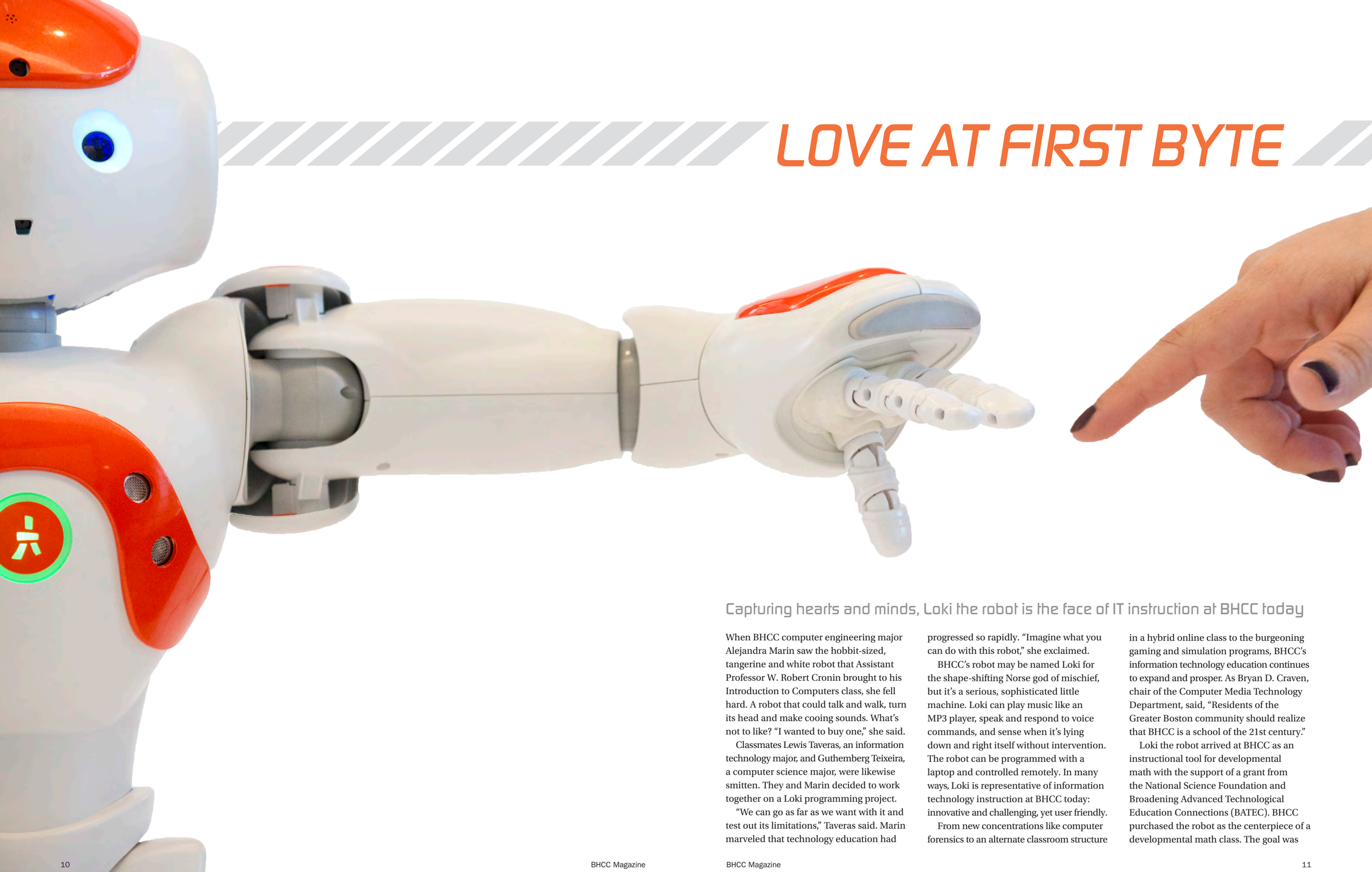
LOVE AT FIRST BYTE



Capturing hearts and minds, Loki the robot is the face of IT instruction at BHCC today

When BHCC computer engineering major Alejandra Marin saw the hobbit-sized, tangerine and white robot that Assistant Professor W. Robert Cronin brought to his Introduction to Computers class, she fell hard. A robot that could talk and walk, turn its head and make cooing sounds. What's not to like? "I wanted to buy one," she said.

Classmates Lewis Taveras, an information technology major, and Guthemberg Teixeira, a computer science major, were likewise smitten. They and Marin decided to work together on a Loki programming project.

"We can go as far as we want with it and test out its limitations," Taveras said. Marin marveled that technology education had progressed so rapidly. "Imagine what you can do with this robot," she exclaimed.

BHCC's robot may be named Loki for the shape-shifting Norse god of mischief, but it's a serious, sophisticated little machine. Loki can play music like an MP3 player, speak and respond to voice commands, and sense when it's lying down and right itself without intervention. The robot can be programmed with a laptop and controlled remotely. In many ways, Loki is representative of information technology instruction at BHCC today: innovative and challenging, yet user friendly.

From new concentrations like computer forensics to an alternate classroom structure in a hybrid online class to the burgeoning gaming and simulation programs, BHCC's information technology education continues to expand and prosper. As Bryan D. Craven, chair of the Computer Media Technology Department, said, "Residents of the Greater Boston community should realize that BHCC is a school of the 21st century."

Loki the robot arrived at BHCC as an instructional tool for developmental math with the support of a grant from the National Science Foundation and Broadening Advanced Technological Education Connections (BATEC). BHCC purchased the robot as the centerpiece of a developmental math class. The goal was

"One of the things I've learned as a historian is how technology can change the way people think."

Assistant Professor Monica Poole
History and Social Sciences Department

to develop and execute a curriculum in which students learn and apply important mathematical concepts by using Loki.

But Loki proved to be a tool in other classes as well, demonstrating BHCC's flexibility in adapting new forms of education that will be responsive to changes in the job market. And, as Marin, Teixeira and Taveras would learn, programming a robot provides skills in a host of area—from computer languages to linguistics.

This reflects BHCC's mission to reach out to students with all levels of technical ability and of all ages, ranging from the 18-year-old who grew up with a mobile phone in hand, to the 30-year-old who realizes that many career paths today require Excel, networking, Web design and other skills, to the 50-year-old professional updating his or her skills.

Providing support to BHCC's technology efforts are national grants including $2.1 million awarded to BHCC as part of a $20 million grant from the National Information, Security and Geospatial Technologies Consortium (NISGTC). This is part of a national collaboration among seven community colleges and 19 partners that targets IT specialties such as programming, network and data, geospatial technologies and cyber security. A sub grant from BATEC allows BHCC and other Massachusetts community colleges to develop and deliver IT programming.

Like the rest of the academic and business world, BHCC is working hard to keep up with the latest computing innovations, the ever-shifting job market for programmers, engineers and other professionals and even the latest twists in social media and mobile phone apps—all without departing from the College's underlying commitment to educate students with life-long skills in problem-solving, innovation and know-how.

"I tell my students I would rather hire a person who is a problem-solver, who can say 'I don't know how to do this thing, but I'm willing to sit down and figure it out,' than a person who is already an expert in something," said Jaime L'Heureux, assistant professor of computer information technology.

Technology education at the College has accelerated in recent years. Computer information technology Professor Paula K. Velluto recalls coming to work as a programming instructor at the College in 1983 when the courses still depended on punch cards. At first, BHCC had just one concentration: programming. Then, as the technology field exploded, more concentrations were added: operating systems, Web design, networking and security.

In 2008, a concentration in gaming and computer simulation was added. Craven recalls the initial skepticism over gaming as a viable career option. "But the program was built around where the market was going," Craven said. Starting with 10 students the first year, the gaming program has grown to 150.

In fall 1997, BHCC had 342 enrollments in computer technology degree programs. Today, about 2,100 students are enrolled in a variety of technical concentrations, including computer forensics, network security and support, wireless technology, help desk techniques, and Web design. Some classes focus on particular software such as Microsoft, Excel, Dreamweaver or Javascript, or on hardware such as routing basics. Students may study for Cisco system certifications, or get credit for Cisco training in other institutions. One of the newest certificates is Health Information Networking for the Cisco Certified Network Professional Program.

BHCC also has created a system of "stackable" credits carefully mapped to industry requirements. The 21 credits

Guthemberg Teixeira, Alejandra Marin and Lewis Taveras (photo, far right) taped their final project presentation with Loki the robot. It can be viewed at bhcc.mass.edu/loki

needed for a certificate in Health Information Networking, for example, can be stacked in the 29-credit Network Technology and Administration certificate, and that in turn can be stacked into a 64-credit Networking Technology and Administration associate degree. Associate degrees can be transferred in total to a University of Massachusetts Boston Applied Bachelor of Information Technology degree.

This means that a student might graduate with a certificate in networking, then get a job in that area to finance four more courses to earn a certificate in computer forensics, thus expanding job options. A student who already has a degree may enter at the 16-credit level, complete a certificate and enter the job market. So, the stackables work as "multiple entry points," Velluto said.

BHCC has fast-track options for those with time and resources to take a large course load and flexibility for students who proceed at a slower place. Internships are available and optional for many certificate programs. As many BHCC graduates can attest, technology training can set students on a path to prosperity and personal satisfaction. Twenty-nine-year old Ramon Delacruz turned his life around with the help of IT certificates from BHCC. Ramon immigrated to the United States at age 20 from the Dominican Republic seeking opportunities. He spent years sleeping in friends' living rooms, parking cars and living hand to mouth while he studied at BHCC. It was a very rough time for him.

Taking a Cisco certification course got him interested in computers and computer information technology professors like Biljana D. John kept "pushing, pushing, pushing" him, and others including Michael T. Puopolo, chair of the Computer Information Technology Department, inspired him to keep going.

Ramon got a part-time job at the College and worked doggedly to get his associate degree. Now a full-time systems analyst at the College, he has purchased a two-family home which supports his sister and mother as he continues to study for a bachelor's degree at Northeastern University in Boston. He hopes to get a master's degree and run his own business someday. He also recently became a U.S. citizen. "Bunker Hill Community College is doing a great job and I'm an example of it," he said.

Velluto was delighted when Delacruz was hired. "We had fostered that intellect and that knowledge and that desire that he had, and it was a pleasure to watch that growth," she said.

Aizhan Osmonova, 27, a native of Turkistan, knew little about computers when she came to this country in February of 2009, seeking political asylum with her parents. She started studying graphic design part time at BHCC in September 2009, quickly focused on Web design, and soon discovered she enjoyed the challenge of computer networks.

"I liked the idea of setting up networks and making sure everything works," Osmonova said. She secured an internship with the College's Web Communications Department at the time a new website was being designed. "She created design elements that became part of the new website," said Executive Director of Integrated Marketing and Communications Karen M. Norton. Through BHCC, Osmonova subsequently got an internship at Arnold Worldwide, the international advertising agency based in Boston. Noting that her BHCC courses were great preparation for her job, she now works at Arnold full time as a technical support analyst. In spring 2013 she graduated from the College with a dual major in Web development and networking and administration.

Job Asiimwe, a BHCC graduate in computer forensics *(story, page 36)* knows that keeping up with the information technology job market is a challenge. "Unlike many other fields, technology is like a storm, it keeps changing, it keeps moving and it comes in very many different ways. If you can't keep up with it, you're going to get lost," he said.

Or, as Monica C. Poole, assistant professor in the History and Social Sciences Department, put it, "People are going to have careers ten years from now that haven't been invented yet."

To stay tuned to market needs, BHCC recruits working IT professionals to teach courses, meaning students get a practical, hands-on view of what they will face in their field. The information security class, for example, is taught by Justin Grosfelt, a Boston-area cyber defense consultant, who has a stellar career in security. Another adjunct professor is Christopher Kelly, J.D., who works for the Attorney General's cyber crime lab, and who teaches a computer forensics course.

The rapid progress of technology requires a new pedagogy—a new style of teaching geared to the present and future. As L'Heureux says, "When was the last time someone in private industry took a multiple choice exam?"

Which is why BHCC has embraced new forms of teaching, such as in the new edX program *(story, page 32)*. And why problem-solving skills are emphasized.

Students often tell Velluto that they are stuck. "I'd say, 'Well that's a problem.' Then they'd wait and say, 'Aren't you going to tell us the answer?' 'No, I'm not,' I say. 'If I tell you the answer, six months from now, that answer is not going to be useful. What you need to be able to do is figure out how to find the answer and solve the problem, using every single resource available for you.'"

And yet, one of the challenges facing BHCC, as well as other community colleges,

is preparing students with basic skills in math, even while offering advanced courses. Many incoming students lack the math foundation they need for a successful future.

And this is where Loki steps in.

For students, robots are, admittedly, "cool." And for others, mathematics is intimidating—even frightening. This is what got Paula Velluto and other BHCC professors thinking about how math and computers are linked. Students "stay out of computers because they think it is all math, when in reality it isn't," Velluto said. And yet math is as essential a skill as problem solving.

Enter the irresistible Loki, made by the French company Aladebaran Robotics, a $16,000 machine with a humanoid appearance, two fingers and a thumb, 500 mb of memory, 25 degrees of movement and a sonar system—meaning it won't walk into walls.

BHCC purchased the robot for a developmental math class. Students can, for example, learn geometry by programming Loki to walk on a set of given coordinates.

Envision a scenario where teachers create a 20-by-20 foot graph, with X and Y axes, on a classroom floor with masking tape. Students are challenged with such problems as "Loki begins its journey at one position and needs to get to another position. If Loki can only move horizontally or vertically, what path must it take to minimize the distance traveled? Based on how fast a robot travels, how much time will be needed?" Students would use math to make the calculation and then program Loki to execute the result. Percent error calculations are part of the lesson. Thus, hitherto theoretical math concepts are given a physical form.

Loki is scheduled to be used during the summer of 2013 in a math program for veterans in a BHCC partnership with Suffolk University, and in the fall, for developmental math classes. Methods of teaching developmental math with Loki will be rigorously analyzed to see what works and what doesn't, said Assistant Professor Cronin.

> "We are technology immigrants; our students are technology citizens."
>
> Professor Paula Velluto
> CIT Department

That's just the beginning: "Loki is so powerful, we are also going to be using Loki in all of the programming classes," Velluto said. Ultimately, BHCC may offer a certificate in robotics.

"Many students arrive at the College saying they want to study engineering or computer science," said JoDe M. Lavine, Ph.D., associate professor in the Science and Engineering Department, who envisions using Loki in her classes. "But they don't always understand how broad those fields really are. By exposing them to a range of materials, motors, programming, sensors and more, Loki can broaden their views of their chosen disciplines."

Which is why Cronin brought Loki to his Intro to Computers class, where three students, Alejandra Marin, Lewis Taveras, and Guthemberg Teixeira decided their final class project would be to create a program for the robot. They decided they would push the physical limits of the robot by "teaching" it to perform "capoeira," a Brazilian martial art that incorporates dance and music; Teixeira is a practitioner. They wanted to have Loki speak in Spanish and Portuguese. And they wanted to get a good grade.

In early May, Marin, Taveras and Teixeira were ready to present their project with the robot they have dubbed "Robocito" or "Little Robot." The project was, they all said, much harder than they anticipated. The class was focused on the computer language C++; they also had to learn C# as well as "Choreograph," the graphical user interface program needed to make the robot move.

They began with slides explaining their research. Robocito then gave a short welcoming message in Spanish and Portuguese—a real challenge since the robot has no program for those languages. So the students devised a way for the robot to speak those languages phonetically.

"But enough of that," the robot said, now in English. "I am really excited to show you the capoeira stance I learned while in Brazil. Now, bear with me, I am a little rusty. Did you get it? Because I am a robot. Ha, ha."

When the laughter died, Robocito began the capoeira moves. The students flanked the robot protectively, as it tilted precariously on one leg. Indeed, they had to catch Robocito from falling a few times even as it uttered a programmed, "Ouch." The robot's joints started getting warm, so the demonstration was ended amid a loud round of applause.

"It was definitely fun working with the robot," Teixeira said. "A little frustrating, because we first thought we could easily program movement from point one to point two. But between those points there are many other what we call 'key frames': how it was going to move, how it was going to shift its weight."

"It was a lot of work," added Taveras. "But it was work we enjoyed doing." ■