Education Week: MIT Orient Course Materials Online to K-12

By Sean Cavanagh

(February 5, 2008) - Many of the students in Rebekka L. Stone’s biology classes hope to become the first in their families to graduate from high school. Some are struggling to master basic English, much less the more intricate language of science.

Yet when she wants to introduce a topic to her students or reinforce one they’ve already covered, the Homestead, Fla., teacher doesn’t hesitate to direct them to one of the most elite sources of scientific information in the world: the Massachusetts Institute of Technology.

The third-year teacher is just one of many science and mathematics educators across the country taking advantage of a Web site created by MIT, the famed research university located in Cambridge, Mass., which offers free video, audio, and print lectures and course material taken straight from the school’s classes. Those resources target K-12 teachers and students.

Known as Highlights for High School, the online site is an extension of MIT’s OpenCourseWare initiative, a project launched in 2001 with the goal of providing free public access to all the university’s courses and curricula via the Internet.

“It empowers students to think beyond this classroom,” said Ms. Stone, who teaches at Homestead Senior High School, outside Miami. “A lot of students have no idea what a college is like. They have no idea what a college lecture is like. ... It takes away some of the fear.”

While many universities have set up free, online video, audio, and print course materials in recent years, the MIT high school site is unusual both in terms of the sheer volume of information available and its specific organization for a K-12 audience.

The site includes more than 2,600 video and audio clips from faculty lectures, as well assignments and lecture notes. Some of that material is assembled on the site for specific high school classes, such as Advanced Placement biology, calculus, and physics, which are college-preparatory courses.

But the online portal also allows high school teachers to search by topic for faculty lectures and assignments and use them as they see fit.

A Different Voice, Online

Ms. Stone sometimes plays the online MIT video clips on her classroom’s overhead projector, or has students take turns watching them on individual computers.

Many of her students come from families that have recently arrived in the United States and speak primarily Spanish at home. Others are natives of Haiti and are most comfortable in Creole. The video lectures, she says, allow students who are struggling with a concept, or with the English language, to pause, rewind, and replay sections they don’t understand the first time, without embarrassment.
For some teenagers, Ms. Stone added, seeing or hearing an explanation of a concept is easier than reading it in a textbook—and much more entertaining.

She has also used video clips to test students’ knowledge. She recently used a portion of an MIT professor’s online ecology lecture to quiz students on material she had already covered.

Hearing a college professor discuss the same science that her students are studying not only reinforces their understanding, but it conveys the point that the material is important, Ms. Stone says. It also underscores the idea that college-level science is more accessible than they think.

MIT took a major step toward increasing public access to its resources online six years ago, with the creation of OpenCourseWare, an effort to place all the university’s course materials on the Internet at no cost. The OpenCourseWare site (http://ocw.mit.edu/OcwWeb/web/courses/index.htm) now houses material from 1,800 courses, in subjects such as architecture, physical education, history, literature, and political science, as well as math and science. The university has spent $29 million on the site and has about 40 employees who develop and maintain it, said Steve Carson, external-relations director for MIT’s OpenCourseWare.

University officials were aware that thousands of OpenCourseWare’s visitors were high school teachers and students, Mr. Carson said. With that interest in mind, MIT last year began planning a site geared specifically to that audience’s math and science needs, a project that university leaders saw as especially relevant given the broad national interest in improving students’ skills in those subjects.

Courses and materials for the high school site were selected with the help of faculty members, university employees, and MIT freshmen, who identified resources they saw as helpful to preparing them for college-level work, Mr. Carson said. That material was then channeled into a separate high school site.

OpenCourseWare’s site receives about 1 million visitors per month. Since it was launched in November, Highlights for High School has drawn about 100,000 visitors, MIT officials estimate.

The K-12 contributors include MIT professor Gilbert Strang, whose lectures on linear algebra are among the most popular on OpenCourseWare site. Mr. Strang has taught at MIT since 1962 and written numerous math textbooks, which are used by colleges and some high schools.

In one video clip, for his course 18.06: Linear Algebra, Mr. Strang, dressed in a navy shirt and slacks, is shown taking students through a series of exercises, which gradually increase in difficulty.

“A matrix is just a rectangular array of numbers,” he says, working on a chalkboard behind him. “Here, it’s two rows and two columns.”

Mr. Strang defines linear algebra as the study of matrices and systems of linear equations. He hopes his lectures on that topic will help students who are taking Algebra 2, or related courses, in high school and want to delve further into that subject.

“I’ve always wanted to make more of a contribution to K-12,” Mr. Strang said in an interview. “I’ve been able find a way to contribute,” he said, referring to the Web site. “I’m very supportive of the whole idea of making these courses available to people around the world.”

Organized Access

Universities have long regarded improving K-12 education as part of their mission, said Diana G. Oblinger, the president of Educause, a Washington-based nonprofit group that supports technology’s use at colleges and universities. In recent years, however, more institutions have gone from providing online resources “about” math and science to providing access to firsthand research and courses those schools’ faculty are conducting themselves.

What makes the MIT high school site unusual, she said, is its simplicity and clear organization.

“One of the biggest barriers for people using this material is time,” Ms. Oblinger said. “You need to make it easy for people and integrate it.”
Gerald F. Wheeler, the executive director of the National Science Teachers Association, said one of the clearest benefits of university sites such as MIT’s is that they give high school students a preview of college-level work. His 55,000-member organization, based in Arlington, Va., offers numerous free Web-based resources for educators and students.

The downside, he argued, is that a lot of online college science material is presented through lectures, instead of through lessons and activities that his organization believes students will find more engaging. Universities “haven’t moved away from that [lecture] model,” the NSTA official said.

Jesse Southwick, a teacher at the Boston Latin School, a public school in that city’s 56,000-student district, sometimes uses the MIT online site to begin discussions or to review material, and occasionally uses it for students who need extra help.

Mr. Southwick, who’s taught AP physics for five years, believes the biggest beneficiaries of the site will be new teachers, or those returning to a topic they haven’t studied since college, years before.

“If I was new at this, I’d watch all those lectures beforehand,” he said. “You’d watch a lecture to know that you were not way off base, way off track.”

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