By Sean Nealon

With a dozen middle school students’ hands in the air, David Morgan, an entomologist with the California Department of Food and Agriculture and an associate researcher at UC Riverside, ended his talk about using good insects to kill bad insects.

The class period was almost over and Morgan wanted to allow time for students to look at insects he brought to the Riverside Science, Technology, Engineering, Mathematics (STEM) Academy from UCR’s Department of Entomology.

The students darted to the back of the auditorium to look at the butterflies, beetles and bees. Others rushed the stage. The insects could wait. They wanted to talk to the man who studies insects. They asked questions about going to college and bugs they found in their backyard. Many brought pen and paper for his autograph.

That enthusiasm and focus on STEM is what educators across the nation, including many at UCR, believe is necessary to fill the growing need for workers in science, technology, engineering and mathematics — fields that drive innovation and competitiveness by generating new ideas, new companies and new industries.

From 2008 to 2018, STEM jobs are expected to grow by 17 percent compared with about 10 percent for non-STEM jobs, according to “STEM: Good Jobs Now and for the Future,” a July 2011 U.S. Department of Commerce report.

In 2010, STEM jobs paid on average 26 percent more than non-STEM jobs. In addition, from 2007 to 2010, the unemployment rate for STEM workers rose 1.6 percent to 5.3 percent while the rate for non-STEM employees jumped from 4.8 percent to almost 10 percent.

Filling those jobs is difficult. For decades, mathematics and science performance assessments have shown American students falling behind their peers throughout the world.

With that in mind, President Barack Obama is directing hundreds of millions of dollars during the next decade to move American students back to the top.

That is a much-needed and appreciated move, said Richard Cardullo, a biology professor at UCR who for more than 20 years has worked extensively with K-12 students and teachers. However, he wonders why, when warnings were sounded nearly 30 years ago in the 1983 federal government report “Nation at Risk: The Imperative for Education Reform,” it has taken so long to act.

“We’re beyond a crisis,” Cardullo said. “We just don’t have enough people in STEM fields to produce a competitive work force.”

UC Riverside is trying to change that.

The university has STEM programs that target students and teachers in elementary, middle and high schools, and community colleges and universities. Many of the programs focus on middle schools because those grades are when children are discovering science and mathematics but have yet to decide whether they are interested in the subjects.

The UCR-based ALPHA Center, a clearinghouse that puts educational research into practice in K-12 schools in Inland Southern California, is the base for many of those middle school STEM programs. Since it was established in 1998, ALPHA Center programs have reached more than 212,000 students, more than 13,000 teachers and nearly 1,000 administrators.

In 2004, the ALPHA Center was recognized with a National Science Foundation Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring by President George W. Bush at the White House. The ceremony honored the center for establishing a network of symbiotic programs that provide academic, financial and mentoring support in mathematics education to underrepresented groups, particularly women.

Two ALPHA Center programs specifically target middle school students. Both are led by Pamela Clute, executive director of the ALPHA Center, UCR’s assistant vice chancellor for educational and community engagement, and a mathematics educator for more than 40 years.

Girls Excelling in Mathematics for Success (GEMS) is a summer program that focuses on mathematics as it relates to practice in K-12 schools in Inland Southern California, is the base for many of those middle school STEM programs. Since it was established in 1998, ALPHA Center programs have reached more than 212,000 students, more than 13,000 teachers and nearly 1,000 administrators.

Girls Excelling in Mathematics for Success (GEMS) is a summer program that focuses on mathematics as it relates to college and business. Healthy Body-Healthy Mind is a weeklong summer program for boys and girls that focuses on developing a well-rounded individual by balancing the role of health education, fitness, nutrition and a positive mental attitude. Students receive instruction in mathematics as it relates to health and
The ALPHA Center also runs Mathematics Academy for Teaching Excellence (MATE), which establishes collaborations between mathematics teachers, university professors, undergraduate students interested in teaching and graduate students interested in research.

Cardullo, the UCR biology professor, also oversees two programs aimed at late-elementary and middle school teachers. He is working with several others, including Maria Chiara Simani, a former program director at the ALPHA Center and now executive director of the California Science Project, and Kimberly Hammond, a professor of biology at UCR. They work for several weeks in the summer in the Ontario-Montclair and Corona-Norco Unified school districts with about 160 teachers from those districts and several others.

With research showing students need to be actively engaged to learn, Cardullo and the others present experiments that make the scientific method accessible and affordable, and able to be completed in a short time. Elaine Haberer, an assistant professor of electrical engineering and materials science and engineering in the Bourns College of Engineering, and Marsha Ing, an assistant professor in the Graduate School of Education, organized another program that assists middle school STEM teachers and students.

Haberer and Ing collaborated with educators at Mira Loma Middle School in the Jurupa Unified School District. These teachers also collaborate with UCR’s Math Engineering Science and Achievement (MESA) Schools program, an award-winning program designed to inspire students who come from educationally and/or economically disadvantaged circumstances.

Last year, Haberer, Ing and three undergraduate STEM students implemented solar energy lessons with a classroom of eighth-grade students. In the coming months, they plan to work with up to five teachers to implement solar energy lesson plans and a solar-powered model car competition.

Haberer, who brings solar energy expertise, and Ing, who is interested in how students learn mathematics and science, feel middle school is the ideal time to reach students. “No one expects all students to become engineers,” Ing said. “But we hope to encourage more students to pursue engineering and build an informed public who supports emerging technologies.”

With research showing students need to be actively engaged to learn, Cardullo and the others present experiments that make the scientific method accessible and affordable, and able to be completed in a short time.

The STEM Academy, located within Central Middle School in the Riverside Unified School District, started in August with 200 fifth-, sixth- and seventh-grade students. The students receive 90 minutes of mathematics and science instruction each day.

“The best way to get them in fifth and sixth grade, they are so excited about everything you present to them,” said Tracy Lawrence, a science teacher at the academy. “It’s just the time to catch their attention.”

Several things set the school apart. The school is in the process of setting up a mentoring program that will pair students with STEM professionals.

Ward Beyermann, a physics professor at UCR who has a son attending the STEM Academy, is chair of the academy’s education partnership committee, which is helping to coordinate the mentor program. He envisions mentors from area colleges and universities and high-tech industries helping to take science fair projects to the next level.

“In most cases, students put together the project, it is judged and then it disappears in the trash can,” Beyermann said. “We are thinking of multi-year projects that will continue to get more sophisticated with time.”

Also unique is a weekly symposium that brings in guest speakers such as David Morgan to talk about their careers in STEM fields. To date, about a half-dozen of the symposium speakers have been affiliated with UCR. They have spoken about everything from citrus to air quality and the smallest insect to the largest galaxy.

“This kind of connection with a university creates a pipeline from middle school to high school and right on to UCR,” said Dale Moore, Riverside STEM Academy coordinator. “That’s what we are looking for.”