The
MIT-China – OpenCourseWare Initiative

Pilot Project Team Report

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Qinghai University • Xining, China

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1. PROGRAM DESCRIPTIONS

Background: MIT-China

At an institution devoted predominantly to science and technology, the MIT International Science and Technology Initiatives (MISTI) Program is built upon the conviction that aspiring scientists, engineers, technologists, and managers need to be trained to work across borders in an increasingly globalized world. Towards that end, MISTI prepares students for careers as global professionals by combining an MIT education with intensive language and cultural training, "hands on" experience in overseas internships, and follow-up involvement in on-campus seminars. Through this approach, MISTI provides students with an unusually comprehensive and in-depth introduction to the challenges of working in the global setting. To date, over 1,500 students have participated in MISTI internships in laboratories, offices, and classrooms from Beijing to Berlin.

Founded in 1994, the MIT-China Program has become a pre-eminent center for applied Chinese studies, giving students the chance to work in a Chinese setting and participate in the rapidly expanding world of Chinese business and technology. Students combine their knowledge of Chinese language and culture with their technical or business expertise by working as interns in companies, universities and secondary schools in China, Hong Kong, and Taiwan. Participating students are selected in close cooperation with their academic advisors, who make recommendations on the basis of each student's academic performance. The special qualifications of each candidate are closely matched with the expectations and demands of the host institution. Since its inception, the MIT-China Program has placed more than 350 students from all courses of study as interns with our partners abroad.

While many MIT-China Program participants travel abroad on individual internships, MIT-China Educational Technology Initiative (CETI) trains teams of MIT students to teach at Chinese high schools, building cross-cultural understanding between younger generations of Chinese and American students through the use and understanding of technology. CETI curricula have expanded from Internet projects to include aero/astro engineering, civil engineering, biotechnology, web design, e-commerce, and digital imaging. More recently, CETI has begun to send teams to schools in rural villages in the provinces of Jiangsu, Sichuan, Shaanxi and Hunan. In addition, CETI has sent a team of students to provide computer training to villagers in rural counties of northern China.

Background: MIT OpenCourseWare (MIT OCW)

On April 4, 2001, MIT announced its commitment to make the materials from virtually all of its courses available through the large-scale, web-based, electronic publishing initiative known as OpenCourseWare (OCW). The goal of this long-term project (funded jointly by the William and Flora Hewlett Foundation, the Andrew W. Mellon Foundation, and MIT in the project's start-up phase) is to promote the sharing of knowledge by providing educators, students, and self-learners anywhere in the world with free, searchable access to MIT's course materials. OCW provides users with open access to the syllabi, lecture notes, course calendars, problem sets and solutions, exams, reading lists, and a selection of video lectures from over 900 courses representing 33 academic disciplines and all five of MIT's schools. Users from more than 215 countries, territories, and city-states have visited the OCW website since it was opened to the public in the fall of 2002. By 2007, the site will include materials from 1800 MIT courses.

OpenCourseWare users are overwhelmingly finding that OCW has, or will have, significant positive impact on teaching and learning activities (for a full description of how the impact of OCW is measured and evaluated, please visit the OCW website at http://ocw.mit.edu). Educators, in particular, report very high impact on teaching practices, with many noting that they have, or plan to, reuse MIT course materials. Such findings augur especially well for the adaptation of OCW materials in developing countries and other locales that are seeking to strengthen their educational systems.

MIT-China – OpenCourseWare Initiative

The MIT-China – OpenCourseWare Initiative is a collaboration between the MIT-China program and MIT OpenCourseWare to introduce the concept and benefits of OpenCourseWare to students and educators in hinterland provinces of China. Qinghai University was selected as the location for the 2004 pilot project. Situated just outside the city of Xining on the Tibetan-Qinghai Plateau at an elevation of 7,500 feet, Qinghai University was identified through MIT's partnership with Tsinghua University in Beijing, which has been working closely with Qinghai to help improve education standards in China's western provinces.

The six main goals of this summer's pilot project were to:

1. promote cultural and technical exchanges between MIT and Qinghai University students and faculty
2. introduce Chinese college-level students to western education methods
3. introduce MIT-OCW to Chinese students and educators

4. teach a six-week curriculum on fundamental concepts in Biology, Computer Science, and Environmental Engineering
5. gather feedback about the project from Qinghai students and faculty
6. establish a solid relationship with Qinghai students and faculty to ensure future collaborations

The pilot project team consisted of three current MIT students and two recent MIT alumni:

- Yiqun Bai (’06, Chemical Engineering)
- Siqi Chen (’02, Biology)
- Peter N. Jeziorek (M.S. ’05, Mechanical Engineering)
- Salvatore Scaturro (’04, Civil & Environmental Engineering)
- Michelle Tiu (’05, Management)

2. PROJECT DETAILS

Student Demographics

Prior to our arrival, Qinghai University administrators selected a group of students who would participate in our summer project. Out of the 100 students selected, 40 were in a special General Studies program, and three groups of 20 students each were majoring in Biology, Computer Science and Environmental Engineering. The General Studies students were either first- or second-year students and attended all of our classes, while the students in specialized majors were third-year students who attended only the classes that applied to their respective majors.

Teaching Schedule

<table>
<tr><th></th><th>Monday</th><th>Tuesday</th><th>Wednesday</th><th>Thursday</th><th>Friday</th></tr>
<tr><td>9am</td><td rowspan="2">CS Lecture</td><td rowspan="2">Culture Presentation</td><td rowspan="2">Environmental Lecture</td><td rowspan="2">Culture Presentation</td><td rowspan="2">Biology Lecture</td></tr>
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<tr><td>10am</td><td rowspan="2">Environmental Lecture</td><td rowspan="2">Recitation #1</td><td rowspan="2">Biology Lecture</td><td rowspan="2">Recitation #1</td><td rowspan="2">CS Lecture</td></tr>
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<tr><td>11am</td><td rowspan="2">Biology Lecture</td><td rowspan="2">Recitation #2</td><td rowspan="2">CS Lecture</td><td rowspan="2">Recitation #2</td><td rowspan="2">Environmental Lecture</td></tr>
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<tr><td>12pm</td><td rowspan="3">Lunch</td><td rowspan="3">Lunch</td><td rowspan="3">Lunch</td><td rowspan="3">Lunch</td><td rowspan="3">Lunch</td></tr>
<tr><td></td></tr>
<tr><td>1pm</td></tr>
<tr><td></td><td rowspan="3">Lab #1</td><td rowspan="2">Recitation #3</td><td rowspan="3">Lab #2</td><td rowspan="2">Recitation #3</td><td rowspan="3">Lab #3</td></tr>
<tr><td>2pm</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>3pm</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td rowspan="4">English</td><td rowspan="4">English</td><td rowspan="4">English</td><td rowspan="4">English</td><td></td></tr>
<tr><td>4pm</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>5pm</td><td></td></tr>
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Our teaching schedule utilized three types of classes: lectures, recitations and labs. All students learning a particular subject attended that subject's lectures at which time new materials were presented, and example problems were demonstrated. Each subject had three one-hour lectures per week. The students were split up into three groups of 20, and each group had its own one-hour recitation section for each subject, meeting twice weekly. During the recitation sections, we reviewed the lecture material, did additional example problems, answered questions, and administered quizzes. The same groups that attended recitation sections also participated in lab classes, with each group attending one 1.5-hour lab class per week. The lab classes presented the students with an opportunity to apply what they learned in lecture. In the Computer Science labs the students practiced programming; while in the Biology and Environmental Engineering labs, they performed various hands-on experiments (see Section 4 for details).

In addition to the three main subjects listed above, we held two-hour English classes Monday through Thursday. The English classes focused on developing oral English skills, and were open to all students and faculty members. At the beginning of the summer, more than 80 students attended our English class. Each of us took a smaller group so that there would be more interaction with each individual student. The classes were unstructured and very informal – activities included vocabulary-building games, tongue-twisters, poems, movies and songs. By the end of the summer, the total number of students attending the class was reduced (for reasons explained later in this report), and most of these smaller classes included discussions on topics of interest to the students – mainly cultural differences between China and the US, and the American education system.

Twice per week we gave special lectures on American culture. Topics included food, holidays, education systems, the college application process, job applications and interviews, volunteer activities, being Chinese-American, MIT, MIT culture (i.e. the "brass rat"), and MIT-OCW. The five of us rotated responsibilities for the culture presentations.

The following table shows the total teaching time and the average range of preparation time per week per teacher (time in hours). The use of different preparation resources and methods for each of the three subjects accounts for the variations in preparation times.

	Lecture	Recitation	Lab	English	Culture	Total
Teaching Time	3	6	4.5	8	1	22.5
Preparation Time	2-6	1-3	1-3	0	1-4	5-16

Facilities

The best teaching facilities on campus were made available to us. Most of our lectures were held in one of two large lecture halls which were both well-equipped with all the multimedia equipment necessary for delivering effective lectures: computer, video output (VGA) cable for a laptop, LCD large-screen projector, sound system, and overhead projector. We were provided with three separate classrooms for our recitation sections. Each classroom had two sets of blackboards and could comfortably accommodate 30 students – this arrangement was ideal for our needs. The Biology and

Environmental lab classes were held in the recitation rooms, and the Computer Science labs were held in the university's computer room.

The university didn't have public printing or copying facilities, so when we had to print or copy something we went to the personal offices of teachers or administrators who immediately made our needs their top priority.

Qinghai University Faculty

The administrators and professors of Qinghai University were extremely accommodating, and came to our aid whenever we needed it. Upon arriving in Xining at the beginning of the summer, we were met by four QU English teachers assigned to be our interpreters. We quickly learned that our students were able to understand most of what we taught in English, so we kindly told the interpreters that we were able to teach on our own. Though the interpreters no longer accompanied us to class, they provided us with their phone numbers and requested us to call them if we encountered any difficulties while teaching or moving about the city during our free time.

There were several faculty members in particular that were extremely helpful to us. We extend our deepest gratitude to teaching assistants Ma Rong, Ma Zhi Ping, Director of Teaching Yu Hongxian, Niu Haining and Zhu Laoshi for all of their assistance. Special thanks, also, to the A/V technicians who helped us connect our laptops to the multimedia equipment each day. Having never hosted foreign guests prior to our project, these individuals did a flawless job making sure that every detail of our teaching, living and eating arrangements were well taken care of. A prime example of their concern with our well being is when Peter needed medical assistance. He forgot to get his Hepatitis B shots in the US, so Ma Rong and Ma Zhi Ping set up appointments with a local hospital and escorted him every step of the way.

Living Arrangements

Qinghai University provided us with three fully-furnished apartments on campus. The apartments were relatively large and extremely comfortable – each had two bedrooms, a living room, a bathroom and a utility room. Each bedroom had a large desk and a comfortable bed complete with sheets, pillows and blankets. The living room had sofas, a coffee table, a filter/boiler for drinking water, and a large color television with cable. Each apartment also had its own telephone line – this amenity was extremely important since we often needed to use the internet to prepare for our classes. In addition, the university had each apartment outfitted with a hot-water heater and shower. Because Xining's summer climate is mild and dry (never reaching above 80°F),

an air conditioner was not necessary and thus was not installed. We honestly could not think of another convenience that would have made our living situation more pleasant; we felt right at home!

From the onset, Qinghai University was extremely concerned with our eating habits. The administrators allotted each of us money to cover the cost of our meals. They arranged for us to eat all meals in a separate section of the student cafeteria, with food prepared by the best restaurant on campus. These meals were quite extravagant, complete with fresh, locally-grown vegetables, tofu, soup, seafood, and high-quality meats. After about a week of eating in our special dining room, we wanted to explore the other dining options on campus and eat with our students to get to know them better. The administrators quickly responded to our request by providing each of us with dining cards that could be used anywhere on campus. They also gave us the daily meal allowance in cash so that we could add the money to our cards as we pleased, or eat in establishments that do not accept the dining card. (For example, just outside the school gate were many small restaurants serving local specialties of roast lamb and *mian pian*.)

Extracurricular Activities

Even with a busy teaching and preparation schedule, we were still able to participate in many extracurricular activities. Most of these activities involved getting to know our students better – we frequently visited their dorms, played sports and video games together, and cooked together. At least once a week we took half-day trips into Xining city (located about 20km southwest of the university) during which time our students showed us around the various parks, restaurants and markets. The in-class dynamic was greatly improved after we got to know our students on a more personal level because they were more willing to ask questions and participate in class activities.

There were many interesting scenic and cultural sites outside of Xining in eastern Qinghai province that we visited during the summer. On the second weekend of our project, the university administrators arranged a day trip to Qinghai Lake for the five us, along with Sean Gilbert and Julian Wheatley (MIT-China directors) who were visiting QU that weekend. Qinghai Lake is the largest salt-water lake in China and the second largest in the world, with interesting environmental conditions and several ethnic minority communities. The following weekend, we went on a self-arranged weekend trip with two of our students to *Mengda Tianchi* (孟达天池). *Mengda* is a nature reserve located several hundred kilometers southeast of Xining with some of Qinghai province's most beautiful scenery. Later in the summer we were taken to Kumbum Monastery by one of our students who is ethnically Mongolian and a follower of

Buddhism. He eagerly shared his deep knowledge of the Buddhist faith while giving us a thorough tour of the monastery grounds. In mid-July, the administrators invited Yiqun and Peter to Beijing to attend the taping of a Chinese television program focusing on the accomplishments of Qinghai University's current president, Li Jianbao. The program was titled "Dialogue" (对话), and aired on CCTV-2 on July 25th, 2004 from 10:05PM to 11:05PM.

3. MIT-OCW

Overview & Purpose

MIT OpenCourseWare (OCW) was created to "promote the sharing of knowledge by providing educators, students, and self-learners anywhere in the world with free, searchable access to MIT's course materials." The emphasis of OCW falls on the open publication of educational resources, not on world-wide distance learning initiatives. MIT hopes to set an example for other universities around the globe by being the first to share course material freely. Ideally, other universities will join the OCW movement, resulting in a world-wide collaboration of educational resources and knowledge.

OpenCourseWare Use at Qinghai University

The MIT-OCW teaching team used MIT OpenCourseWare to develop a suitable curriculum for the students at Qinghai University. Each individual teaching team (Computer Science, Biology, and Environmental Engineering) used its corresponding OCW subject materials in a different manner, as it applied to the teaching team's and students' particular needs. For example:

Biology – Lecture notes loosely based on 7.012 and 7.02 OCW materials. Some labs based on 7.02 OCW lab materials.

Environmental Engineering – Lecture notes and example problems were adapted from 1.061 OCW materials.

Computer Science – Perhaps the most OCW-intensive of the three subjects taught, the Computer Science curriculum incorporated MIT-OCW materials into each facet of its program. 6.001 OCW lecture notes were used as the basis for class lectures. In many cases, the lecture note material was taken (more or less) verbatim from the lecture slides; the material was then translated into PowerPoint presentations with new animations, graphics, definitions, examples, and Chinese technical translations added by the teaching team. Recitation material was loosely modeled from information contained in the 6.001 textbook, which is also available on the OCW website. 6.001 OCW labs and projects were used directly by students in class.

Following in the spirit of OpenCourseWare, each teaching team will make its course notes and presentations available for educational use on the MIT-China website.

General OCW Feedback

In western China, computer and Internet access is limited. For example, most students at Qinghai University do not own a personal computer and must use the school's computer facilities. However, the computer labs at Qinghai University are open only during certain hours and are often crowded, making it difficult for students to find an available computer to use. Furthermore, the hard drives of the lab computers are reset to a standard format each day; thus, students will lose all information, programs and files saved onto any computer. The students who do use the university's computer facilities have to pay for Internet access – it is not provided by the school for free. For those students fortunate enough to own a personal computer, they have no way of accessing the Internet from their dormitory and do not necessarily have 24-hour electricity. These factors have created a barrier to OCW use at Qinghai University, and we assume that there are similar conditions at other universities in far western China. Thus, there may be some limitations to the overall impact of MIT-OCW in those remote regions of China that have not yet fully developed the technical infrastructures to support it. Future OCW teams may have more impact at universities in larger cities in central and southern China and near cities along China's extensive coastline.

Despite some technical challenges, students at Qinghai University really liked the idea of OCW, and were thrilled to have the opportunity to work with us on this project. As one student said, "Yes, it's good to learn things from different places and resources. Yes, I think I would use this. Knowledge is not just used to pass our exams. We should use different types of knowledge to solve different kinds of problems." Another student stated, "This is convenient. The resources are very broad." If the students had more reliable computer and Internet access, they believe that the online information provided by MIT-OCW would be helpful and useful to them. Students themselves mentioned that MIT-OCW might be more beneficial to students in eastern China, where they estimate that over 90% of all students own a personal computer and have more frequent and reliable internet access. Our project, in the very least, has raised this issue of computer and Internet access at Qinghai University, which may help speed up the rate of technical developments there.

As we learned during the MIT-OCW/ CORE conference in Shanghai, universities in China are thrilled that MIT is providing free, online course materials. However, Chinese universities tend not to want their students to use this material solely for personal education. If MIT-OCW materials are used in the classroom, or if students are required to study MIT-OCW materials for a class, universities may feel that its students should receive course credit for this work. Particularly for Chinese universities this type of incentive is almost essential to encourage the students to use OCW materials.

Chinese students tend to be driven primarily by exam scores and grades; thus, they are less likely to pursue independent studies in a university classroom unless the work is related to a future exam or certification.

While it is not MIT-OCW's goal to offer distance learning initiatives for non-MIT users, it has been suggested that MIT could offer some type of test or examination to demonstrate that OCW users have mastered a certain level of education and knowledge. Since MIT will not offer some form of certification, some universities may want to offer their *own* course credit to students who use MIT-OCW materials in class. We are not sure how this fits into MIT-OCW's main mission; it's just a thought for the OCW office to bear in mind (i.e. "Though MIT may not offer credit for OCW courses, can/should other universities offer their own course credit – independent of MIT or OCW – on their own terms?").

Ten Challenges & Recommendations

1. **Challenge** – While in the computer lab, our students would have some difficulty accessing the MIT-OCW website.
   Recommendation – We are not sure if this problem is related to Qinghai University's own LAN or not. Peter and Michelle instructed their students to access the following websites, in order: http://ocw.mit.edu, http://www.twocw.net, and http://www.core.org.cn/ocwweb. Usually, one of the three websites would be fully accessible to the students.

2. **Challenge** – Adobe Acrobat Reader is not the universal software that we, as Americans, tend to think it is. Acrobat Reader was neither popular nor well-known among our students at Qinghai University. Each time the students accessed materials from the OCW website, they had to download and reinstall the Acrobat Reader software in order to view the files (see above; lab computers are reformatted upon each reboot). Inaccessibility to Acrobat Reader and unfamiliarity with the software are hindrances to use of the OCW website.
   Recommendation - Perhaps the OCW materials can be offered in different formats; ideally, the formats could satisfy the particular needs of individual countries. The logic behind MIT's decision to use Adobe .pdf's as a file standard is clear – Adobe Reader is free software available for personal use. However, MIT-OCW's dedication to one specific file format may be excluding users in different countries from using the OCW site.

3. **Challenge -** Many Qinghai University students did not understand how to use the OCW website. Perhaps students with higher levels of computer experience may

find the OCW website extremely easy to navigate. However, our students, who have a varied background of computer and Internet experience, were confused with how to navigate and use the site. For instance, when we directed students to the OCW website and asked them to browse to the 6.001 course homepage, many had difficulty doing so. The students did not understand that a list of course majors is provided on the left-hand side of the page and that they needed to click within this area to select a particular major. Also, once at the EECS webpage, students did not understand that they should click on the Course Title, rather than on the Course Number, to access the page (for instance, rather than clicking on "6.001," one must click on "Structure and Interpretation of Computer Programs"). Many would click on the course number itself and became frustrated when they could not access anything. This continued when we browsed to the 6.001 Projects page. When students attempted to access project files, they would click on the Project Name ("Project 0") rather than on the file extension (".pdf") that followed the Project Name. These were sources of usability problems for our students.
Recommendation - Create an online tutorial on "How to use the MIT-OCW Website." Perhaps offer the tutorial in different languages. Tutorials were specifically requested and suggested by several of our students. The copy of the Dalian University Chinese language OCW tutorial provided to MIT-China is not posted online or available electronically, and the hardcopy is not legible enough for easy dissemination.

4. **Challenge** – In order to properly teach the 6.001 curriculum, Michelle felt it necessary to access all of the materials available on the 6.001 OCW website. To facilitate this, she downloaded the entire contents of the 6.001 course webpage so that she could also access the materials offline. However, she found that downloading each individual file quickly became time consuming.
   Recommendation – Perhaps MIT-OCW could include a "Download the Archived Contents of this Folder" option which would allow users to download all the contents of an OCW webpage as one large .zip file. SloanSpace, the general Course 15 class website server, offers this option and perhaps can serve as a model for OCW.

5. **Challenge** – When using the 6.001 OCW lecture notes, Peter and Michelle found that many of the diagrams were inaccurate [for example, see Lecture 2, Page 1, Slide 6]. In the process of converting the files from .ppt to .pdf format, the diagrams were somehow altered – the text had been shifted within the diagram.
   Recommendation – Sal suggests that when converting a document to .pdf format, the fonts be embedded (the option to embed fonts is provided when creating a .pdf). He believes this may solve the problem. Also, perhaps MIT-OCW can screen the

diagrams on the .pdf's that are uploaded more thoroughly in order to ensure the diagrams are not altered in the conversion process. Simply checking one converted .ppt file can reveal whether or not this problem recurs with all the remaining .ppt files for the same class.

6. **Challenge** – Students requested that sample problems be presented with accompanying solutions. They have no way of gauging whether they are learning material properly if no sample solutions are made available.
   Recommendation – Provide more sample solutions on the OCW website. Request professors to also provide answer keys to the exams, problem sets, and labs that they publish online.

7. **Challenge** – Often, students would request the contact information of professors who teach the courses offered on the OCW website. They feel that, "if there is a problem, and a student is using OCW by themselves, they wouldn't know who or where to ask for help."
   Recommendation - Explain to OCW users why the contact information of professors is not provided on the OCW website, so that users can understand the rationale behind this decision. This may help to clear up some confusion. Furthermore, there is a clear need for communication among OCW users. Perhaps an online forum, mailing list, or chat room can be created for OCW users. This communication forum could bring OCW users together so that they may meet and interact with one another. Thus, ideas, solutions, and hints could be shared among the OCW community. This might satisfy the user request for contact information for MIT professors and teachers.

8. **Challenge** – Michelle had several opportunities to teach from the 15.564: Information Technology OCW website. However, upon review of the lecture notes provided on the website, she found that many of the sources and much of the data were outdated. For instance, in Lecture 16/17 of 15.564, page 27 extrapolates facts from 1995-1999.
   Recommendation – Perhaps for more cutting-edge, advanced technology classes (or for classes which course information is constantly changing), MIT can provide more frequent updates of course material on the OCW website.

9. **Challenge** – From a teaching perspective, Peter found it inconvenient to use the OCW materials. The 6.001 curriculum was, more or less, taught verbatim from the 6.001 OCW lecture notes. Peter and Michelle converted the 6.001 OCW lecture note materials into PowerPoint presentations, while adding their own animations, additional sample problems, graphics, and translations to the original material.

Thus, they both retyped each .pdf page into a PowerPoint slide, and then modified the original material as needed. Retyping one slide takes roughly 3-5 minutes; for a lecture of 20-30 slides, the entire retyping process can total 1-2 hours. In teaching a class of 25 lectures, 50 hours can be consumed in the retyping process alone. This can result in a huge loss of time.
Recommendation – Peter feels that the OCW materials should either convert easily to the .ppt format or that the original .ppt files should be made available for use. This could save OCW users a tremendous amount of time. However, Michelle feels differently. By having to retype the OCW materials, she was forced to review the material beforehand and felt better prepared for her lectures. Also, since .ppt files were not readily available, Michelle felt more inclined to adapt and modify the OCW materials for her own use. She feels that this personal extension and application of the original OCW material follows in the spirit of the OCW project.

10. **Challenge** – Qinghai University students have mixed feelings towards the CORE initiative. Since language translation is "not a perfect science," some students are concerned that the true meaning of the OCW material may be lost in translation. Other students feel that their peers may become "lazy" and not wish to challenge themselves by reading the English language version of the OCW notes; instead, they might always revert to the OCW notes available in their own native language. On the other hand, many students had difficulty with the OCW materials because of the language barrier. As one student said, "There are too many difficult words."
Recommendation – If MIT-OCW materials are translated into other languages, the translations may help students with difficult technical vocabulary. Alternately, MIT-OCW may suggest or even offer free translation software via the OCW website. With this software, students can look up words or translate entire portions of text expeditiously. This could perhaps help make the OCW information easier and more likely to be used in foreign countries.

4. SYLLABI

Biology

7.012: Introduction to Biology, 7.02: Experimental Biology & Communication, 7.03: Genetics

Instructors | Yiqun Bai & Siqi Chen

Class Description & Objective | Using material from three different MIT courses, this biology curriculum is designed to give an introduction to the field of Biology and show its medical and environmental applications. Upon completion of the course, it is hoped that students will have a basic understanding of how to think as a biologist, and how to approach everyday problems from a biological perspective. Creative thinking, problem solving, and research design are stressed in all class sessions.

Class Times

Lectures – M11, W10, F9
Recitations – TR 10, 11, 1:30
Lab – MWF 1:30-3:00

Syllabus

#	*Lecture Title*	*Date*
1	Introduction to Biology at MIT	6/22/04
2	Introduction to Genetics	6/23/04
3	Mitosis and Meiosis	6/25/04
4	DNA Sequencing and Applications	6/28/04
LAB	Solving Meiosis, DNA Replication Problems	6/28/04-7/2/04
5	Recombinant DNA, chimeric mice	6/30/04
6	Uses of Biology in Agriculture	7/2/04
7	Stem Cell Technology	7/5/04
LAB	Development Project	7/5/04-7/9/04
8	Introduction to Development	7/7/04
9	Development II	7/9/04
10	Introduction to Biochemistry	7/12/04
LAB	Onion Microscope Project	7/12/04-7/16/04
11	Biochemistry II	7/14/04
12	Introduction to Enzyme Kinetics	7/16/04
13	Enzyme Kinetics Review	7/19/04
14	Equilibrium Enzyme Problems	7/21/04
15	Biochemistry Exam	7/23/04
16	Miscellaneous Applications of Bio	7/26/04
17	HIV, AIDS, and viruses	7/28/04

Additional Comments | This curriculum was prepared using our own notes from when we took these classes at MIT; OpenCourseWare provided additional resources such as

problems, exams, and supplemental lecture notes. We combined material from 7.012, 7.02, and 7.03 as we saw to be most relevant to the curriculum. For the first two weeks, we gave an introduction to the basic concepts and vocabulary of biology. These topics served mostly as review for the students; however, the English vocabulary provided a challenge for these first weeks. To increase exposure to, and creative thinking and interest in the field, we also focused on developing biotechnologies. Topics such as Stem Cell technology, AIDS, Recombinant DNA technology, etc. were explained to demonstrate the applicability of the science. (For further details on the biology curriculum, please refer to section 7 "Personal Reflections" below)

Computer Science

6.001: Structure and Interpretation of Computer Programs

Instructors | Peter N. Jeziorek & Michelle Tiu

Class Description & Objective | This course introduces students to the basics of computation. The objective of 6.001 is *not* for students to learn the Scheme programming language. Rather, students are expected to learn the underlying concepts and structure of computer programming languages. Upon completion of the course, students should then be able to explain and apply these basic concepts to *any* programming language. Students should also be able to analyze computational systems, and generate solutions to abstract problems.

Class Times

Lectures – M9, W11, F10
Recitations – TR 10, 11, 1:30
Lab – MWF 1:30-3:00

Assignments

Homework #1 – Assigned June 29th, Due July 1st
Homework #2 – Assigned July 20th, Due July 22nd
Mid-Term Exam – July 13th
Project 0 – Assigned Week of June 28th, Due Week of July 5th
Project 1 – Assigned Week of July 12th, Due Week of July 26th

Syllabus

#	*Lecture Title*	*Date*	*Description*
1	Introduction to 6.001	6/22/04	Overview of course structure, materials, and objectives. Discussion of practical applications of course content.
2	Scheme Basics	6/23/04	Introduction to basic language elements: primitives, combinations, abstractions, evaluation rules. How to write and create simple procedures.
3	Procedural Abstraction	6/25/04	Language elements: using the "lambda" special form to write procedures. Capturing common patterns, and introduction to procedural abstractions. Introduction to the "if" special form.
4	Substitution Model	6/28/04	Introduction to the substitution model. Discussion of the design and use of recursive and iterative algorithms.
5	Orders of Growth	6/30/04	Review of evaluation rules. More with Scheme primitive procedures. Discussion of orders of growth, amount of computer resources needed, and system efficiency. Applications to recursive and iterative procedures.

6	Good Programming Practices	7/2/04	Discussion of good programming practices, including code design, debugging, documentation, evaluation and verification. Emphasis on "black box" code abstractions.
7	Types & Higher Order Procedures	7/5/04	Introduction and examples of type variables. Discussion of higher order procedures, especially in relation to procedural abstraction and type variables.
8	Data Abstraction & Compound Data	7/7/04	Introduction to data abstraction. Language elements: creating and manipulating compound data, using lists and pairs. Application to procedural abstraction: enumeration, reference, mapping, filtering, and accumulation.
9	Symbols & Example Problems	7/9/04	Introduction to symbols, with respect to constructors and operators. Review of course material, and examination preparation. Sample problems.
10	Quiz Review	7/12/04	More examination preparation and comprehensive conceptual review
11	Trees	7/14/04	Introduction to basic tree structure. Discussion of tree manipulation, using compound data techniques. Discussion of sets as unordered lists, ordered lists and binary trees.
12	Mid-Term Solutions	7/16/04	Reivew of mid-term solutions
13	Computer Security I: Private Key Cryptography	7/16/04	Introduction to 15.564 – Information Technology (IT). Discussion of IT and its importance in today's society. Discussion of how 15.564 complements the 6.001 curriculum. Introduction to cryptography; in particular, discussion of private key cryptography technology.
14	Tagged Data	7/17/04	Introduction to tagged data. Emphasis on application to data-directed and defensive programming.
15	Computer Security II: Public Key Cryptography	7/21/04	Comprehensive discussion of the logic and technology behind public key cryptography. Public key infrastructure, SSL certificates, and applications to e-commerce. Access control, biometrics, and smart cards.
16	Computer Security III	7/23/04	Methods of intrusion: viruses, denial of service attacks. Defensive measures: firewalls, intrusion detection systems (pattern vs. anomaly detection), and hacker attacks.
17	Data Mutation	7/26/04	Introduction to data mutation. Language elements: "set!," "set-car!," and "set-cdr!". Application to electronic queues, and discussion of increased code efficiency.
18	Wireless Technology	7/28/04	Discussion of new applications in wireless technology. Includes cell phone technology, wireless LAN's, and GPS technology.

6.001 Teaching Challenges

Imperative Knowledge | The 6.001 students had some difficulty in understanding the concept of "imperative" knowledge. Imperative, or "how to," knowledge concerns itself with the process and method behind solving a problem; in contrast, there is also declarative, or "what is," knowledge, which states factual information.

Students were better prepared and more inclined to think using declarative knowledge. If the students were given a problem similar to one they had seen before, they could easily solve the problem. Similarly, if a problem required the students to follow a very strict problem-solving method and procedure, the students could also answer that question well. However, when the curriculum required that the students use abstract thinking in order to capture higher-level patterns, their problem-solving abilities tended to be challenged. Without much prior knowledge of how to solve similar problems, students had some trouble creating procedures and patterns of their own.

Application of Knowledge | Concurrently, students experienced some difficulty with applying the knowledge learned in class. We observed that students could understand a concept within a very particular context or application; however, when the material or information was generalized or applied to a different scenario, the students tended to have some trouble understanding the connection. As a result, projects and homework problems were at times challenging to the students.

Computer Hardware and Software | Though computers and Internet access were available to the students during scheduled lab hours, it was difficult for students to access computers on their own time. The lack of free 24-hour computing resources hindered the students' progress in this class. [See section 3 for more information.]

English | Teaching students in English posed its own challenges. Though all students in our class passed the CET4 (band 4) English test, many still had some difficulty with listening comprehension and speaking. We simplified the OCW 6.001 lecture vocabulary and often repeated ourselves during lectures to stress the important points. For the majority of his lectures, Peter translated the critical vocabulary into Chinese and typed the Chinese characters on a glossary slide at the beginning of the lecture and on each slide under discussion as well. This method proved to be very helpful for the students (and for Peter), but it was very time consuming. Using a thorough English-Chinese technical dictionary, the main challenge was choosing the most accurate definition out of many - the entire process took two to three hours for some lectures. Michelle took another approach by simplifying difficult English words into more commonly used English synonyms.

Basic Computer Skills | Teaching a mixed group of 1st- through 3rd-year students basic computer knowledge and usage skills was also an interesting experience. Some students had difficulty navigating the web to access the 6.001 MIT OpenCourseWare website and downloading the installers for Adobe Reader and Scheme. This activity took 10 minutes for some, and as long as 30 to 40 minutes for others. Students with the most limited computer skills did not know how to copy and paste content within the

same document. All students were proficient at using e-mail accounts and ICQ clients, and often did so during class time!

Projects & Homework | Some students had trouble with work that was to be completed outside of class, including projects and homework. For the first homework, about half of the class turned in answers. For subsequent homework assignments, we received work from only the most dedicated students. Often, the work that they handed in demonstrated that they had experienced some difficulties with or misunderstanding of the class material. Some of the students had trouble navigating the Internet and learning how to use Emacs via the tutorial. All of the projects that we assigned required an extensive amount of reading; which, with hindsight, may not have been very suitable for a short summer course in western China.

Exams | We gave one exam during the six-week term. The exam included everything that we had covered in class up to that point. Even though the number of students attending lectures and recitations was dwindling, surprisingly almost everyone showed up for the test. We gave a fair test, with several tricky questions that would help create a good Gaussian distribution in addition to a possible 15 points worth of extra credit. We had to throw out one question because we forgot to include the definition of procedures required to solve the problem. Therefore, the test had a total of 75 points with a possibility of 15 points of extra credit. It was clear from the exams that students had some problems with syntax and writing their own procedures. And it is also readily apparent that we need to rethink suitable evaluation methods for these unique settings.

Knowledge of Other Programming Languages | Students had some difficulty understanding why they were taught the Scheme programming language. Scheme is an academic language, and differs from the more "practical" languages, such as C++, Visual FoxPro, or Visual Basic, that the students are accustomed to studying. Many of the students felt that time spent learning other programming languages is simply a waste of time. To try to overcome this bias, we explained many times that the purpose of the class was not to teach a programming language, but to teach a way of solving problems. Despite our best efforts of stressing practical applications like cryptography and sets, we would often hear the students say "Scheme is not useful".

Environmental Engineering

1.061: Transport Processes in the Environment

1.031: Geotechnical Engineering

Instructor | Sal Scaturro

Class Description & Objective | This course is designed to serve as an introduction to environmental engineering, with particular emphasis on open-channel transport processes and flow through porous media. Upon completion of the course, students should be able to describe how the concentration of a substance within a system changes as a function of space and time based on advective and diffusive transport. In addition, students should have a basic understanding of soil strength and how the presence of water affects it. It is hoped that students will be able to identify and model real-world situations using skills they have learned in this class.

Class Times

Lectures – M10, W9, F11
Recitations – TR 10, 11, 1:30
Lab – MWF 1:30-3:00

Assignments

Homework #1 – Assigned June 24th, Due June 30th
Homework #2 – Assigned June 30th, Due July 6th
Homework #3 – Assigned July 6th, Due July 13th

Exam

July 16th, one hour mid-term on transport processes

Syllabus

#	*Lecture Title*	*Date*	*Description*
1	Intro to Transport Processes	6/23	Flow, concentration, mass flux, control volumes
2	First Order Processes	6/25	Theory and examples, time scale analysis
3	Diffusion	6/28	Diffusion theory, derivation of Fick's Law
LAB	Lab #1	6/28-7/2	Explanation of standard lab procedures, Lab #1 intro
4	1-D Diffusion	6/30	Transport equation in 1-D, max concentration
5	Advection	7/2	1-D transport with advection
6	Boundary Conditions	7/7	Mixing time, 1-D Diffusion with boundary conditions
LAB	Lab #1	7/7-7/12	Estimating Flow in a Channel
7	2-D & 3-D - Advection	7/9	Transport equations in 2-D and 3-D with advection
8	2-D & 3-D - Boundary Cond.	7/12	Application of full transport equation with boundary cond.
9	Review	7/14	Review for Exam

LAB	Lab #2	7/14-7/19	Estimating Diffusivity of Materials
10	Exam	7/16	Transport Processes
11	Intro to Geotech Engineering	7/19	Soil properties and relationships, Bernoulli Equation
12	Seepage I	7/21	D'Arcy's Law, hydraulic conductivity, head tests
LAB	Lab #3	7/21-7/26	Estimating Diffusivity (improved version)
13	Seepage II	7/23	Flow through wells, example seepage problems
14	Soil Stresses I	7/26	Soil strength, total stress, effective stress
15	Soil Stresses II	7/28	Effect of water on soil strength

Assumptions & Qualitative Analysis | Generally speaking, the traditional Chinese education system tends to stress getting the correct and accurate answer when working out a problem. Perhaps the greatest challenge to the students I taught was understanding that procedure is more important than getting the correct numerical answer in transport problems. In many examples that the students and I worked on, several answers might be correct based on the assumptions made about the system of interest. Thus, the important part of many of these problems involved making valid assumptions. For example, if a channel is much deeper and longer than it is wide, the diffusion or advection over the channel width might be neglected, thus greatly simplifying the problem. A challenge to the students – especially in the beginning of the course – was becoming comfortable "leaving things out" of the solution. Further, the fact that two students could be correct with answers differing by as many as 50 units was initially a difficult concept for them to accept. In almost every class, I stressed the importance of qualitative analysis – comparing aspects of a system based on orders of magnitude, not precise numerical answers.

Learning Habits | The bulk of the transport processes content that I taught can be boiled down to several governing equations. Though some of the students were genuinely interested in the theory behind and derivation of these equations, most students learned the material through application of these equations. The issue that arises from this learning habit is that different example problems use the equations in different ways. Students could follow and understand a problem when I demonstrated it on the board, but when I gave them a different problem (requiring a different set of assumptions), the students often tried to "fit" my procedure to the problems they worked on, resulting in an incorrect procedure and ultimately an incorrect answer that didn't make mathematical sense.

Labs | Having very little or no lab experience in the field of environmental engineering, the students were extremely excited to do "hands-on" projects that would allow them to apply what they learned in lectures and recitations. Conversely, having no lab experience obviously presented a huge obstacle in teaching them how to properly conduct a lab. I devoted almost an entire lab period to explaining proper lab techniques and write-up procedures. Similar to what is stated above, the students had some difficulty understanding that it's OK to get bad results when doing a lab – in many labs, getting the expected result is nearly impossible. I stressed that the most important part of a lab is to

understand *why* one may obtain an unexpected or "bad" result so that subsequent trials can be adjusted to obtain more realistic and/or expected results. Having told the students that the 'discussion' section of their write-up is most important, I was a little disappointed when I collected the lab books and saw that most students only wrote a line or two for this section.

Because Qinghai University did not have any specialized environmental equipment such as flumes, velocimeters or devices to measure concentration, I had to significantly adapt the 1.106 labs for the two labs that the students worked on. The first lab was estimating flow in a channel – we used one of the university's irrigation ditches along with ping pong balls and a stopwatch. The second lab was determining the diffusivity of several fluids in water – we used wash basins and common household fluids (like soy sauce). Not having fully completed these labs prior to presenting them to the students, there was much that I learned while the students were working on them. Often, they would raise a question and wanted an answer from me right away. In these situations, I explained to them that these are questions that they should try to figure out for themselves – the precise reason for doing the lab.

5. PROJECT FEEDBACK

The feedback presented below was obtained through informal discussions held throughout the course of the summer, as well as through videotaped interviews with seven students and four faculty members of Qinghai University.

Student Feedback

English | For most students, improving their oral communication skills and expanding their English vocabulary were high priorities this summer. The MIT-OCW classes not only introduced new curricula, but also provided the rare opportunity for the students to practice their spoken English with native English speakers. Though students place great value in the English language, they have a mixed view of its use in the Chinese classroom. Some students believe that English use should be limited since it can be a source of frustration. For instance, students who cannot understand the material because of a language barrier may easily become discouraged and cease coming to class. One student commented that in the beginning of the summer she was afraid to ask questions in class because she was afraid of making an English mistake (by the end of the summer, she happened to become one of our most vocal students!). On the other hand, there are students who would prefer classes to be taught entirely in English. These students believe that their classmates would become lazy if we used a mix of Chinese and English in the classroom. Learning in English is a difficult feat that requires constant attention and diligence, and some students welcomed this challenge.

Teaching Style | The students enjoyed the Western teaching style and methods that we brought to the Chinese classroom. In particular, the students appreciated that they were both encouraged and expected to ask questions in the classroom. They liked that teachers were readily available before, after, and during class to ask and answer questions. Students were excited that they were not simply asked to memorize and repeat information in class. Some students said that in other classes they felt "bored" and "tired" when the teacher merely talks for two hours. The students enjoyed attacking problems from different perspectives and thinking in creative ways. Not only did they like acquiring new knowledge, but they also liked learning how to apply this knowledge to real-world problems. "By learning this [application of knowledge], there is a better chance that we will remember what we have learned," states one student. In particular, students enjoyed labs and projects; through these exercises, students were able to demonstrate mastery of knowledge through demonstration and application.

Attendance | What incentive do the students have for coming to class? One student found the subject material interesting and enjoyed the opportunity to practice his

spoken English; for him, that was enough incentive to attend class. Other students disagreed. Since class attendance was not mandatory and did not count towards a final grade, there were a number of students who simply did not attend class. Some students believed that we were too lenient with class attendance. They asked us to become stricter - that we should "force" students to come to class by taking attendance each day. Other students enjoyed the freedom and responsibility we allowed them, and did not believe we should alter our attendance policies. One student felt that if we gave more assignments and tests that more students would want to come to class.

Subject Content | Some students felt they had already learned much of the subject material that was presented in class. These students asked that we present more interesting material on subjects they had not already studied. One student was very interested in Western culture (as opposed to just American culture) and suggested that we present lessons on culture from a variety of Western countries.

Faculty Feedback

Comments from Li Jianbao, President of Qinghai University
The following is translated and paraphrased from an hour-long interview.

As the first foreigners to have ever taught at Qinghai University, the MIT students' positive and open attitude towards education has had a great influence on our students and was a great encouragement to them. I am proud to have hosted responsible and earnest MIT students, and feel that they related to our students very well because of their relatively young age and eagerness for cultural exchange. Just by being here and walking around campus, they have increased our students' confidence.

I definitely want the collaboration between MIT and Qinghai University to continue in the coming years. Perhaps the program can become more formal by allowing the MIT students to teach a complete Qinghai University course and give the students a final grade. In addition, I would like to see the MIT students collaborate with our students on research projects so that our students can become more active and well-rounded academically.

It is important for teachers at Qinghai University to use resources from abroad, and I hope that some will use OCW as a supplement to their course content, at the very least. However, I think that much of the MIT course content on OCW is deeper than what is taught here and QU teachers will have difficulty understanding some of the content. If OCW seeks to reach out to all corners of the globe, I think that first the teachers need to understand the courses. If the teachers have difficulty understanding the material, they

might get frustrated and give up. An ideal situation would be for MIT OpenCourseWare representatives and MIT professors to come to Qinghai University to teach our teachers how to use OCW and teach them more advanced concepts in their respective fields.

As for the students, I believe there should be some incentive or reward for those who use OCW for part of their education. One option is for students to take a standard test upon completion of a course. If MIT doesn't offer such a test, perhaps Qinghai University can create and administer one. However, if such tests are created locally by each individual university, there would be no basis for comparison of students from around the world who use OCW. I would like to see students from all over the world to be at the same level of understanding after using OCW.

I think that compared with other universities around China, Qinghai University will benefit most from MIT's presence since we are currently in a developing stage. The Chinese government supports Qinghai's collaboration with MIT, and we all hope that the program will continue in the future.

Feedback from other QU Faculty | Many Qinghai University faculty members were happy with the casual and interactive style of teaching which encouraged the students to think actively and creatively. One administrator felt that our focus on teaching through example problems and labs, rather than by testing, was very beneficial to the students' overall educational experience. They would like us to continue teaching larger courses such as biology, information technology and environmental engineering so that we can interact with a large number of students, and because these subjects are very relevant in China today.

Some of the teachers and administrators think that OCW is a great tool since its content is easily accessible, up-to-date, and in depth. In Qinghai, it is very difficult to obtain foreign text books, but they feel that OCW is a great substitute. Regarding translation into Chinese, one teacher believes that if the content is geared to students in a particular subject, then translation is not necessary. However, translation would be essential for self-learners who are not attending school and are less likely to have strong English skills.

6. RECOMMENDATIONS FOR FUTURE TEAMS

As the first students to work on this initiative in China, we had many unanswered questions prior to arriving in China. Qinghai University did its best to answer our questions, though the administration tends not to respond quickly by email or fax, which caused Sean Gilbert to follow up with QU directors regularly by phone for basic information. "This is our first collaboration with a foreign university, so we are not exactly sure how to proceed" was the response Sean Gilbert received at times during phone calls. "We'll work out all the teaching arrangements after the students arrive," was another response. We believe, ideally, that there should be much more communication with the host university during the spring term prior to an OCW team's arrival in China. A more detailed understanding of the logistics and the university's expectations before arrival would be extremely helpful for preparations.

Expectations

Prior to an MIT-China - OCW team's arrival at a university, expectations between all parties should be made clear. For example, the team members and the university should know the students' expectations – what class format they expect, what they hope to learn, what topics they would like to explore, etc. The team members should understand the university's expectations – how many classes they are expected to teach, how many hours a week they should spend in the classroom, how they should document their experiences. Finally, the university should know the team members' expectations – what types of classroom facilities they need, what type of curriculum they are prepared to teach, what commitment they expect of the students. In essence, the lines of communication need to remain open and clear between all parties at all times. Establishing clear communications, of course, is always one of the greatest challenges in any cross-cultural business or project. Therefore, OCW teams also need to be highly adaptable and quick to think and react on their feet, as in most instances there will be gray areas of communication in team projects. At such times, in the end, it's best to learn from doing, and document everything about the project so that the next group of OCW teams can learn from the experience.

Timing

The teaching schedule should be arranged so that the teaching curriculum does not conflict with university exams. This summer final exams fell within the fourth week of our curriculum. Since students were not receiving grades for our curriculum (but were still receiving grades in other classes), some felt it was acceptable to skip our classes in

order to prepare for and take their exams. Our teaching schedule ran into late summer and overlapped with the students' summer vacation; some of our students went home after finishing their exams. In future years, this program should either begin earlier in the summer or students should be informed that they must miss some of their summer vacation in order to continue attending our class. The teaching schedule should also not conflict with the schedules of any other teaching groups that may come to Qinghai University.

Teaching Style

Future MIT-China - OCW teams should be aware of the differences between American and Chinese teaching styles. Teams will most likely use a western teaching style in the classroom which focuses on thought processes, methods, and problem solving. This is a significant departure from the Chinese teaching style that students are accustomed to, which instead tends to emphasize repetition, memorization, and pattern recognition. It is important for the MIT-China - OCW teams to realize that it will take time for the Chinese students to become comfortable asking questions in class.

Grades

Perhaps our teaching curriculum could give credit for attendance or we could give the students grades, as this might give the students more incentive to attend all of the classes. It might also increase the level of responsibility and commitment that the students feel toward this program. If the MIT-China OCW team were to give the students a grade, a well-planned out syllabus must be made available to the university well in advance of the summer for review.

Marketing

When this program is offered to university students, the school should carefully emphasize the class' aims and goals. Students should not be encouraged to take the class solely in order to improve their English speaking skills or to learn about American culture. While these things are important, they will naturally occur during the course of the summer. It is important to remember that the MIT-China OCW teaching teams have an established technical teaching curriculum. Improvement of students' English skills is a secondary aim of our teaching teams. The team's main goal is to bring technology education to students in China, while we, ourselves, learn about China and improve our Chinese language skills.

Participant Selection

The students that we taught this summer were chosen by QU administrators based on their grades. We believe that students should also be chosen based on their interest in the program - not solely on intelligence and grades. While some of our students were extremely enthusiastic about the program, many students did not attend all of the classes. On the other hand, we spoke with many students who were very motivated, who spoke English well, but had not yet passed or taken the band-4 English examination. Ideally, the MIT-China OCW team should take part in the participant selection process. We found that during the later weeks of the project when somewhat fewer students were coming to class, it was much easier to teach those fewer students who had genuine interest in the subject matter. If we could identify those students from the very beginning, it would greatly facilitate the entire teaching process. If MIT-China OCW teams are not directly involved in the selection process, they should be provided with more information on their group of students prior to arriving at the university. Relevant information should include year, major, English and math level, and prior courses taken. This information could help MIT-China OCW teaching teams develop and tailor their curriculum to the students' needs and interests. Furthermore, it would help to avoid re-teaching subjects that the students may have already learned.

Teaching Facilities

Lecture rooms should be equipped with audio and visual multimedia equipment. MIT-China OCW teams should be taught how to use the audio and visual multimedia equipment in case the A/V technicians are absent. Recitation and lab rooms should have an easily accessible source of electricity, a white or black board, and a fresh supply of chalk and/or markers. We should also know what types of lab facilities are available beforehand in order to prepare effective Biology and Environmental Engineering experiments. Computer lab rooms should contain at least 20 computers, and we should ideally have administrator privileges to all the computers in order to be able to freely add the programs that are necessary to run the class. Unless there is 24-hour access to computers with high-speed internet access, it is likely that teams will need to use their own computers (laptops) and relatively expensive dial-up internet service providers.

Weekly Meetings

All of the university administrators were very responsive when we requested to hold a meeting to discuss some issues, but we think that weekly meetings with an administrator or two would be very helpful for mid-course evaluations of the program. These meetings can be as long or as short as necessary, can aid in ensuring the pace of

the program, and can help establish clearer channels of communication. With these meetings, the MIT-China OCW teams would be more informed of future appointments; for instance, such as media coverage events, which, in our case, rather inconveniently necessitated that Peter and Yiqun take a train to Beijing for a CCTV-2 program in the middle of our teaching schedule.

Other Educational Activities

In addition to the OCW subject-based curriculum, the English classes, and the cultural presentations, future MIT-China OCW teams should try to incorporate other educational activities into their summer programs. The greatest need, perhaps, is for tutorial classes on basic computer and internet usage. Such tutorials could be made optional, but would be very useful for students both during and after the summer program. A similar tutorial could be given on standard laboratory protocol and write-up procedures. This summer we concentrated mainly on introducing OpenCourseWare to the students. As President Li Jianbao also suggested (see section 5), future MIT-China OCW teams should conduct more tutorials for university teachers on how to use OCW and incorporate its contents into their classes. Another goal for our teams would be to work with the students to initiate research projects. Currently there are no undergraduate research opportunities at Qinghai University, and very few for graduate students. Starting an undergraduate research program would allow students to apply their knowledge and work more closely with other students and teachers, potentially providing a greater motivation for students to want to learn.

OCW Feedback Questionnaires

The overall setting of Qinghai University – and presumably many other educational institutions in developing regions – is not necessarily as conducive to the use of OCW as in America or other developed countries. The MIT-China OCW teams should work with the OCW staff to develop a modified feedback questionnaire that is more closely related to actual conditions in developing countries. While it is useful for the OCW office to know how students and educators plan to use OCW, these concerns are secondary if OCW cannot effectively or consistently be accessed. Perhaps through using a modified questionnaire, OCW can more easily identify potential barriers to its use in underdeveloped areas.

7. PERSONAL REFLECTIONS

Yiqun Bai

This has been one of the fastest six weeks of my life, and also one of the most enjoyable. From the time I stepped off the plane in Xining to the day that I left this city, I have experienced challenges and lessons, and now leave Qinghai with unforgettable memories. Even before arrival, conversations with team members were always filled with excitement; we were determined to make this a great project.

From students and administrators, I learned that everyone at the school was very excited about our arrival. This excitement was shared. Ever since confirmation that I would be on the team for this project, I was filled with anticipation for having such a great opportunity. I was extremely excited to once again come to China and to learn about an area of China that I had never been to. I wanted to interact with Chinese students, and introduce them to the exciting material that I had just learned from my two years at MIT. Although I knew that I did not have a complete background in my major, I was confident that I could introduce them to the culture and education style that I've learned in the U.S.

Our living conditions, classroom conditions, students, and administrative aids were all far better than I expected. While the project was still a challenge, and at times I was very busy with class preparations, I was happy to see the positive results from our work. I believe that this was an experience not only for the students, but also an enrichment of my own life.

Expectations Before Arriving | I am Chinese, and have been raised in a very traditional Chinese family here in the U.S. Although I already had a general understanding of Chinese culture and am fluent in the language, I still harbored many uncertainties before my arrival in Xining. I did not know anyone who had been to western China, and did not know what living conditions I would face. I knew the temperatures fluctuated drastically from day to night, but that was about all I knew about Qinghai Province. As MaRong and ZhangBo walked us to our apartment on our first day on campus, I thought I would be living in regular conditions of a dormitory in a Chinese university.

Teaching Facilities. For a successful teaching program, the facilities and resources available are extremely important. While we had obtained some information about the resources that were available at Qinghai University, I was uncertain about the specifics. For example, I did not know what types of materials were available in the Biology

laboratory, and when we could use the classrooms. I was not sure what type of Internet access we would have at the university, or whether the students had easy access to computers and the Internet.

Students. The only schooling I had ever received from China was one year of first grade and one month of third grade. Although I had heard much about the education system from my parents, cousins, and friends, I still had never experienced the system first hand. Before arriving in Xining, I had many questions about how the students would react to our teaching style. What would be the level of English of the students? How much background did they have in the fields we were teaching? How were the students selected and why did they decide to participate in the program? I wanted to share as much as I could with the students, but I was unsure about the approach I should take. Knowing the difficulty of the college entrance exams in China, I feared that my background in Biology would not be sufficient to teach much to the students. I was not sure how much work I should be giving them, and what other obligations they had for the summer. While I wanted to teach directly from the MIT curriculum, I was unsure whether to teach according to only one class on OpenCourseWare or combine my own set of classes. If I used only one class from OCW, I would have a more organized set of the materials, and the curriculum could be more easily taught. However, I felt that putting together my own collection of lectures from a combination of classes would provide a better tailored curriculum for what I felt might be helpful at the school. I decided that I would use the material from two main classes, and would also rely upon some outside sources for interesting material to be used outside of the classroom. I also wanted to introduce to the students the most cutting-edge research and scientific advancements that have been introduced to me at MIT. I wanted to share with them the basics of modern Biology and introduce applications of biological knowledge. More than anything else, I hoped that they would become more excited about the field of Biology, an excitement that would hopefully continue even after our team had departed from the university.

Actual Conditions | Two wonderful administrators of the school, MaRong and ZhangBo, picked up Peter and me at the Xining airport. During the car ride to the university, we discussed some of our expectations and logistical questions. These teachers were two of the many people in charge of helping us with our stay at the university.

Accommodations. We climbed the dark stairs to the third floor of the apartment not really expecting to have anything besides a bed and desk in our living quarters. To our pleasant surprise, the living conditions were exquisitely prepared. All the furniture was new: TV, water filter, beds, desk, lamps, etc. Everything had been freshly

renovated and prepared solely for us. Things were definitely starting out on the right track! Even simple toiletries such as shampoo, soap, and bath slippers were given to us. Food, we were told, would be specially prepared for us everyday by a chef in the university cafeteria! While the administrators gave us much guidance and helped with our adjustment to living in Xining, we also received our needed free time and personal space.

Classroom facilities. During our first tour of the university campus, MaRong and ZhangBo showed us the classrooms where we would hold all of our classes—it was the best classroom of the school, equipped with multimedia projectors and speakers, with seats for just under 200 students. During the first few hours, Peter and I also suggested that we would need smaller classrooms with blackboards, since they would be more useful for smaller sized recitation classes. Although these facilities were not prepared ahead of time, there was immediately an effort to provide us with the additional classrooms. All the requests we made were met with respect and very careful consideration. For computer science and biology laboratory classes, we requested laboratories, and received both facilities. Upon arriving at the campus, I expected a difference in the resources and facilities available compared with those at MIT. However, as a member of the first MIT student team to introduce OpenCourseWare in a remote, western part of China, I realized that overcoming any challenges in terms of resources and facilities was also an integral part of the entire teaching experience. Although the facilities at QU were not as conveniently accessible as those at MIT, they were sufficient for the classes we taught.

Students. The students were the main focus of this project, and they have made this experience worthwhile. They have surprised me with their skills, helped me when I needed guidance around Xining, became our friends, shared with us details of their local culture, and taught me lessons about life beyond anything I could learn from the United States or an MIT classroom. Because of my lack of understanding about the academic level of the students I would receive, I was very uncertain about what to expect. I was a bit intimidated the first time I walked into the multimedia classroom where Teaching Director Yu introduced us to the students. Over 100 eager faces were staring at us, and I was not sure how much information I would be able to teach them. However, upon conversing with the students, I realized that the goal would be to exchange information between us, rather than establish a strict teacher-students format. Although I expected respect from the students while I was lecturing in the classroom, I also wished to become their friend outside of the classroom.

I was extremely touched and impressed with the eagerness and enthusiasm of the students to learn. It was great to see that they were so excited to have us at the

university. The first thing I noticed upon speaking with the students was their curiosity about American culture. They wanted to fully experience the American style of education. While the English proficiencies of the students varied greatly, I found that it was possible to communicate about almost anything with them in English. Initially I spoke slowly and used simple vocabulary. However, as they became more accustomed to us speaking in English, I spoke more quickly, and used more difficult vocabulary with some typical American slang. Although I can speak Chinese, I would use Chinese to interpret only when I had tried all possible ways of explaining the term in English. The students eagerly accepted my interactive style of teaching, and would tell me how different it was from the lecture-listen style they are accustomed to.

Teaching Biology was a big challenge, as the subject is difficult to teach using simple vocabulary. Although pictures and calculations could be used to explain concepts, English was one of the most difficult obstacles to overcome. In America, the goal of teaching is not actual knowledge, but rather the process of obtaining knowledge. We speak of the learning process rather than how to memorize information. While the students surprised me with their strong memorization and mathematical skills, they didn't have much experience in learning how to solve a complex problem. At MIT, although there are a variety of majors and concentrations for engineering and science, each student graduates with a common ability to solve a variety of types of engineering and science problems.

At first, the students were hesitant to "think outside the box" and gave me generic answers that any textbook would give. It seemed to be difficult for them to stand up in a big crowd and answer a question during a lecture. However, with more time, their creativity and public speaking skills gradually emerged in class. They began to ask questions when they did not understand a concept; they would correct me when I made a mistake at the blackboard; and they would offer me ideas that sometimes differed from what I taught. The students were all very intelligent, and I fully believe in their abilities to use what we shared with them to further investigate topics of their interest.

Faculty. All of the administrators and teachers were extremely helpful and thoughtful. Teaching Director Yu Hong Xian and his assistants, Ma Rong and Ma Zhi Ping, were the main people responsible for us. Although they arranged many details for us, we also were free to make our own arrangements outside of class. The main concern for Yu Hong Xian was our safety. Many teachers in our respective fields attended our lectures. For my biology curriculum, I would speak to a certain teacher from the Qinghai University Agricultural Institute, and she would give me great feedback about my teaching. In addition, during the first few days of class, the English teachers

assigned to interpret for us also attended our lectures and provided us with feedback. I felt this type of communication was extremely important in helping us with our teaching. It was with the help of all of the teachers and administrators that we quickly became accustomed to the university and Qinghai culture.

Conclusions. Overall, I felt extremely satisfied with the program and believe it was a great success. I firmly believe in the future of OpenCourseWare and our collaborations with Qinghai and other Chinese universities. Given the lessons from this year, future generations of MISTI interns will be even more successful in their experiences with OpenCourseWare. I believe that this collaboration is not only important to the lives of students at Chinese universities and MIT, it establishes important links between the Chinese and American education systems. I am very proud to have formally presented this pioneering project at the United Nations Industrial Development Organization in Beijing, where I conducted research on the Chinese education system after completing our OCW program in Xining, and at the MIT-OCW / China Open Resources for Education (CORE) conference in Shanghai in early September.

Siqi Chen

I was very surprised when Sean Gilbert contacted me about coming to teach at Qinghai University for MIT this summer. I was flattered that he thought of me since I had already graduated and my only other experience with the MIT-China program was when I went on a biology internship at Fudan University. As luck would have it, I was finishing an MS degree in biology this spring, and had not planned anything yet for the summer. This seemed like an interesting opportunity for doing something different, meet some new people, and see an area of China that I had never heard about. I had no idea where Qinghai was, so I did a Google search to find out something about it. Everything I read about the people, climate, environment, and the Great West Development project further piqued my interest, and I decided to join the MIT team at Qinghai University for the summer of 2004.

When I arrived at the Xining airport, Ma Rong and Ma Zhi Ping picked me up and drove me back to the dorms that we had been assigned. The living arrangements were better than I had anticipated; everything was new and had obviously been procured especially for us. Since I was late arriving to Qinghai, I got my own dorm upstairs from the others. Each suite had 2 bedrooms, a living room area, a wash room, and an adequate bathroom. The next day I met Peter, Sal, Michelle, and Yiqun and we went on a trip to Qinghai Lake with Sean and the two Ms. Ma's. We also met some of the other administrators at dinner that evening.

June 28th, I began teaching; actually Yiqun taught and I watched. I gave my first lecture on June 30th and was a bit nervous and went too fast for the students. I got a bit frustrated at my inability to bridge the communication barrier as the concepts were not complicated. However, I went over it again in recitation the next day and, after leaving out many details, the students seemed to understand more. The lecture and recitation schedule proved to be quite grueling and combined with 2 hours of English class in the evenings made for very long days. A few weeks into the program, we asked to move English class from 7:30pm to 3:30pm so that we could have the evenings free and incorporated a Monday movie day. The time switch worked out a lot better for us but we lost some students in the process.

I tried very hard to simplify the vocabulary, to drop out every unnecessary term, to translate words into Chinese and to use very simple definitions. But a challenge with biology is that concepts, ideas, and problem sets tend to be more descriptive rather than quantitative. For example, in CS, the students could go onto a computer and write a code and see whether or not it works and can debug the program without really knowing much CS vocabulary. In an engineering course, many of the concepts can be

conveyed through mathematical equations that are the same in English and Chinese. I was initially impatient with my difficulties in communicating a relatively simple concept and idea in English and the students' lack of response on whether they understood me or not. I would ask if there were any questions, and there would usually be silence and blank stares so I assumed that they did not understand. But without feedback, I was momentarily lost on how to re-explain a concept. Perhaps I was speaking too fast or teaching in an unfamiliar style—i.e. asking the students to tie together techniques and concepts from different lectures and areas of biology? I tried to use some of my research projects as examples of how to think about problems that are not in a text book and how we can apply different techniques we learn to solve real world problems. I also tried to make it applicable to my Qinghai class by talking about genetically modified organisms.

I initially took the American college approach to lecturing and simply plowed ahead unless students asked questions. However, I quickly learned that no one will ask questions if they don't understand a word that I say, so I would intentionally slow down and ask for questions at the end of a section, or go back over material again whenever I saw a sea of blank stares. This can be challenging as it is difficult to need to think of different ways to explain the same thing three or more times. However, this did become easier as they became more comfortable with us and our teaching styles, and their confidence level in their spoken English grew.

Unfortunately we did not get the biology labs until the third week here and the lab had very limited equipment. To be fair, the administrators did warn us that it was a new building that has not been fully equipped. However, we had hoped to have access to some basic molecular biology tools, such as a gel electrophoresis box for DNA visualization, that were not available. We ended up assigning the students a simplified version of a lab we had in 7.02 to study the effects of mutagenic chemicals on zebra fish embryos. The purpose of the lab was to teach the students about group work, computer research, designing a lab, writing a lab procedure, and to get them to think about a problem outside of the confines of a textbook's cover. We gave the students class time to do research on the internet about zebra fish development and chemicals and asked each group to submit a procedural write-up of what chemicals to use, when and how much to use, how long to expose the embryos to the chemical, and how long afterwards they would look. The next week we took the students to the biology lab building; none of them had been there before as it is a newly constructed building. Very few of them had used the microscopes before so we had them do a simple onion skin staining experiment and a check scrape. They were all eager to try their hand at making slides and viewing their handiwork under the microscope.

The students seemed to really enjoy the culture presentations. They had many questions about dating, school, sports, dress, getting into MIT, jobs, and American culture in general. English class gave us further opportunities to explore cultural differences, and as the students' confidences grew, they became increasingly more inquisitive and outspoken and we were able to have many lively discussions that highlighted our cultural differences. We taught them about thinking "outside of the box," volunteering, finding a major and job that you enjoy doing, and not to be afraid to express a dissenting opinion. In the first few weeks of class, whenever we asked a question, there would be a great big unanimous "yes" or "no," but towards the end of our stay here, we often would get differing opinions and ways to do a problem.

Despite some student attrition in classes, I think we were successful in our project at Qinghai University. Although we did not really teach them much technical information, we shared with them how to problem solve, work in teams, and we helped them to improve their spoken English….all the while using the MIT-OCW website as a focal point. Personally, I feel greatly enriched due to this experience; I have met some wonderful students, worked with some highly dedicated and gifted MIT students, and have had an opportunity to see China's western frontier. I feel extremely lucky to have had this opportunity as a recent alumnus.

My experiences with the MIT China program, both this time and two years ago, have convinced me that I want my future career to somehow include both China and the US. In fact, I am returning to a job in the States with a new boutique consultancy, IS Managing (ISM), that specializes in helping US and European manufacturing interests set up outsourcing projects in China. When I finish this project for MIT, I will be taking the reins for a new life-sciences/biotech division for ISM and trying to help foreign investments in the life-sciences in China. This trip to Qinghai has also piqued my interest in China's developing West and alerted me to possible environmental engineering and protection projects that could be launched here.

Peter N. Jeziorek

This pilot OCW project at Qinghai University was a success in that the five of us were able to learn "hands on" about an area of China that very few Westerners have visited, and Qinghai University was able to establish its first educational links with a leading American university. In collaborating with MIT on this project, Qinghai University administrators emphasized their need to be connected to the outside world and to raise education standards in western regions of China. Introducing MIT-OCW to Qinghai University might be an initial, small step in this direction. In the very least, we've demonstrated that MIT-OCW can be useful as a tool for teaching classes on a variety of technical subjects. Without OCW, I would not have been able to teach a class on computer programming without spending countless hours creating a course curriculum out of scratch. OCW made teaching a much easier process. I might also add that it could have been made even easier if the PDF formats were readily convertible into PowerPoint in order to make our lectures more dynamic. Much of my class preparation time came from having to re-type all the lectures by hand.

One thing that Qinghai University did not inform us about prior to our arrival in Xining was that Qinghai students are required to take their final exams over the course of the summer. At MIT, students tend to study just a few days in advance for their exams, while at Qinghai University, students tend to study for several weeks in advance. The summer exam schedule meant that there was some attrition of students attending our lectures during the exam period. When Qinghai University schedules any future MIT-China OCW teams to teach during the summer, it should ensure that exams do not overlap with the OCW teaching schedule. Also, incentives, such as grades that count at the university, perhaps should be established for the students attending OCW classes.

Future MIT-OCW teams should also consider the pros and cons of teaching in some of the more remote areas of China. It is a fantastic experience to be able to introduce OCW materials at universities that would not otherwise have access to current global educational technologies and methods. And as Qinghai University President Li Jianbao informed us, "Qinghai University needs MIT-OCW more than other universities [in China's more developed east coast.]" However, there are challenges with infrastructure in some of the more remote areas. Qinghai University's computer science labs, for instance, posed their own challenges. Although we were provided with a room full of computers to work with, a percentage of the computers did not work, and another percentage of the computers operated slowly. Some computers could access MIT-OCW, while others could not. Some computers were Windows XP machines with 1.5 GHz processors, while others were Windows 98 machines with 400 MHz processors. We

required only two programs in order to run our lab effectively: MIT Scheme and Adobe Reader. None of the computers at Qinghai University had a program to read PDF files. This Portable Document Format is not so portable in China, at least not in China's far western regions, and should perhaps be avoided when teaching in remote areas. Also, the computers would allow new programs to be installed, but would not save that installation after shutdown. We requested both programs to be installed on all the computers in the lab (since we could not do it ourselves without Administrator privileges). MIT Scheme was installed on maybe 2-3 computers, while Adobe Reader was installed on perhaps 15 of the computers. This meant that for every lab, the students would have to re-download MIT Scheme or Adobe Reader and install, wasting between 10-20 minutes each class. Also, students were not prepared to do 10 hours of projects per week, as most of the students don't have access to computers outside of the computer center. They also have an 11:00pm curfew in their dormitories without access to computers, and so there is no student custom of "burning the midnight oil" at Qinghai University-- at least not on computer projects. Those students that had computers in their dormitory rooms did far better on the projects than those that did not have computers, but this of course was a small minority of people. Finally, our lab time was interrupted by teacher-controlled programming. Randomly all the computers would all of a sudden take on a new Windows XP computer screen and the teacher would teach the students how to use certain programs. When this happened, we would lose 15-30 minutes of class time. We learned later that one solution is to unplug the Ethernet cable for five minutes and then plug it back in.

While it is difficult at this early stage to measure any long-range impact our OCW project might have on Qinghai University and its students, we know that the project was successful by the enthusiasm of the students and Qinghai University's request for OCW teaching teams in the years ahead. This was a first-time, eye-opening experience for Qinghai University and MIT. And it was an experience that changed me. To prepare for this summer project in China, I studied Chinese at MIT in Professor Wheatley's class and read many books on China. I kept a daily journal on the Chinese vocabulary and phrases that I heard throughout the summer, and I am now taking Chinese III at MIT in an attempt to raise my Chinese speaking skills to a level that would open up long-term career opportunities in China. It was a great honor for both Michelle and me to be interviewed by CNN and featured on its *Global Challenges* documentary, which introduced our Qinghai OCW project (broadcasted on September 11, 2004). It seems that just yesterday I was a California kid from Silicon Valley, but now I'm graduating from MIT as a mechanical engineer inspired by China possibilities!

Michelle Tiu

This summer, MIT-CETI sent me to Qinghai University to teach computer science to a group of talented young students. However, I firmly believe that teachers must also be learners, and so I left for China with the intention of also learning as much as possible from my students. And I did learn something very important from them this summer: because of my experiences with the students at Qinghai University, I have decided to pursue teaching and education as a career after I graduate from MIT.

For the past school year, I have been struggling with my purpose at MIT. I began the year as a double major in Electrical Engineering & Computer Science and Management Science. Yet, I wasn't happy with the classes that I was taking or the material I was learning. After much thought, I concluded that a career as an engineer or as a businesswoman was not the right path for me. I couldn't spend the rest of my life working for a company which sole aim is to make money and turn a profit.

In my heart, I cared too much about the world and the people who struggle through it everyday. I knew that I had to devote my life to helping other people and to making a difference in the lives of others. Yet, at this point, I still did not seriously consider a career in teaching. Instead, I explored the world of non-profit organizations and hoped to find a career for myself there.

But my trip to China this summer changed everything. For me, my teaching experience in China is the culmination of all the personal reflection and internal searching that I have done over the past year. This opportunity allowed me to address all the issues and concerns that I have felt over the past year, and has showed me a profession in which all my career desires and needs can be met – as a teacher.

But teaching has always been a part of my life! For the past six years, I have been heavily involved in a number of different programs that teach leadership skills to students. For a part-time job during the school year, I am a math tutor to a middle-school student. For an Alternative Spring Break Trip two years ago, I worked as a *Teach For America* teacher in the underprivileged New Orleans school system. I have always loved to teach, and I have always been a teacher – I had just never realized it before.

What was unique about my experiences at Qinghai University? I believe it was the duration and intensity of my teaching experience. For six weeks, Peter (my teaching partner) and I were in charge of teaching the 6.001 curriculum; we had no one to rely on but ourselves. Never before have I been responsible for such a large curriculum for

so long a time. And so, in my six weeks at Qinghai University, I was able to truly experience what it is like to be a teacher.

And, of course, being a teacher is not easy. There were many days when I left my classroom a bit flustered and confused because the students were having difficulty with a certain concept in English. Then there were days when I became flustered because the students would talk amongst themsleves during lecture. Other days, the A/V equipment wouldn't be available, preventing me from teaching my full lesson. Sometimes I was just exhausted and completely drained from the countless hours I had spent preparing lessons and teaching in the classroom.

Did I experience all these frustrations while I was at Qinghai University? Yes.
Did any of them matter? Not at all.

To quote Po Bronson, "When your heart's engaged, the inevitable headaches and daily annoyances become tolerable and don't derail your commitment." And, for me, that is why teaching is different. For the first time in my life, I knew that my heart was truly engaged. Unlike any other job I have ever had, there was not one day that I did not look forward to teaching. Every morning I woke up and I was excited to go to class. I loved to see the students, to talk with them, to learn about them, and to learn from them. I mentioned the difficult teaching days, but those were outnumbered by the many great days filled with fun and learning.

My summer experience at Qinghai University helped me to understand these truths about myself. When I think back on the summer and all of the students, the only thing I can do is smile. I am so proud of the students and their accomplishments, and I am grateful for all they have given me. I am lucky to have met them, and have them influence my life as much as they have.

Because of my summer experiences, I have learned several things. For instance, I am now very interested in traveling the world and experiencing different cultures. This program has helped me see the benefits and opportunities that cultural exchanges can provide, and I am more interested in international affairs than ever before. Also, I now know what it is like to be a foreigner, and I can attest that it is not always an easy experience. I have a newfound respect for people who emigrate from their home countries and have to build their lives anew in a foreign land. Lastly, this program has strengthened my resolve to delve into the teaching field; yet, because of this experience, I have found an interest in educational issues in developing countries. I have no doubt that my summer in China will shape the path that I will take in life.

Sal Scaturro

Having been in China for a total of 12 months over the past four years on various MIT-China program internships, and having spent time in both large cities and small towns throughout the country, I honestly thought that I would not learn too much more about Chinese education and culture on this, my fourth trip to China.

I have never made such a foolish and naïve assumption in my life.

The unique experiences I have had this summer as part of the MIT-China – OpenCourseWare Initiative at Qinghai University have been among my most meaningful, thought-provoking, (and at the risk of being cliché) life-changing. On my internship with the Environmental Education Media Project for China (EEMPC) in Beijing during the summer and fall of 2001, I first became exposed to issues facing the developing world. I was so deeply influenced by working with my dedicated colleagues at that organization that I decided to shift my academic focus from structural engineering to environmental engineering upon returning to my undergraduate studies at MIT. I felt that this change would allow me get closer to my newfound interest in understanding – and helping – those in the developing world who lack similar opportunities and the infrastructure to improve their lives. Now, three years later with a bachelor's degree in Civil and Environmental Engineering and with a much clearer understanding of what 'development' implies, I am in Qinghai province – at the very heart of China's developing west. Like my internship at EEMPC, this summer's project at Qinghai University has deeply influenced my academic interests and personal growth.

The development of the western provinces, namely Xinjiang, Qinghai, Gansu, Ningxia and Shaanxi, is currently a hot topic in China today. The Chinese government has recently dedicated many resources to improving the economy and education in this region, and has begun supporting international collaborations such as this MIT-China – OCW Initiative with Qinghai University. Immersed in this rapidly changing environment over the past several months, I have come to appreciate the many factors involved in development. In addition to the clear-cut economic and political factors, there exists a multitude of underlying cultural, historical, educational, environmental and geographical factors that will either expedite or hinder this region's development. Based on my own observations and the countless number of conversations I've had with several of my students also interested in this topic, I feel that having a strong understanding of the relationship among these underlying factors will be essential to the effective and responsible development of western China.

I have thus decided to apply to graduate studies programs for the fall of 2005 with the intent of studying these aspects of China's development. I feel that my experiences this summer at Qinghai University are too valuable to tuck away in my "China drawer" and forget; rather, I feel the need to formalize them in some way. Furthermore, a potential next-step in my China career might be working on China-related projects at an international organization such as the UN, World Bank, or Asian Development Bank. Having proper academic research experience in my area of interest would be a great tool if I ever chose to work at one of these organizations. In short, I need to complement my rich China experiences with sound academic research.

Though I spent a lot of time exploring my new interest in the development of western China this summer, I have also rekindled and further developed my interest in the environment and sustainable engineering for the developing world. My six-week curriculum at Qinghai University focused primarily on environmental transport processes and basic geotechnical engineering. In addition to relearning all of the subject content for these courses, I also relearned an important thing about myself: I love to teach. No matter where my life's path takes me, I am certain that it will involve teaching. I have learned a lot about teaching this summer since this is the first experience where I've had to design and implement a full syllabus. I have also come to understand and appreciate the importance of mastering a subject before teaching it. There were many instances over the summer when I felt challenged by my students and was not immediately able to answer a question or explain a concept. Or worse, I would answer or explain and then realize that I had made a mistake in what I said. Making a mistake in itself is not necessarily a bad thing – you learn by making mistakes. However, making a mistake as a teacher can have a very negative impact on students who are trying to learn something new.

As I mentioned in our presentation at the MIT OCW – CORE conference held in Shanghai at the beginning of September, I feel that this is an extremely lucky time for me – or anyone else – to begin a career as an educator due to the presence of open content educational materials and the sharing of knowledge across cultures. Though open-resource materials are only starting to become omnipresent in the educational world, they will always be available to me during my career as an educator – this is why I consider myself lucky. It's similar to how my generation has grown up with computers as a part of every day life, but my parents' generation did not. The concept behind OpenCourseWare is so revolutionary, and I am certain that it will change the face of education around the world. It already has begun to do so – I've seen it here at Qinghai.

Teaching my environmental curriculum this summer has also strengthened my understanding of what it means to be an MIT student, a product of the American education system, and an engineer. In almost every class session, I stressed using the appropriate procedure rather than getting the correct answer, and using assumptions and qualitative analysis to simplify and conceptualize a problem rather than attacking the whole problem at once. Through making correct assumptions and applying appropriate procedures, getting the correct answer to even the most complex problems almost becomes a guaranteed result. Repeating this doctrine to the students nearly every day, I realized that this problem-solving approach is exactly what my MIT education was all about – it was precisely what MIT was trying to teach me. (If I had only made this realization freshman year…) I suddenly understood that there exists a fundamental set of tools that can be used for any type of problem-inside *and* outside the world of academia. I finally found those tools this past summer, and was eager to pass them along to my students.

Then I realized that you can't "teach" people that these tools exist; each student must find them for him- or herself at some time or another.

As an educator, I will always be a student. Indeed, failing to remember that learning never ceases is absolute failure. I often told my students over the summer that I was also a student and that they were all my teachers. I encouraged them to challenge and correct me when I made a mistake, and I think they were very surprised by this gesture which was a complete departure from their traditional role as students. By putting myself on the same level as my students and inviting them to share in my experiences – communication and cultural barriers to education seemed to disappear.

I will forever be a student, and will forever be a student of China.

[see photos of this project below]

8. PICTURES

Peter enthusiastically teaches his students.

Our students during the first lecture.

After a home-cooked meal by our students.

Students working on the Environmental Lab.

At Mengda nature preserve with students.

At Nanshan park in Xining with students.

Peter and Bing Bing at Kumbum Monastery.

Michelle, Wesley and Jessica on campus.

At Qinghai Lake with Sean Gilbert.

Dressed in traditional clothes, holding a lamb.

Dining out in Xining.

At Kumbum Monastery.