Officer Craig Linebaugh said. The university strives to work in partnership with the community and has found great success with LCPS through programs like the science and engineering day, as well as others such as student art exhibits.

"Anything that helps bring people to our campus and helps us make that connection with the community is important to us," he said.

At midday, Robert Ballard, most famously known as the oceanographer that discovered the wreckage of the RMS Titanic in 1985, treated students to a special presentation. Ballard spoke about the importance of ocean exploration, noting that the vast majority of the ocean floor remains unexplored to this day and scientists have a better understanding of the moon than they do our own oceans.

"In many ways our planet is more alien than the moon because it is covered, 72 percent of it, by water. The average depth of the ocean is 12,000 feet, and it gets down to 37,000 feet," he said, adding that the largest mountain range on earth, the mid-ocean ridge, spans every ocean on the planet.

Ballard spoke about his most exciting discoveries-of life on the ocean floor at depths which no light can reach. Near the thermal vents that release heat from underground magma chambers, he and his team discovered worms two meters in length that expelled their lungs from their body. Fields of giant clams proved just as intriguing, having a reddish-black coloration and "a disgusting smell of rotten eggs." Further research revealed that the oysters were completely lacking in internal digestive organs, having been taken over by bacterium and converted to use chemosynthesis, a process in which they create energy through the oxidation of inorganic matter, such as hydrogen sulfide or methane, rather than sunlight as in photosynthesis.

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