

The world's a classroom? Thanks to technology, it can be

By Stuart Wolpert | 3/19/2009



Credit: Reed Hutchinson/UCLA

The UCLA professor called on one of the students in his classroom during a discussion about whether the genes in your chromosomes can be patented. He then called on another student in a classroom some 370 miles away, at the University of California, Davis.

Undergraduates from both campuses are participating in a distance-learning honors course on genetic engineering and its implications that uses state-of-the-science technology, including high-quality audio and video over a high-speed fiber optics network. The students can see and hear one another and the professor in each classroom in real time.

The instructor, Robert B. Goldberg, a UCLA distinguished professor of molecular, cell and developmental biology, taught the same course with students from Japan's Kyoto University, separated by the Pacific Ocean and a 17-hour time difference, in 2004. He envisions expanding distance learning and encourages other professors to do so as well.

"We have the potential to connect, in one class, students from the United States, Europe, Asia and South America — like what's done on television news where someone's in Washington and someone's in Baghdad and someone's in Moscow," said Goldberg, a member of the National Academy of Sciences, who has won awards for his teaching. "There is the potential to bring people from different parts of the globe together in a global village of education. What an amazing experience for the students! Imagine the cultural differences. We can give students experiences that they would never have.

"It's seamless; there's no lag with the fiber optics cable," he said. "It's like being in the same classroom. It's a really novel opportunity to see what people at other campuses in different cities, with very different backgrounds, think about issues. This class can be a really good model for interactive higher education teaching."

Class sessions from the UCLA–UC Davis course are shown on YouTube at www.youtube.com/view_play_list?p=3D6BD220BC6AC096.

The class uses the California Research and Education Network (CalREN), a high-bandwidth, high capacity network operated by the Corporation for Education Network Initiatives in California (CENIC).

"People have e-mailed me from as far away as Europe and said they saw the class and they have never seen anything like it before," said Goldberg, who will teach the course again next year.

He teaches as if it's one classroom. Students, mostly non-science majors, make oral presentations in groups and participate in group discussions and instant polls. Goldberg will ask a question, such as whether genes can be patented, and the students will vote using a hand-held device. Goldberg, who is collaborating with John Harada, a UC Davis professor of plant biology, immediately sees on a screen the percentages of students who have given various answers. He then calls on students to defend their views.

"It's totally interactive, totally integrated, which adds to the educational experience of everybody, and it's a lot of fun," Goldberg said. "The kids love it. I love it; I think it's fabulous."

The students have participated in various laboratory demonstrations in class, including DNA extractions and DNA fingerprinting. There have been guest speakers on topics such as genetic testing, the science and ethics of stem cell research and cloning, biofuels, and genetically modified organisms in plants. One day, the UC Davis students came to UCLA to meet their classmates.

Goldberg uses lectures, film clips, debates and discussions to provide an understanding of how genetic engineering is carried out and what societal issues are raised by the use of this powerful technology.

"The students learn how to think critically," he said.

In the course, "Genetic Engineering in Medicine, Agriculture and Law," Goldberg covers a wide range of issues, from how genes work to the medical, legal and ethical issues surrounding genetic engineering.

"For the first time in human history, we have control over our biological destinies by using powerful genetic engineering technologies," he said. "The course covers what genetic engineering is and how it has affected our lives and society. The goal of this class is to put genetic engineering into a scientific and historic perspective so that students can make objective decisions about how this technology should be used in the future.

"Questions addressed include: How are genes isolated, reprogrammed and put back into living cells in order to change their genetic destiny? How has genetic engineering helped push back the frontiers of basic knowledge, created a multibillion-dollar biotechnology industry and become part of our daily lives? What federal and state laws govern our ability to manipulate living organisms, and what does the Constitution say about science? What is the potential for using genetic engineering to create and combat bioweapons? How is genetic engineering being used to create the livestock and crops of tomorrow? What are the ethical issues related to producing genetically engineered food and powerful new drugs? What are the implications of using genetic engineering to diagnose and cure diseases as well as enhance human life?"

At the end of the class, students will have the opportunity to conduct research in Goldberg's laboratory using many of the genetic engineering technologies they have read about and discussed.

Goldberg notes that his distance-learning courses have at times highlighted significant cultural differences in teaching and learning. When he taught the class with Kyoto University, for example, he found that their students do not ask their professors questions.

"I had to get them to overcome the cultural inhibition to raising their hands and asking a question," he said. "That took two or three weeks. The Kyoto students said they had never seen teaching like this in their lives. Their professor said he learned more about teaching methods than he ever learned before."

The course is made possible through UCLA's Office of Instructional Development and is funded in part by a federal grant to Goldberg and Harada from the National Science Foundation Plant Genome Program.

"UCLA is a fabulous place to teach," Goldberg said. "There are so many resources available to us."

UCLA is California's largest university, with an enrollment of nearly 38,000 undergraduate and graduate students. The UCLA College of Letters and Science and the university's 11 professional schools feature renowned faculty and offer more than 323 degree programs and majors. UCLA is a national and international leader in the breadth and quality of its academic, research, health care, cultural, continuing education and athletic programs. Four alumni and five faculty have been awarded the Nobel Prize.

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