AC 2009-1036: INTRODUCING EARTHQUAKE ENGINEERING THROUGH SIMULTANEOUS IN-CLASS AND WEB-CAST LECTURES: AN INTERNATIONAL EXPEDITION TO A MEGAPOLIS AT SEISMIC RISK

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Introducing Earthquake Engineering through Simultaneous In-Class and Webcast Lectures, and International Expedition to a Megapolis at Seismic Risk

Abstract

As part of an effort to integrate international experience in the Civil Engineering curriculum at Purdue University, in Spring 2008 semester, an earthquake engineering course that incorporated a 10-day study-abroad experience to Istanbul, Turkey was offered. The program scope, while having structural engineering perspective at its core, included a range of earthquake related topics such as geology, seismology, and architecture. This approach not only fulfilled the overall objective of the program as stated in the description by IAESTE, the organization that co-managed the program along with Purdue University Global Engineering Program and the School of Civil Engineering, but also attracted students nationwide to attend the Earthquake Engineering Program (17 from Purdue University and four from four other universities) from a wide range of earthquake related fields including civil, mechanical, mining and mineral, and geophysical engineering. The group had three sophomore, ten junior, six senior, and two graduate (doctoral) level students.

Through distance virtual learning technology, students from all institutions were able to participate in real-time semester-long classroom meetings before and after the actual study-abroad experience in Turkey. Initial data suggests that students achieved high learning outcomes and enjoyed a very positive learning experience throughout the course. Data regarding student learning outcomes were collected and used to assess the efficiency of the distance-learning (virtual classroom lectures) and experiential learning (study-abroad program) pedagogical methods.

This paper describes these two pedagogical methods, and, in particular, explores the impact of experiential learning on students' benefit from the program. It further discusses the program logistics in light of international institutional partnerships and cost-benefit analysis as relates to the expected student learning outcomes.

The course, titled "Earthquake Engineering/Istanbul at the Threshold", has been deemed successful. It is hoped that it could be offered in a similar format in Spring 2010.

Introduction

As highlighted in "The Engineer of 2020: Visions of Engineering in the New Century"¹, natural disasters can still have serious impacts on society. Of these disasters, earthquakes provide a unique challenge due to the fact that there is limited ability to forecast the level of damage future events would deliver to built-environment. The low frequency but high consequence nature of major urban area earthquakes requires sharing of technical and societal experience at global level to understand the processes involved and to develop successful engineering designs as well as organizational understanding to minimize risk in urban areas. True to these facts, fundamental principles in earthquake engineering can be applied globally. Learning such principles is a very

efficient way to empower engineering students. These learning experiences would help prepare prospective engineers who would be participating in fields associated with earthquakes for the global challenges and opportunities that are very likely to come by in the future.

While several U.S. academic institutions offer courses in earthquake engineering, almost all at post-baccalaureate level, there is no earthquake engineering course that brought students from different academic institutes, both at undergraduate and graduate levels, through use of Internet-based virtual-presence and participation tools, and with exclusive study-abroad experiential learning portion, until 2008.

In 2007, IAESTE-USA requested proposals from academic institutions in the United States to develop such an inclusive and specially tailored course. In particular, the request was for a U.S. university to assume the Lead Academic Institute (LAI) role to develop and offer an international program on earthquake engineering and to consider the case of Istanbul, Turkey as the center-piece of the course. Purdue University responded to the proposal and was granted the LAI position. In its successful proposal, Purdue University offered to develop a semester-long course on earthquake engineering, with undergraduate students as the main target but also admitting graduate student. The classes were to be delivered in both in-class and virtual real-time distance-teaching/learning format. Last but not least, a 9-day trip to Istanbul during the mid-semester was included to punctuate the course and give the students to observe how earthquake engineering principles are used to mitigate earthquake risks in a megapolis housing over 12 million people².

The course was offered in Spring 2008 semester. 19 undergraduate and two graduate students from five academic institutes and five engineering majors took the course as a 3-credit technical elective civil engineering study-abroad course. 17 of the students were from the LAI and the other four were from four other institutes. The classes were conducted in a classroom on Purdue University campus, in two 1.25-hr sessions per week, with real-time audio-visual webcast and all-way communication to allow participation and virtual presence of students from other universities. All of the students participated in the Istanbul study-abroad portion of the course. Cultural immersion and the study abroad experience served as a keystone of this course as it allows students to apply what they have learned in class to real-life in the global setting.

In what follows, issues associated with pedagogy are discussed first. Opportunities, challenges, and solution approaches and actions are described for different aspects of the program. Afterwards, the learning outcome, based on anonymous survey results, is presented. Details of the program logistics are given to shed light on the practicality of pedagogical theories. Finally, future outlook and recommendations are made for continued success of the developed program and similar programs.

Pedagogy

The Class Composition

The aforementioned earthquake engineering course attracted students from five different engineering departments (16 civil, 2 mechanical, 1 construction, 1 geological, and 1 mining and mineral) in five universities (19 from LAI Purdue University, and four students from

Pennsylvania State University, University of Kentucky, University of Pittsburgh, and University of Wisconsin at Madison) with a wide range of college education background (3 sophomores, 10 juniors, 6 seniors, and 2 PhD students). 10 of the 21 students were women.

Initially there was a priori group-association amongst students, i.e. associating themselves with their classmates they know from other courses, particularly observable in the LAI civil engineering undergraduates as they dominated the composition of the class. In early meetings, despite the high level of enthusiasm in class discussions there was minimal interaction between non-associated students and others during the class breaks. The difference in level of participation between on-campus and virtually-present students was obvious. However, neither group-association nor virtual-presence boundaries were observed after the overseas trip. It was obvious that living together for 9 days and the common experience had erased the boundaries and barriers of communications, at least at the personal level. A clear evidence of the newly-developed bonding was the high-level of interaction between students during class-breaks in which several in-class LAI students engaged in chats (both text-based and audio-visual) with their classmates from other universities. Another evidence was the high level of participation at the end-of-semester celebration for the class that was held at LAI. All but one of the remotely-participating students attended. The absence was due to conflict with final exams.

The main challenge brought about by the diverse background and seniority-level of the students was in keeping everyone interested in the material presented in class and engaged in discussions. The level of discourse had to be adjusted throughout each lecture. When high-level interpretations were to be given, they were introduced by first mentioning that they were provided particularly for more senior students both to raise level of attention in those and to preclude frustration in junior students. In all cases, however, the lectures were conducted in an open format setting with questions taken at all times including in the midst of a presentation as opposed to at the end of a lecture format as one would typically see in formal seminar presentations. The students were encouraged to ask questions and to initiate discussion by suggesting a relevant topic or project.

Besides the regular class-material based homework assignments, on average given every other week, completion of a term project on Istanbul, “Istanbul: the past, the present, and the future”, was a requirement to receive a passing grade in the course. The term project, with its separate parts on cultural history, seismic history, seismic hazard setting to be completed before the overseas trip, and the state of the built environment of the city, estimation of the state of the built environment immediately after a major earthquake in the near future, and mitigation and emergency-response recommendations, allowed the students with different levels of education to present their understanding at their own level. The performance of the students was judged by the level of sophistication they should be able to provide in their own class-level.

Curriculum

In typical civil engineering undergraduate curriculum, students’ exposure to dynamic response of structures is extremely limited. The fundamentals of rigid body dynamics with introductory study of simple mass-spring vibratory systems provided in freshman-level physics and sophomore-level dynamics courses practically form the extent of formal education in analytical

dynamics for majority of undergraduate students. At senior level, undergraduate students take design courses in which dynamic loads are simplified to their static equivalents without any detailed discussion of the dynamics to statics conversion process. Dynamic response of structures is excluded altogether. Structural dynamics is taught at graduate-level often with a refresher portion on fundamentals of vibratory systems.

The main curriculum challenge was to develop a syllabus that would allow rapid development of a common minimum-level of understanding of dynamic processes involved so that the students with their wide range of engineering background could participate in the learning process at their respective levels at all times. The topics covered in the course are listed in Table 1.

Table 1. Outline of class lectures, in chronological order.

<ul style="list-style-type: none"> • <u>Seismology/Engineering Seismology</u> <ul style="list-style-type: none"> ○ Tectonic plates and faulting ○ Physics of earthquakes (elastic rebound theory; fault slip and rupture process) ○ Earthquake parameters ○ Seismic waves (body waves, surface waves); wave propagation in earth ○ Seismogram versus strong ground motion records; principles of motion recorders ○ Measuring earthquakes (magnitude; shaking intensity; released energy) • <u>Earthquake Engineering (Geotechnical)</u> <ul style="list-style-type: none"> ○ Effects of local site conditions on local ground motion: amplification, liquefaction ○ Soil-structure interaction • <u>Earthquake Engineering (Structural)</u> <ul style="list-style-type: none"> ○ Engineering representation of structures (equation of motion; single and multi degree of freedom linear elastic models) ○ Free and forced vibrations; undamped vs. damped systems; dynamic amplification ○ Numerical and analytical approaches to solve equations of motion ○ Base excitation; seismic load representations; response spectra ○ Vibration isolation (base isolation, tuned mass dampers) ○ Dynamic testing of structures ○ Response of structures to ground motions: reinforced concrete, steel, and masonry structures ○ Fundamentals of earthquake resistant design for new structures ○ Fundamentals of retrofit/upgrade for existing modern/historic structures ○ Observations from recent earthquakes in the United States and around the world ○ Post-earthquake inspection of structures (reinforced concrete, steel, masonry, and wood)
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A wide range of topics related to earthquake engineering were covered in the course: from the nature of earthquakes to response of structures subjected to earthquake ground motion, and on to principles of seismic design of modern structures as well as retrofit and upgrade of modern and historic structures. The course was also an critical thinking exercise that allowed relating laws of nature and engineering principles (modeling, analysis, and design) using a serious real-world problem as the medium.

The overseas trip to Istanbul, a city facing very high seismic risk², provided opportunities to see how earthquake engineering concepts were applied in practice. In particular, in accord with the material studied in the classroom, the group visited several construction and retrofit sites including of a modern high-rise complex, several historic monumental structures, and a submerged railroad tunnel (MarmaRay) connecting Asia and Europe at the bottom of the Bosphorus Strait. Additionally, the students visited three research laboratories including an earthquake research laboratory of the host university (Istanbul Technical University), the MarmaRay tunnel material research laboratory, and a second earthquake research laboratory that also houses a seismological observatory where real-time monitoring of seismic activity in Istanbul at grand scale could be seen.

Distance-learning

The course was designed to allow participation of students through real-time audio-visual broadcast over the Internet with all-way communication. Besides the four students that were not living near Purdue University West Lafayette campus, several on-campus students chose to follow the class via real-time webcast. Adobe Acrobat Connect Pro software³, run on Purdue servers, was used to webcast the course lectures and to communicate using text-type chat as well as audio-visual feed in all directions. The software with its secure and remote hosting allowed reliable broadcast of lectures. After the overseas trip, a number of students from Istanbul, despite the time difference, followed the lectures and participated in discussions as guest students.

The main challenge of the distance-learning, at logistics level, was the requirement that all presentations needed to be delivered in the digital medium. When compared with the instructor's traditional blackboard lecturing and in-class demonstration work elsewhere, preparation of the all-digital course material was significantly more time-consuming than it would have taken in a "traditional" setting. The traditional blackboard for mathematical derivation and illustration sketching had to be replaced with a digital tablet-board that required a lot practice to use comfortably.

In-class experiments were broadcast using a webcam. To avoid loss of visual clarity due to possible slow data transmission rates, in-class vibration demonstration setups had to be modified to avoid high-frequency oscillations. In at least one case, the demonstration had to be recorded using a stand-alone digital video camera and uploaded to the course website for remote students to download and view after class. Additionally, a visit to the on-campus structural engineering laboratory to view an on-going full-scale infill-wall test had to be recorded on a digital video camera and posted for download and viewing off-line.

In spite of the challenges of adapting educational technology to traditional pedagogy, the authors find it a learning opportunity to experience how engineering could be taught in 21st century. Students participated in the course understood the challenges and were patient to the slower delivery rate of materials. On the other hand, students also had an opportunity to interact with students from other universities. Literature suggests that the widespread of education technology enhances the excellence of teaching and learning⁴.

Experiential-learning

The overseas trip to Istanbul, Turkey allowed the class to gather first-hand experience of how earthquake engineering concepts are applied in a megacity housing over 12 million people, and under very high seismic hazard (in the order of 50% probability of magnitude 6.7 or larger in the next 30 years). Students had the opportunity to bring meaning to engineering theories and understand how engineering work impact real people, even outside of their country. The overseas trip itinerary was carefully developed to maximize the use of time during the group's stay. On two mornings, students attended half-day seminars on earthquake engineering principles as applied to various structures in Istanbul. Several of the projects and structures mentioned in these seminars were visited during the site visits in Istanbul. The linking of classroom presentations and field-visited projects/structures was critical to sustain the intensity of students' learning experience.

The main logistical challenge was in scheduling the trip time. The trip was scheduled during the Spring Break of the LAI, which conflicted with the Spring Break of only one distance-learning student from another university. The other logistical challenge was in balancing time and effort between various engineering site visits and cultural immersion which was part of the IAESTE request. These challenges were handled by continuous and high-level coordination with IAESTE-Turkey that started even before the course had commenced. The secretary general of IAESTE-Turkey, a structural engineering faculty in Istanbul Technical University (ITU), was of critical help with her network of colleagues, civil engineering alumni and students. The itinerary was finalized, including all technical and non-technical activities, well in advance of the arrival of the group in Istanbul.

Graduate and undergraduate structural engineering students from ITU joined the group as Turkish student hosts. The size of the collective group was adjusted to allow transporting the guest and host students in the city as a single group. The host to guest ratio of students was 1:3. This high ratio and the fact that there was a single group allowed continuous interaction and rapid development of beneficial group dynamics. These were two key factors in achieving success in the cultural aspect of the experiential learning, and provided significant help in achieving success in the technical aspect, as well.

During site visits, students received on-site presentations from site-engineers and were able to converse with technical people.

Learning Outcome

The students' opinions were surveyed using three anonymous questionnaires: two study-abroad questionnaires at the end of the overseas trip (one by IAESTE-USA and the other by Purdue University as the LAI), and a traditional questionnaire by LAI at the end of the semester. All 21 students participated in surveys. The IAESTE-USA and LAI study-abroad questionnaires included 16 and 22 questions, respectively. The traditional questionnaire included 14 questions. The IAESTE-USA survey had numerous prose questions; two questions for which the replies could be quantified are given in Table 2. Tables 3 and 4 list the questions and the mean or the mid-point of the responses to the LAI questionnaires.

Table 2. Two questions from the IAESTE-USA study-abroad questionnaire. Percentages indicate ratio of students replying with the corresponding answer.

Would you recommend this program to your friends?	Yes 100%	No 0%	
Because of the Earthquake Engineering program,	Decreased	Remained the same	Increased
The likelihood that I will complete my engineering degree has	0%	71%	29%
My interest in earthquake engineering	0%	19%	81%
My understanding of how culture impacts the practice of engineering has	0%	14%	86%

Table 3. LAI study-abroad questionnaire. Scale 5 (strongly agree) – 1 (strongly disagree). Mean scores.

Overall, I would rate this course as:	4.8
Overall, I would rate this instructor as:	4.9
My instructor demonstrates the importance and significance of the subject matter:	4.9
My instructor takes into consideration ethnic and cultural differences in teaching this course:	4.9
This class provides a meaningful learning experience.	4.9
This course supplies me with an effective range of challenges.	4.5
My instructor provides many challenging new viewpoints.	4.5
I learned new ways to think about the issues dealt with in this course.	4.7
This course helps me organize my ideas and information.	4.3
My critical thinking skills improved because of this course.	4.0
This course encourages me to think critically.	4.1
My problem-solving abilities improved as a result of this course.	4.0
My technical skills were improved because of this course.	4.2
My field experience is well coordinated with my course work.	4.6
I receive adequate supervision at the field site.	4.8
The local cultural context was integrated into the academic content of this program.	4.9
Extra-curricular program features involved cultural integration.	5.0
This program enhanced my overall Purdue University education and training.	4.8
I am better equipped to deal with inter-cultural issues.	4.9
I learned the basic content of this course.	4.7
Learning was more meaningful in this class than other classes I have taken.	4.3
I was more motivated to learn in this class than in other classes I have taken.	4.2

It was clear from the anonymous replies to the IAESTE-USA survey that the students benefited from the study-abroad trip to Istanbul. To quote a few students, “I learned ... what needs to be taken into account when designing structures for earthquakes and some new technologies that are being implemented to protect structure from earthquakes”, “academically, it was really fruitful in the sense that being in a seismic environment does affect your technical critical thinking.”, and “it was quite the thrill to see engineering in a different world but that it is basically the same.” It is interesting to note that the tone of the anonymous replies were very similar to the “man-on-

the-street” interviews the instructor and the program manager did with several students on the last day of the trip in Istanbul.

Table 4. LAI traditional course questionnaire. Scale 5 (strongly agree) – 1 (strongly disagree). Mid-point scores.

My instructor makes good use of examples and illustrations.	4.9
My instructor displays a clear understanding of course topics.	4.9
My instructor explains difficult material clearly.	4.4
My instructor seems well-prepared for class.	4.8
My instructor has an effective style of presentation.	4.3
I am generally pleased with the text(s) required for this course.	4.7
Course assignments are interesting and stimulating.	4.3
My instructor is actively helpful when students have problems.	4.9
My instructor is readily available for consultation.	4.8
I would enjoy taking another course from this instructor.	4.9
My instructor displays enthusiasm when teaching.	4.9
My instructor motivates me to do my best work.	4.8
Overall, I would rate this course as:	4.9
Overall, I would rate this instructor as:	4.9

In addition to the technical experience, the students apparently valued the cultural experience highly: “I think the interaction with Turkish students was very important as well as distinguished speakers”, “I learned so much about the culture of Turkey and that there is big world outside the US with completely different traditions”, “I definitely gained many new friendships and a stronger civil engineering network not only with the American students but with the Turkish students as well. It was also a good growing experience as I was very nervous before the trip since I did not speak a word of Turkish and was not sure how I would get along”, and “no matter how different people are, we are all human and desire to be happy.”

It is difficult to gage the long-term impact of the course and the value of the experience quantitatively. However, on the anniversary of the study-abroad trip, an anonymous questionnaire will be distributed to the alumni to estimate the impact or perception of impact of the course has on the alumni in their current academic or professional work.

Program Logistics

The nature of a large Research I higher education institution often posts challenges to its faculty members in pursuing activities outside of their primary responsibility. Although rhetoric of a research institution may focus on the importance of study-abroad programs, faculty members, especially junior faculty members who have yet to obtain their tenures, find it time consuming to engage in teach abroad and related programmatic logistics. The development and management program involves great amount of administrative details, ranging from program recruitment, flight arrangements, program payment and budgeting, excursion planning, and so forth. These tasks are outside of faculty members’ functions and can become impeding to the success of the program.

As mentioned before, IAESTE-USA, a program of AIPT requested teaching plans and proposals from various schools. The Earthquake Engineering program proposed by Purdue University was accepted based upon the compatibility of program goals and faculty member expertise in the Civil Engineering discipline. This program was then promoted not only at Purdue University, but all U.S universities throughout the nation. As a result, four college students applied to the program through IAESTE national website. All other student participants were from Purdue University.

The writers believe that the success of the Turkey Earthquake program can be largely contributed to the fact that the IAESTE-USA national office handled all program logistics. The faculty instructor concentrated on the design of the academic course and its pedagogy, while IAESTE-USA office served as the program provider that handled all other non-academic program related activities. Such activities include:

- Student registration (online)
- Collection of program deposit
- Make local arrangements in Turkey
- Airline ticket purchase
- Visa application
- Purchase program gift items for local hosts (notebooks and T-shirts)
- Conduct pre-departure orientation
- Delineated program behavior expectations and insurance policies

Registration of credits was handled by Purdue University. Non-Purdue students registered and enrolled at Purdue University as non-degree seeking students. The cost of Purdue University tuition was built into the total program costs payable to IAESTE-USA. Therefore, Purdue University was not directly involved in the program management. However, related administrative offices at Purdue University were notified as appropriate.

One note-worthy point of program development is that even as IAESTE-USA program officer handled program logistics, close ties existed between the program travel arrangements and academic design. The faculty leader was consulted about the excursion sites and travel itinerary, as the activities outside classrooms were closely connected to the teaching materials. The positive and smooth collaboration between program provider and faculty leader(s) is the key to the success of the Earthquake Engineering Program.

At most of the higher education institutions, budget determines the limits the expansion of study abroad program. New program cannot be developed unless there are enough students to break even financially. Program directors would have to pay close attention to the bottom-line figure in order to ensure program viability. The Earthquake Engineering course was designed to be self-supporting. In fact, study abroad programs all over the nation face the danger of cancellation when there is insufficient student participation. Program leaders often find that their hands are tied behind their back in designing a desirable program due to costs. By lowering the cost of the program, program leaders sometimes have to forgo activities that are education but costly.

In many instances, it is a “balancing act” between quality and cost of the program⁵. Authors were mindful of student interest as well as students’ reaction to the sticker price of the study abroad programs. Authors persuaded students to look beyond the sticker price of study abroad programs. However, study abroad programs must “break even” financially in order to be sustainable in the long run.

The total cost of the program for each student was \$2921.00. This price tag included airfare, accommodation, all excursions, course credits, course materials, classroom space, medical insurance and all breakfasts and lunch. Throughout the recruitment phase of the course, students were encouraged to look beyond the sticker price and to be able to see the price as a reasonable, all-inclusive cost. Yet, it was inevitable for some students to be intimidated at first. However, all students returned testified that the cost is worthwhile for the experience and the accommodations made for the program. For Purdue University students, other financial aids such as Federal grants and travel grants were also issued to qualified students as incentives. In order to provide incentives and a form of encouragement to the faculty member, the host academic department was also approached to release the faculty member time for teaching.

Future Outlook and Recommendations

As mentioned above, effective communication between the program provider and the faculty member contributed to the successful learning outcomes of the study-abroad program. This is also an importance factor to the sustainability of the program. The positive experiences of both students and faculty member continued to extend beyond the program termination date. The Turkey Earthquake Engineering program had a successful first year and the program leaders had originally intended to conduct the program for the following year.

Common to all study-abroad programs and even regular on-campus classes, budget balance is the main determinant factor of program viability. Delicate balance must be found between student participation rate and the capacity of the program. In case of low participation rate, the program may face cancelation due to insufficient funding payable by students. In case of excessive participation rate, the program leader may face possible liability issues due to mismanagement.

The recent economic crisis has post new challenge to the Turkey Earthquake Engineering program. Unfortunately, the number of applicants for the 2009 Spring semester course were at 30% of the number the first time the course was offered. As the program ceases to be financially viable at such low enrollment level, the program is cancelled for 2009 Spring. It is the hope of the writers that this program may be offered again in the future to interested students as it was deemed a very rewarding academic and cultural experience by the students and the faculty leader/course instructor.

Conclusions

The Turkey Earthquake Engineering course that was developed in response to a national call from IAESTE-USA included an overseas study-abroad portion. It attracted a very diverse group of engineering students from multiple universities, different class-levels, and engineering backgrounds. The technological challenges of delivering real-time webcast lectures were not

overwhelming and were overcome using existing technology with minor modifications to demonstration kits. The teaching format had to be adjusted to make the course inclusive and interactive, as opposed to a one-way lecturing, particularly for virtually-participating students.

Based on student feedback through three anonymous surveys it was evident that the students felt personal and technical growth by taking the course and, in particular, participating in the study-abroad portion.

The writers, the first one being the developer and instructor of the course, attribute the success of the course to not only the enthusiasm of the students but also to the successful collaboration between the LAI Purdue University, IAESTE-USA national office, and IAESTE-Turkey.

Even though the course was deemed outstandingly successful by the students, the viability of the course, like that of in similar study-abroad courses, depends not only on the close collaboration between involved parties but also on continued support from the proponents of global engineering vision.

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References

1. National Academy of Engineering (2004). *The Engineer of 2020: Visions of Engineering in the New Century*, Washington, D.C.
2. Griffiths, J. H. P, Irfanoglu A., and Pujol S. (2007). Istanbul at the Threshold: An Evaluation of the Seismic Risk in Istanbul. *Earthquake Spectra*, v.23(1), 63-75.
3. Adobe Systems Inc. (2008). Adobe Acrobat Connect Pro software.
4. Kearsley, G. and Schneiderman, B. (1998). Engagement Theory: A Framework for Technology-Based Teaching and Learning. *Educational Technology*, v.38(5), 20-23.
5. Dessoff, A. (2006). Quality and Cost in Education Abroad: Balancing Act. *International Educator*, July/August, 24 -30.