Zainab Al-Firdaus has never had to look far for role models.

The 14-year-old Perrysburg High School sophomore is the youngest in a scientifically gifted family that includes her father, Dr. Abdul-Majeed Azad, associate professor of chemical and environmental engineering.

Her mother, Shakila Abdul-Majeed, is a PhD student in the College of Pharmacy, returning to the classroom after 22 years of raising a family. Her 24-year-old brother, Ahmed Fasih, is a second-year PhD electrical engineering student at The Ohio State University, and her 21-year-old sister, Ayesha Farhat, a psychology major at Owens Community College, plans to become a psychiatrist one day.

Dr. Abdul-Majeed Azad watched as Zainab Al-Firdaus, center, adjusted the rate on the syringe pump to regulate the flow of the viscous fluid that eventually electrospins into nanofibers, while Sara McKelvey looked on. The trio wrote a paper that will be published this fall in the Department of Defense’s Advanced Material Manufacturing and Testing Information Analysis Center Quarterly.

It’s Al-Firdaus, however, who is in the spotlight these days, a co-author along with her father and Sara McKelvey, a senior majoring in chemical engineering and bioengineering, of a scientific paper about fabrication of nanofibers of titanium dioxide, a photocatalyst with antimicrobial propensities, that will appear this fall in the Department of Defense’s Advanced Material Manufacturing and Testing Information Analysis Center Quarterly. Titanium dioxide is a ceramic oxide, a compound that provides the glow in house paints and is used in skin lotions and orthopedic implants. When activated by light, it produces free radicals that attack bacteria.

During summer 2007, Al-Firdaus worked closely in her father’s engineering lab with McKelvey. They got to know each other and hit it off.

“Zainab was a lot of fun to work with last summer,” recalled McKelvey, a Toledo native and
Sylvania Northview High School graduate. “Even though she was young and did not yet have a strong background in chemical engineering, she was a sponge for knowledge. She was always eager to learn about what was going on in the lab with our experiments and never hesitated to help. Thinking back, I can remember sharing with her all that I possibly could. Through her questions, I was able to see that she had a very scientific mind. I explained to her what we were doing in each step of each experiment and why we did it. By the end of the summer, it felt like she was the little sister I never had.”

Even though she was unfamiliar with the chemicals and tools used in the lab, Al-Firdaus said the “experience was really different and interesting.”

“I really enjoyed working in the lab because it showed me how science could be incorporated into an average person’s life,” she explained. “Science and discovery is appealing to me because of the fact that it can possibly make a person's life easier or healthier or even more exciting. Discovery is naturally amazing because humans are naturally curious and it’s enticing to be able to learn more and more about the world we live in.”

Most evenings find Al-Firdaus, who has a 3.8 grade point average, plowing through homework in chemistry, global studies, and advanced trigonometry and pre-calculus. Math is her hardest subject.

But science is only one of her passions. Basketball, soccer and piano are a few others. And she likes to hang out with friends.

Al-Firdaus has been inspired by her mother’s return to the classroom.

“When I was little I always thought that the saying ‘Nothing is impossible’ was just something that everyone told you,” said Al-Firdaus, who is particularly interested in the environment. “Now I realize that it really is true, thanks to my mom. She is definitely someone I aspire to be like. We don’t study together since her science is much more advanced than mine and her vocabulary has me lost most of the time, but we do have frequent conversations about her work and science in general.”

Azad wants to see young women enthusiastic about engineering careers and to learn science from not just textbooks, but in laboratories as well. It is very important, he said, to stimulate the next generation of inventors and to share the wonder and passion of scientific discovery.

McKelvey agreed and said she “benefited greatly” from the lab experience and that Azad was “a wonderful mentor” and “very passionate about his work.”

“He was always available to help or offer ideas if I was having trouble with my experiments,” she said. “He knew what I was capable of, so he expected a lot from me.”

“It was great to be able to apply so much of what I have learned in a hands-on experience. Working in a lab takes the learning process one or two steps further than learning in the classroom,” McKelvey said. “I was always challenged to be thinking about cause and effect, whether designing experiments or analyzing results. Working in a lab for me was not like work at all. I enjoyed it so much that I have decided to look primarily for research and development jobs after I graduate.”