RALEIGH, North Carolina (AP) -- In knee-high rubber boots, Jennifer Young peers out over a dozen or so sows and their litters, seemingly oblivious to the stench coming from their pens.

Pigs have been Young's constant companions during her five years at North Carolina State University, whether it's been running their genetics statistics on a computer, or more odious tasks like weighing and measuring them in the muck at the "Swine Education Unit" on a university-owned farm.

It's been time well spent. Working with animal science Professor Joe Cassady, she's presented data at conferences, met the big names in the field, landed internships and tweaked her career plans. This fall, she'll attend a top graduate program at either Iowa State or Nebraska.

"You get a much more personal experience than just being one person in this huge classroom, where you might not get to actually connect with the professor," she said.

Traditionally, undergraduate education has taken place in the classroom, while research has been for graduate students and faculty. No more. Colleges and universities are pushing hard to get many more undergraduates involved in research.

More than one-third of graduates at the University of California-Irvine do research work with faculty. Rutgers, Georgia Tech and the Universities of Florida and North Carolina-Greensboro are among numerous large institutions to ramp up major undergraduate research initiatives in recent years.

So have smaller schools, like Meredith, a women's college in Raleigh. And numerous journals and conferences have sprung up as venues for young researchers to present work.

"Nationally, there is nothing hotter than undergraduate research," says George Barthalmus, N.C. State's director of undergraduate research.
Occasionally, undergraduates make genuinely important research contributions -- such as the University of Michigan students involved in the discovery of a key breast cancer gene.

Far more often, though, it's about experience rather than outcome.

"It changes the students," Barthalmus says. "They see themselves more like graduate students and faculty. They go to faculty seminars. They become colleagues."

Though it may take time to train undergrads, they are cheap labor for faculty; students can be "paid" with course credit or through the government-subsidized work-study program. Large schools also use it as a marketing tool, to assure prospective students that they'll work closely with mentors and won't get lost in the crowd.

It's also good for a college's reputation, which depends on students moving to the next level. Undergraduate research has become almost a prerequisite for top graduate programs. That's a big reason demand is skyrocketing -- N.C. State can't say exactly how many undergraduates do research, but the number is growing rapidly. In the chemistry department, 58 percent of majors do research, compared to 15 percent five years ago.

Meanwhile, government agencies like the National Science Foundation are throwing big money into the concept, hoping to encourage a new generation of scientists.

The push also is coming from a growing recognition that whether it's science or literature or history -- research seems to do students all sorts of good, even if they don't make a career out of it. Not only are undergraduate researchers more engaged in their subject, but they also appear to improve more broadly in teamwork and collegiality -- skills employers value but complain students don't typically learn in class.

They also gain a network of people who help keep them on track to graduation. Students involved in research "are more likely to go visit faculty in their office hours because they think the faculty really care about their academic success," said Sandra Gregerman, director of the Undergraduate Research Opportunity Program at the University of Michigan.

And there's some evidence that research gives an extra boost to groups that fall off track at higher rates, such as minorities and women interested in science careers.

Low-income students are another target group. N.C. State is tying undergraduate research to its new "Pack Promise" financial aid program. Its goal: Find research jobs for any students who participate in the work-study program and want them. If they need to work, N.C. State concluded, it's better to do something academic than to, say, wait tables.

"This is really like another class," says Katie Youngs, a first-year Pack Promise student who has just started working with Cassady's animal science group and is learning the ropes from older students like Young.

For all the benefits, scaling up undergraduate research is a challenge. Elaine Seymour, a University of Colorado researcher who has studied the trend, says teachers want to be mentors but can't "handle a whole new load of students who may or may not be potential scientists, and may have cottoned on to the notion that it will help them get into medical school."
If universities want to get faculty to take on undergraduates, they'll have to reward them for the work when they apply for tenure, she said. It's a sore subject, though some academics say their institutions are slowly coming around.

Cassady, who is up for tenure this spring, says he believes N.C. State respects the time he puts into it. Besides, he said, it's fun.

"I just enjoy it," he said, checking on the sows and litters with Young. "I could go to the USDA or private industry and probably get paid more. But I wouldn't get to work with students."

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