



Nothing Like the Real Thing

UMMS laboratories partner with a local high school to increase achieving students' seriousness about science.

By Andrea L. Badrigian



A multiple choice quiz: Please read the following passage and then select the most appropriate statement from the choices that appear below:

When research is mentioned in the media, they only show faceless figures behind white lab coats and goggles. It makes the whole research area seem technical and impersonal. The field is actually very involved and emotional. The process is dynamic, with ups, downs and even 180° turns. Yet, what drives this process is the fact that every step, the biggest downs and the smallest ups, is a discovery. Research is very true to the dogma of science: whether it brings breakthroughs, mistakes, successes or failures, it's about learning and doing from what you learn. The reality of experimentation, and of most other things in life, is you never know what to expect. Making mistakes is OK and failures can only add to success. Errors are part of the process; being able to explain the errors and figuring out how to avoid them next time is the important part.

The author of this passage is:

- A. A former Worcester North High School student.
- B. A student who scored a 5, the highest possible score, on the Advanced Placement Biology Examination prior to his entrance to Cornell University.
- C. A participant in the program that brings exceptional high school students to the labs of UMass Medical School researchers to advance their scientific knowledge through hands-on experimentation with the most advanced equipment available.
- D. All of the above.

Loc Van will tell you, the answer is D. He is all of the above and much more, as are each of the students that have, over the past five years, joined their North High Advanced Placement (AP) Biology teacher Jane Raabis in UMMS laboratories to view the processes of mitosis and meiosis, enzyme catalysis, and genetic and molecular development in all their splendor. “Doing labs in class is great, but nothing beats seeing the real thing,” said Loc.

Kevin Quang, a North High graduate and junior at UMass Amherst, is just as enthusiastic about the hands-on exposure he gained at UMMS. “I’ve always known that I wanted to pursue a career in the scientific field, since biology always interested me. How can’t the study of life interest you? Visiting the UMass Medical School labs let me experience biology as a ‘scientist’ first-hand and not just as a student reading it out of a book. I actually had the opportunity to squeeze eggs out of a frog and work with live fruit flies. A book definitely can’t beat that learning experience.” At UMass Amherst, Kevin found he was a step ahead in his Biology 100 and 101 labs. “The labs done at the Medical School, such as transforming bacteria to become resistant to an antibiotic or working with enzymes, are also done here at UMass Amherst. I was able to help other students who didn’t understand the lab, and it made the lab report much easier for me.” The North High-UMMS collaboration requires students to keep detailed lab notebooks, chronicling the experimental “ups and downs” Loc Van described. “Manuals weren’t required for my labs at UMass Amherst,” said Kevin, “but I found myself scribbling down information in my notebook anyway and this helped me when it came to doing the lab report.”

UMass Medical School’s Stephen J. Doxsey, PhD, and North’s Raabis beam when they hear former students—now studying science in college—attribute part of their academic

success to the program the two have maintained since 1999. They mention others that characterize the caliber of learners they've been privileged to shepherd through the collaboration: Melissa Jacquez, who scored an impressive 3 on the AP test and is now majoring in biology at Holy Cross; Maria Black, a nursing major at Fitchburg State College; and Wemoor Randolph, a current North High student who plans to be an obstetrician.

Dr. Doxsey, associate professor of molecular medicine, biochemistry & molecular pharmacology and cell biology (a title that reflects not only the fields in which the scientist is well-versed, but also his suitability as a designer of the program),

brought the idea of students in full-fledged labs to North High's principal, Robert Boulé; science department head, the late Robert Davis and biology teacher Raabis in the spring of 1999, based on his experience as a post-doctoral fellow at the University of California/San Francisco. "I was involved in a science education program at UCSF, initiated by Dr. Bruce Alberts who is now president of the National Academy of Sciences, that connects researchers with students," said Doxsey, who assisted middle school pupils with their science projects. "One of the first things I did when I came to UMass Medical School was to reach out to North in the same way." One of North's former students, Nora Aboody, went on to win the state Science Fair competition

after working with UMMS. "I then wanted to get involved at some other level," said Doxsey, and the AP Biology class concept came to be.

"It started small," said Raabis, North's current Science Department chair, who noted that six students—all female—first entered the UMMS labs with the objective to complete a portion of their required course material there, using sophisticated equipment North simply couldn't provide. "This program was an answer to several things for us," said Raabis. "Not only did the UMass labs give us the advanced equipment that allowed us to complete gel electrophoresis, transformation and enzyme catalysis, but the program also served as a response to the state's mandate



Left, Jane Raabis, North High's Advanced Placement Biology teacher, demonstrates the proper technique for coaxing frog eggs for North senior Francis Adu-Gyamfi. Below, students Sylvia Roman and Jermaine Collins-Watkins retrieve a frog to try it themselves. The frog eggs are then encouraged to undergo cell division, while students watch with the naked eye. The process can also be magnified; Steve Doxsey, PhD (page 12), views the slides he has prepared for students to analyze via the computer screen. The monitor shows the colorful, fluorescent expression of a living cell protein, revealing microtubule fibers in the mitotic spindle during cell division.





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– Kevin Quang, North High graduate
and student at UMass Amherst

that high schools restructure the school day to increase student achievement.” North High had moved to block scheduling of courses and a semester system, allowing students to carry fewer classes, yet spend more time in each. “AP Biology would now meet for 99 minutes each day all year,” Raabis enthused. “What a great opportunity for our students—this new partnership fit

the mission of North as well as UMass Medical School in terms of outreach.” (See related story, below.)

And what a great selling point for Raabis, as she worked to recruit an increasing number of students, from a variety of diverse backgrounds, to the challenging AP Biology course. Achieving students take the course to prepare for the Advanced Placement

Biology Examination and, if they score successfully, for a freshman year in college exempted from prerequisite science classes. “The partnership with UMass was successful from the start; the kids were very excited. No other high school in Worcester has this opportunity,” said Raabis. Her class numbers grew, from six, to nine, (males now joining in), to a high of 19 in

Pipeline promotes opportunities for thousands of area students

Bringing North High School students to UMMS laboratories isn’t the first and only connection between the two educational institutions. North’s Health Science Academy was established through the Medical School’s Worcester Pipeline Collaborative, a decade-old outreach initiative that has introduced the varied opportunities inherent in the health and science fields to thousands of local students, primarily those from minority and economically disadvantaged backgrounds. Jane Raabis, the AP Biology teacher at North, is grateful to the Pipeline for supplying transportation for her students to the world of UMMS research. “With the Health Sciences Academy and AP Biology class at UMass, our school has covered all of the bases for all its students, no matter where they are in their academic level.”

The Pipeline is nationally recognized as a successful educational partnership between the Medical School and local health care institutions, scientific companies, colleges and the Worcester Public Schools. As it

strengthens overall educational efforts to promote scientific literacy in the community, the Pipeline prepares the workforce for jobs in biotechnology, health care and research through mentoring, internships and job shadowing programs for students, and professional development and curriculum assistance for teachers.

Many students who participated in the early years of the Pipeline are now graduating from college and seeking careers in the life sciences field. According to Deborah Harmon Hines, PhD, UMMS associate vice chancellor for school services, the Medical School is waiting with anticipation at the end of the Pipeline to hire its “graduates” whenever possible. At a recent UMMS Job Fair, qualified Pipeline participants were given preference for many of the available positions. According to Dr. Harmon Hines, “This institution decided to support Pipeline programs some 10 years ago, and it’s now starting to pay off in the employment realm.”

September 2002. “At that point, we had to break the class into two groups when we visited the Medical School,” said Raabis, who this past year brought 14 students to the labs of Doxsey (mitosis and meiosis) and his colleagues David Lambright, PhD (enzyme catalysis); Craig Peterson, PhD (molecular biology) and Tony Ip, PhD (genetics of organisms).

Dr. Ip joined Doxsey and Raabis’ program as “the only fruit fly biologist on the campus at the time,” he said. “The students come to my lab to do short

have as much of the enzyme to break down alcohol as other ethnic groups, and the kids just thought that was really cool, that he would even talk about that.” Such openness encourages the students to ask questions at the same time it dispels myths about “the scientist.”

“I usually start from the top, describing how research at UMass Medical School complements the work of our clinical partner, and how I fit in as a scientist—what is my day like?” explained Doxsey about his initial approach to each new

Doxsey and his colleagues find the program “so satisfying. When the kids leave we know they’ve learned something—what makes us tick. They realize that this is a cool environment where people are trying to figure things out using these different tools and it can be very attractive.”

“Steve and the other investigators really give the kids the sense that they can see themselves doing something like this,” said Raabis. She watches the students’ confidence grow throughout the year, as they complete each of the labs. “They

North High 10th-grader Yuee Liu in the Doxsey lab

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— Jane Raabis, North High Science

Department chair



experiments on mating behavior and alcohol sensitivity. They always show their curiosity and interest, truly budding minds in science. It’s rewarding to know that one day they may remember they did some interesting experiments at UMass Medical School.”

Raabis is certain they’ll remember, in part because the scientists themselves are accessible people, who dress in jeans and speak to the students on their level, without a trace of condescension. “Tony came right out and told the students that Asian people, he being one of them, don’t

class of students. “I introduce the post-docs and assistants in my lab and describe where they are in their careers as well. This really provides a sense of progression for the students.” When Doxsey details his work in cancer research, he establishes an immediate connection. “The kids start talking—they say ‘yeah, I have a relative with cancer.’ Soon they understand why the cell division they’ll witness in the lab is a step toward seeing that abnormal processes in our bodies can cause cancer.”

enter the AP Biology class with experience in science rooms that have no sinks, no tables, and then enter the labs at UMass with full equipment and someone working in the field to guide them. It makes all the difference.” And, Raabis noted, the time and effort the investigators put in is not lost on the students. “These kids really appreciate this opportunity, which always exceeds their expectations. And, they know they are special because they have been chosen to be part of this. It’s like icing on the cake. It makes it the best that it can be for them.” ©