Christopher S. Kim, David M. Shafie, *Chapman University*

CUR Focus

Designing the Campus Environmental Audit as a Senior Capstone Course: Achieving the Triple Bottom Line

The senior capstone seminar is an essential curricular component of many degree programs. For a new interdisciplinary B.S. degree in environmental science and policy (ES&P) at Chapman University, a four-year comprehensive master's university located in Orange County, California, the capstone serves two vital purposes from an undergraduate research perspective. First, it serves as a forum for committed students of environmental science and policy to apply their knowledge and begin to address real-world problems in the community. In doing so it allows students to actively promote environmental sustainability, which is increasingly seen as a legitimate and important mission of the academy (Hales 2008). "Institutions of higher education," according to an essay in the Worldwatch Institute's annual publication *State of the World*, "must aim to create an ecologically literate and ecologically competent citizenry, one that knows how Earth works as a physical system and why that knowledge is vitally important to them personally and to the larger human prospect" (Orr 2010).

A second purpose of the capstone seminar is unifying and reinforcing the undergraduate curriculum. This is a particularly critical function for interdisciplinary programs. A comprehensive assessment of degree programs in environmental science and environmental studies concluded that many of these programs lack clarity of purpose, "suffer from muddled goals," and represent "an educational smorgasbord of course offerings" (Clark *et al.* 2011a). As a remedy for this interdisciplinary malaise, Susan Clark and her co-authors recommend a cohesive core curriculum to integrate knowledge, culminating with an applied senior capstone (Clark *et al.* 2011b). As such, the capstone seminar also has to satisfy the needs of an outcomes-oriented assessment process.

Key elements of the environmental capstone at Chapman are independent research, a written report, and presentations (in both oral and poster form). These elements are intended to serve both as assessment tools and as opportunities for students to demonstrate the critical thinking and research-based skills developed throughout the ES&P curriculum. From a broader perspective, the ES&P capstone provides a potent example of embedding research into the curriculum, a goal of many high-quality undergraduate programs (CUR 2012; Karukstis and Elgren 2007). Accordingly, the capstone experience was structured to develop and assess mastery of the ES&P program's four desired learning outcomes:

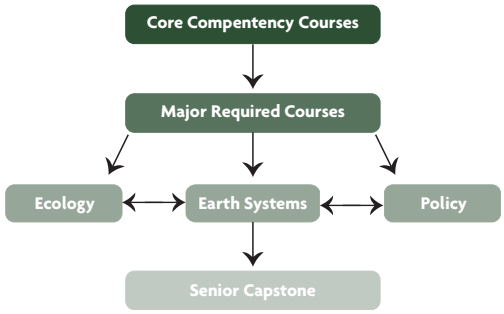
1. Students will be able to apply critical thinking and analytical skills to design and interpret scientific experiments, results, and data.
2. Students will be able to analyze and critically evaluate the political, economic, and ethical aspects of environmental policies.
3. Students will be able to identify interfaces between science and policy to assess complex environmental challenges from an interdisciplinary perspective.
4. Students will be able to communicate effectively through written, visual, and oral presentations.

Expectations were especially high in the spring of 2013 when the first graduates of the new degree program fulfilled the capstone requirement by conducting Chapman University's first campus-wide environmental audit. The capstone was designed to be a collaborative course, with students working individually, in pairs, and as a team to complete the project. This article details the design, execution, and assessment of this unique, yet readily transferable, undergraduate research project that served the needs of students, provided the final building block in a new undergraduate program, and will ultimately further the goal of campus environmental sustainability at Chapman.

The Environmental Science and Policy degree program

The bachelor-of-science degree in environmental science and policy was launched in the 2009-2010 academic year as an interdisciplinary collaboration between the Schmid College of Science and Technology and the Wilkinson College of Humanities and Social Sciences at Chapman University. By leveraging existing faculty strengths in several environmentally related fields—including earth-system science, ecology, environmental chemistry, environmental policy, and geochemistry—the degree was proposed in order to offer a formal way in which students could pursue both a strong scientific grounding in environmental issues and a deeper understanding of the ways in which environmental policies regarding these issues are developed, implemented, and enforced. In simpler terms, the ES&P degree program was designed to train environmental scientists who can communicate effectively with policy-makers, and to produce policy-makers who are scientifically literate in a range of environmental topics.

Figure 1. Schematic Outline of Curriculum for the Environmental Science and Policy Degree



The structure of the ES&P degree is shown schematically in Figure 1. In the first two years, majors complete core competency requirements in mathematics (calculus, statistics), general chemistry, biology, physics, and geology. They also complete separate introductory courses in environmental science and environmental policy, as well as courses in environmental politics and the public-policy process. Additional required courses designed specifically for the major include an environmental seminar featuring weekly guest speakers from various environmentally related professions; introduction to Geographic Information Systems (GIS); and an upper-level course on environmental problem-solving that helps prepare students for their capstone experience by using case studies and basic mathematical methods to understand the influence of human and environmental factors on the flux of energy and matter.

Majors must also select one of three focused academic areas of study (ecology, earth systems, or policy) and complete three upper-level courses of their choice in their selected area, along with one upper-level course in each of the other two areas, thus ensuring a degree of breadth and depth in students' knowledge across all relevant areas of study. These components of the curriculum were used to produce a curricular map for assessment purposes. This map, which appears in Table 1, indicates which courses introduce, develop, and lead to mastery of each of the specific desired learning outcomes.

The culmination of the ES&P curriculum is the capstone seminar, in which all seniors design and conduct a group research project during the spring semester prior to graduation. Structured as a formal course with regular class times and faculty instructors, the concept of the capstone was to have seniors work collaboratively on a single independent research project that resulted in a

Table 1. Environmental Science and Policy Curriculum Map and Desired Program Learning Outcomes (PLOs)

Course	PLO 1 Apply critical thinking and analytical skills to design and interpret scientific experiments, results, and data	PLO 2 Analyze and critically evaluate political, economic, and ethical aspects of environmental policies	PLO 3 Identify interfaces between science and policy to assess complex environmental challenges from an interdisciplinary perspective	PLO 4 Communicate effectively through written, visual, and oral presentations
ENV 101 Intro. to Env. Science	I		I	I
ENV 102 Intro. to Env. Policy		I	I	I
ENV 111 (L) Physical Geol. (+Lab)	D			D
ENV 205 Env. Seminar			D	
ENV 310 Geographic Information Systems	D			
ENV 330 Env. Problem Solving: Energy/Matter Flow	M			D
POSC 374 Env. Politics + Policy		D		D
POSC 375 Public Policy Process		D		D
ENV 498 Senior Capstone Seminar	M	M	M	M

Note: I=PLO is introduced in this course. D=PLO is developed in the course. M=course is designed for mastery of the PLO.

clear, deliverable product and that demonstrated their mastery of the program's desired learning outcomes. One advantage of group work is that students are able to produce a substantive and comprehensive report with the potential to impact the community, as the campus environmental audit demonstrated. Further, the collaborative approach has been embraced as a method to prepare students for an increasingly complex and decentralized workplace (Robins and Greenwood 2000). There should be greater demand for employees who can participate in collaborative decisonmaking in the future as government and nonprofit organizations move toward the team model (Donovan 1998).

Several possible capstone projects were considered by the degree's faculty curriculum committee prior to the first offering of the senior capstone in spring 2013. These included partnerships with local nonprofits, on-campus initiatives, and research collaborations with non-governmental organizations. Eventually the committee decided to conduct a campus-wide environmental audit of Chapman. This allowed maximum control over the execution of the planned project while providing a clear deliverable of direct use to the campus community.

History of Campus Environmental Audits

A small number of colleges began conducting environmental audits in the 1990s, inspired by the "Rio Declaration on Environment and Development" resulting from a United Nations Conference on Environment and Development in 1992. A key component of the Rio Declaration was Agenda 21, a comprehensive public policy strategy for communities to achieve sustainability by integrating environment and development decisions in an open and democratic way. A campus-wide environmental audit first attempted in 1993 at Bishop's University in Lennoxville, Quebec, was eventually institutionalized and became a planning and management tool, as well as an instrument of pedagogy (Bardati 2006). The impetus for campus environmental sustainability in the U.S. originated with the 1994 Campus Earth Summit at Yale University. That event produced the "Blueprint for a Green Campus," one of the first documents to provide a template by which colleges and universities could set an example for sustainability in their communities, including the implementation of campus environmental audits (Campus Earth Summit 1995). On the tenth anniversary of the Rio Declaration, Wynn Calder and Richard M. Clugston reflected on the near-invisibility of Agenda 21 in the U.S. and the slow rate of progress toward adopting sustainability policies at American institutions of higher education. Among their recommendations was the use of campus sustainability audits and capstone courses to foster student engagement and integrated thinking (Calder and Clugston 2003).

Organizing students to conduct a campus environmental audit readily satisfies the definition of undergraduate research as "an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline" (CUR 2012). It also fulfills many of the goals for the conduct of undergraduate research including the hands-on application of knowledge, the development of interdisciplinary skills, the public dissemination of research findings, and "the ability to capture student interest and create enthusiasm for and engagement in an area of study" (CUR 2012). The concept of a campus environmental audit is also easily transferable to any physical campus as a means to engage undergraduates majoring in environmental sciences/studies in conducting significant independent research "in their own backyard." At Chapman, we wanted to design the first ES&P senior capstone to be an immersive undergraduate research experience that would benefit the university community and the environment, while also allowing considerable cost savings for the institution—the "people, planet, profit" model that is commonly referred to as the triple bottom line in sustainability strategies (Elkington 1998).

Structuring the Senior Capstone

Course framework. The spring 2013 ES&P capstone enrolled 10 seniors, and the authors served as co-instructors—Kim from environmental sciences and Shafie from political science. A university co-teaching grant awarded for the initial offering of the capstone allowed each faculty member to receive teaching credit for a full course, meaning that both faculty members were present at all class meetings. They alternated or shared instructional duties during classes and provided extensive individual feedback on every student assignment. An additional university grant of $1,500 awarded to facilitate the teaching of sustainability across the curriculum was applied to costs associated with the publication of the completed audit, class travel to other campuses, and a public event to publicize the final audit. The course, designated ENV498, met twice per week for an hour and 15 minutes, fulfilling the requirements for a three-credit lecture course at Chapman.

Preparatory readings were provided to ENV 498 students during the "interterm" period in January prior to the start of the spring semester. A survey also was distributed asking the students to list and rank the areas they were most interested in focusing on during the audit. The responses were used to assign students as authors and co-authors of chapters covering the 10 subject areas addressed by the audit, which were (1) building construction, (2) curriculum, (3) dining

services, (4) energy, (5) landscaping, (6) procurement, (7) recycling, (8) transportation, (9) waste management, and (10) water. Each student served as the primary author of one chapter and the co-author of a second chapter. This degree of engagement before the course formally began helped to establish the expectation that students would have considerable autonomy in defining and developing their portion of the capstone experience.

Syllabus. The course syllabus was structured so that the co-instructors would provide relevant instruction in their areas of expertise while also allowing students multiple opportunities to present their work and receive feedback on their progress throughout the semester. For example, the class reviewed case studies and research methods early in the course, with instruction in and discussion of the more practical components of an environmental audit scheduled later in the semester. Outside speakers from Chapman University's offices of institutional research, strategic marketing and communication, and academic technology were invited to present talks on statistics, webpage design, and survey administration and analysis. Three class field trips hosted by facilities directors at nearby campuses provided the students with examples of how other institutions address sustainability issues. A summarized version of the course syllabus is shown in Table 2.

Table 2. Summary Course Syllabus for ENV 498: Environmental Science and Policy Senior Capstone Seminar

Week	Class topics
Interterm	Audit topic prioritization, preparatory reading
1	Course goals, timeline, introduction to conducting environmental audits
2	Discussion of audit topic considerations and goals, case studies
3	Proposal presentations
4	Research methods: surveys, writing
5	Research methods: quantitative analysis, data analysis
6	Campus visit: Santiago Canyon College, methods of communication
7	Policy implementation at Chapman University
8	Life cycle analysis
9	Spring break
10	Update presentations
11	Campus visit: UC Irvine, considering cost-neutral sustainability
12	Presenting data, crafting recommendations: variables to consider
13	Campus visit: Orange Coast College, crafting an executive summary and introduction
14	Final presentations
15	Chapman University Student Research Day (poster presentations)
Final	Public release of 2013 Chapman University Environmental Audit

Written assignments. Specific written submissions were due at multiple points throughout the semester in accordance with detailed templates provided to students in advance. This allowed consistency in content and ensured that each student was thinking critically about the variables, data, and analytic methods most relevant to their topics. These assignments and deadlines were essential because the ten students were not only responsible for their own chapters of the audit, but they were also responsible for collaborating on a second chapter and the overall document. For example, the initial proposal for a student chapter on a particular topic asked students to provide:

- A brief history/background of your chapter topic as it relates to Chapman University,
- The goals of your chapter—broadly, what information do you hope to obtain and what analyses do you hope to be able to conduct?,
- The data you anticipate you will need, over what time-frame, and from what departments and/or individuals it will come,
- The types of survey questions you can envision (and what population you will target) that will help you gain insight into environmental practices and preferences related to your chapter topic, and
- The kinds of recommendations you expect to be able to make after conducting your analysis.

At each stage of the writing process, students were challenged to identify and refine the key concerns and questions, the types of data needed and how they would acquire it, which methods of analysis would best answer their questions, and what reasonable conclusions or recommendations they could make based on their findings. Students were also asked to determine what data were lacking or unobtainable and to recommend additional studies to be conducted in the future.

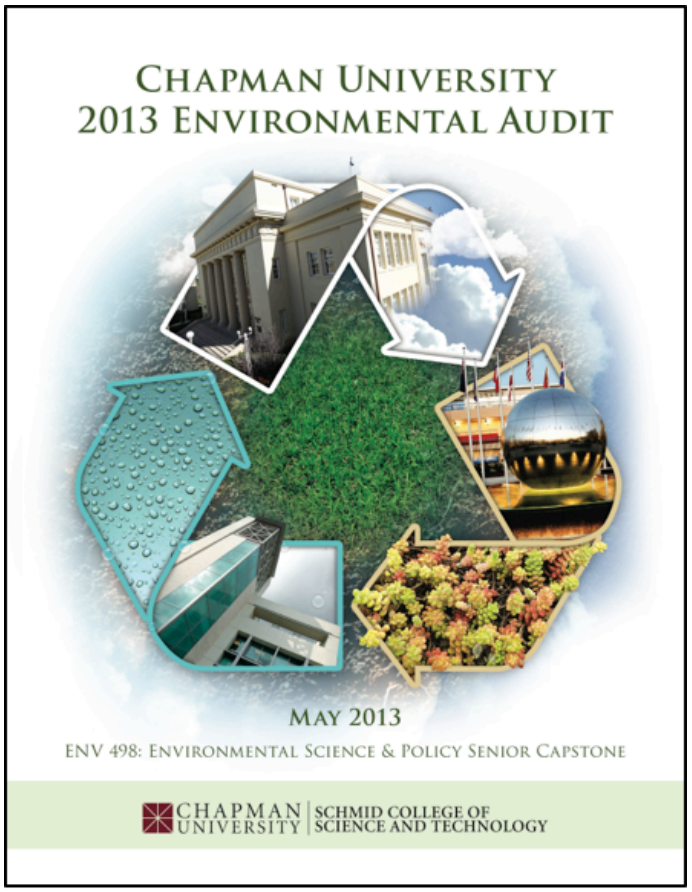
Additional written assignments included a chapter outline, a draft of the chapter, a second draft of the chapter, the final formatted chapter, and an academic poster presentation. After uploading each assignment, students were then required to provide detailed edits of their co-author's chapter drafts

Designing the Campus Environment *continued*

and brief written feedback for four additional chapters (both the first and second drafts). This ensured that at some point each student had reviewed each chapter of the audit. Each of the two co-instructors also provided written comments and grades for every written assignment based on established grading rubrics for the written work. These thorough peer and faculty reviews provided an abundance of both detailed and general comments at multiple stages of the writing process, enabling students to readily identify areas needing improvement, incorporate suggestions, and in some cases conduct additional data analyses or investigations.

Sustainability survey. Even as the ten student authors worked to collect specialized data for their individual chapters, they also collaborated on a campus-wide survey that served as a common data source. The Chapman Campus Sustainability Audit Survey actually consisted of two separate data collections: a student survey (n=977) and a survey of faculty and staff (n=344). It gauged respondents' knowledge, attitudes, and behaviors on topics ranging from energy use and recycling to commuting and purchasing patterns. Each student in the seminar developed from three to seven questions related to the subjects of their chapters for the campus-wide survey, thus ensuring that the social and behavioral side of sustainability would be incorporated into each of the audit's themes. The survey served as a valuable source of original data and also as a useful pedagogical exercise in survey design and analysis.

Figure 2. Cover of the Chapman University Campus Environmental Audit



Oral presentations. The capstone course involved multiple class presentations, scheduled to slightly precede the submission of written assignments to allow students to incorporate feedback on their presentations into the written assignment. Each student gave three individual 15-minute presentations over the course of the semester: (1) a proposed plan of work for researching the topic at hand, (2) an update of initial results and work yet to be completed, and (3) a final complete overview of the background, results, conclusions, and recommendations to the university. In addition, each student participated in the Chapman University Student Research Day, a campus-wide poster event showcasing independent student research. Finally, at a campus reception at which the audit findings were released, each student gave a two-minute "elevator pitch" summarizing his or her findings and held another formal poster session for a broad audience of attendees. In-class feedback, written and scored peer evaluations, and instructor-graded evaluations were provided each time a student orally presented his or her work, allowing progressive improvement in presentation skills throughout the semester. Chapman's manager of energy conservation and sustainability also attended all presentations and offered useful suggestions and clarifications to the students on their findings.

Finished audit and dissemination. The final version of the first Chapman University campus environmental audit (Figure 2) begins with an executive summary that concisely presents the findings of each of the 10 chapters, along with one or two key recommendations by each chapter's author. The individual chapters each contain (1) an introduction to the chapter's specific subject; (2) a historical overview of the subject at Chapman; (3) a detailed accounting of the subject's current status at Chapman (containing most of the data, survey results, and other content collected throughout the semester); (4) a concluding assessment (identifying areas of progress, areas needing improvement, and existing gaps in knowledge); (5) recommendations (grouped into low-, moderate-, and high-cost or high-effort categories); (6) university and off-campus contacts; (7) references; and

(8) appendices. This structure intentionally mirrors that of independent research studies and professional consulting reports.

The audit findings were officially released in May 2013 at a public on-campus reception organized by the class to which all university contributors, top administrators, and ES&P majors were invited. Copies of the complete audit (a limited edition of 75 were printed) were offered to selected key contributors and administrators, and the online version of the audit (available at www.chapman.edu/sustainability) went live shortly after the event. Chapman University's president, James Doti, was sufficiently impressed by the presentations that he requested a copy to be delivered to every member of his senior staff.

Students further presented results from the finished audit at the Metropolitan Water District of Southern California's 2013 Spring Green Expo in May 2013 and also at the California Higher Education Sustainability Conference in Santa Barbara in June 2013. Perhaps most importantly, the standing Chapman University Faculty Sustainability Committee is currently using the audit and its chapters' recommendations as a governing document for the committee's future efforts.

within the past five years, in some cases corresponding to Chapman's hiring of a manager of energy conservation and sustainability in 2011. Another consistent finding was that the decentralized, non-digital format used to store most university data related to sustainability (e.g., utility bills, purchasing data, photocopy-center requests, and waste disposal costs) poses a considerable obstacle to meaningful analysis and assessment of areas needing improvement.

Students identified potential substantial cost savings in several areas, a result that was personally empowering and that financially validated the importance of conducting a campus environmental audit. For example, after requesting and receiving estimates from multiple artificial turf companies, the authors of the landscaping chapter calculated that replacing the campus' central Memorial Lawn with artificial turf would result in savings of more than $400,000 in periodic turf replacement, fertilizer, and herbicide costs over a 15-year timeframe. In another example, the student researching waste management found that the waste-disposal provider had overcharged the university for waste pickup over the past year and a half by $9,300, which the provider upon

Table 3. ENV 498 Form for In-class Peer Evaluation and Feedback for Oral Presentations

I. Preparation & Contents						
Poorly prepared	1	2	3	4	5	Well-prepared
Missed important concepts	1	2	3	4	5	Comprehensive coverage
II. Presentation						
Poor voice quality/eye contact	1	2	3	4	5	Excellent voice/eye contact
Irregular pace	1	2	3	4	5	Even Pace
III. Overall presentation rating	1	2	3	4	5	
IV. Comments/Questions:						

Key findings. The vast majority of findings produced by the audit were identified for the first time by the students during the research on their individual topics. For example, students compiled years of utility bills and invoices; conducted a Geographic Information System investigation of the locations of outdoor trash and recycling containers; tracked usage of refillable water stations; quantified the increasing occurrence of terms such as "environment" and "sustainability" in course-catalogue descriptions over time; and calculated the relative proportions of university purchasing orders that requested recycled versus non-recycled products.

Nearly all of the students reached a similar conclusion: that after relatively minimal or modest activity at Chapman on measures of environmental sustainability over previous decades, substantial improvements had taken place

notification agreed to credit back to the university.

Assessment. When the capstone seminar was offered in spring 2013, it represented the first opportunity to gauge the effectiveness of the new four-year curriculum in environmental science and policy. Therefore, assessment of the program's desired student-learning outcomes was also a goal when evaluating the capstone.

As the members of the senior class researched their topics and made progress on their individual chapters, the regular assignments and deadlines produced valuable feedback from peers as well as the instructors. Students gave substantive comments to one another and used a common rubric (See Table 3). For oral presentations, students evaluated one another on the basis of (1) preparation, (2) the inclusion

and presentation of relevant concepts, (3) voice quality and eye contact, (4) pacing, and (5) overall quality of the presentation. Written assignments were evaluated using a grading rubric that included the chapter proposals, drafts, and the final chapters.

To help assess students' learning outcomes, the audit project was structured to include skills ranging from interpreting data to analyzing policies to communicating results. These goals of the capstone were achieved, and in many respects, faculty expectations were exceeded. Similarly, the course evaluations were highly positive. Students expressed pride in the final audit as well as appreciation for the collaborative process involved in producing it. A typical student comment listed valuable aspects of the capstone experience:

"[I] liked that it helped prepare us for the work field and the 'real' world in that it forced us to work with other professionals in the field. Liked that we were all able to give each other feedback and get comments on our work."

Numerical course evaluation results also reinforced the finding that students were satisfied with the course. For example, the statement "The instructor encouraged me to think critically about the subject matter" received a score of 4.9 out of a possible 5.0 scale (n=9).

Based on student feedback and the campus community's response to the audit, we concluded that the audit format could effectively serve as a template for future capstone projects. The initial costs of the course that were covered by an external grant will be incorporated into the ES&P program's budget, which due to a 2013 external review has been increased to include these and other program costs. Going forward, the ES&P program is scheduled to offer the capstone seminar every spring semester, revisiting two or three of the ten sections of the audit in greater depth each year and conducting the full audit again about every five years. This may necessitate the development of additional sections of the capstone class (and additional faculty, as the co-teaching grant was only for the inaugural course) in order to accommodate all seniors enrolled in the program, with separate topics investigated by each section. However, these additional sections are expected to be readily approved because of rapid increases in enrollment in the ES&P program since its launch in the 2009-2010 academic year. The scalability of the capstone experience as the major expands is therefore viable but will depend on a continued and proportional growth of instructional and financial resources for the program.

In assessing the capstone seminar, we identified several areas for improvement. The most prominent theme in student comments was the amount of work required within the afforded time frame. Most considered the project to be too ambitious to undertake during a single fourteen-week semester. The following student comment was representative:

"…this is a course that should last a full academic year. The work that we produced was great but a more relaxed pace would have allowed us to produce a more thorough and comprehensive audit. I feel that a whole semester could have been dedicated to gathering data, analyzing, and re-organizing our data and collective information before compiling it into a report."

In response, the spring 2014 iteration of the ES&P capstone (which focused specifically on water and landscaping issues) scheduled pre-semester informational meetings, assigned additional targeted readings during the interterm period, and conducted an online survey of capstone students to determine what topics to focus on in this year's audit. In addition, lessons learned by the co-instructors during the inaugural version of the course were incorporated into the 2014 version to adjust the pacing of the course, the deadlines for various deliverables, and the structure of the instructional content offered throughout the semester. The inaugural 2013 audit, which provided recommendations and pinpointed gaps in data for selected topics, also served as a strong foundation upon which the following year's class could build more efficiently. A more permanent curriculum revision under consideration involves the addition of a one-credit weekly seminar during the fall semester for senior capstone students to further spread out the workload expected in such a research-intensive project.

One common source of frustration for the student authors was the resistance or unresponsiveness they sometimes experienced from administrators, staff, and contractors when seeking data. As a result, future projects will require better planning and arrangements in order to secure buy-in from these gatekeepers as early as possible. As instructors, we consciously want to limit our participation in the data gathering and analysis. However, our first cohort's experience demonstrates the need to pay more attention to clearing bureaucratic obstacles ahead of time. Severe delays could undermine the timeliness of the research process and final report, impacting the students' learning experience and increasing the stress for the students involved. An additional area with significant potential for improvement is the quality of assessment, which could benefit from conducting pre-capstone and post-capstone surveys to measure students' perceptions of their capabilities and educational advances in the course. Finally, there are issues frequently associated with group work, such as differences in student effort and "free-

rider" problems. These are likely to remain challenges for instructors and students as they undertake future capstone projects.

Conclusion

The successful completion of Chapman University's first campus-wide environmental audit provided a rigorous, applied undergraduate research experience for graduating seniors majoring in environmental science and policy. Establishing a standardized structure for the senior capstone seminar that can be readily repeated in upcoming years, yet provide unique results each time, should pay substantial dividends to both the ES&P major and the university as a whole. Envisioning the senior capstone as a series of annual environmental audits on specific topics is also a way of consistently ensuring that all ES&P majors experience directed undergraduate research at least once during their college careers, addressing both the goals of the senior capstone seminar and the learning objectives of the ES&P major.

Further, annual environmental audits will serve as a positive, constructive, persistent force in maintaining Chapman's progress toward more environmentally sustainable practices. In addition to being programmatically sustainable, the ES&P capstone effectively achieves the "triple bottom line" goal of environmental sustainability: benefiting people (ES&P majors, faculty, and university staff), the planet (through recommendations for reducing resource use and increasing energy efficiency), and profit (through cost-savings achieved by carrying out the recommendations).

References

Bardati, Darren R. 2006. "The Integrative Role of the Campus Environmental Audit: Experiences at Bishop's University, Canada." *International Journal of Sustainability in Higher Education* 7: 57-68.

Calder, Wynn and Richard M. Clugston. 2003. "Progress Toward Sustainability in Higher Education." *Environmental Law Reporter* 33: 10003-10023.

Campus Earth Summit. 1995. "Blueprint for a Green Campus: The Campus Earth Summit Initiatives for Higher Education." Report, Heinz Family Foundation. http://www.ithaca.edu/sustainability/docs/crr/blueprintgreencamp.pdf.

Chapman University. 2013. "Chapman University Campus Environmental Audit." Report, Chapman University. http://www.chapman.edu/campus-services/facilities-management/sustainability/environmental-audit/index.aspx

Clark, Susan G., Murray B. Rutherford, Matthew R. Auer, David N. Cherney, Richard L. Wallace, David J. Mattson, Douglas A. Clark, Lee Foote, Naomi Krogman, Peter Wilshusen, and Toddi Steelman. 2011a. "College and University Environmental Programs as a Policy Problem (Part 1): Integrating Knowledge, Education and Action." *Environmental Management* 47: 701-715.

Clark, Susan G., Murray B. Rutherford, Matthew R. Auer, David N. Cherney, Richard L. Wallace, David J. Mattson, Douglas A. Clark, Lee Foote, Naomi Krogman, Peter Wilshusen, and Toddi Steelman. 2011b. "College and University Environmental Programs as a Policy Problem (Part 2): Strategies for Improvement." *Environmental Management* 47: 716-726.

Council on Undergraduate Research. 2012. *Characteristics of Excellence in Undergraduate Research*. Washington D.C.: Council on Undergraduate Research. http://www.cur.org/assets/1/23/COEUR_final.pdf

Donovan, Craig P. 1998. "Developing High Performance Teams in the Public Management Classroom." *Journal of Public Affairs Education* 42:147-156.

Elkington, John. 1998. *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*. New York: New Society Publishers.

Hales, David. 2008. "Sustainability and Higher Education: For Future Generations to Thrive in this World, Education Must Lead the Way by Teaching and by Example." *New England Journal of Higher Education* (Fall): 23-24.

Karukstis, Kerry K. and Timothy E. Elgren, eds. 2007. *Developing and Sustaining a Research-Supportive Curriculum: A Compendium of Successful Practices*. Washington D.C.: Council on Undergraduate Research.

Orr, David W. 2013. "What is Higher Education for Now?" In *State of the World 2010: Transforming Cultures from Consumerism to Sustainability,* project director Erik Assadourian, 75-82. New York: Routledge.

Robins, Lynton and John Greenwood. 2000. "Groups and Groupwork in Public Administration." *Public Administration* 78: 957-965.

Christopher S. Kim

cskim@chapman.edu

Christopher Kim, associate professor of Earth and environmental sciences at Chapman University, is an environmental geochemist who investigates metal contamination in natural settings, specifically focusing on abandoned mine lands in California. He has raised more than $1.7 million in external funding to conduct environmental research with undergraduates at Chapman. Kim is also a councilor in the geosciences division of the Council on Undergraduate Research and the director of Chapman's Office of Undergraduate Research.

David Shafie, associate professor of political science at Chapman University, conducts research on environmental politics and public policy. His most recent books are Presidential Administration and the Environment *(Routledge, 2014)* and Eleventh Hour: The Politics of Policy Initiatives in Presidential Transitions *(Texas A&M University Press, 2013). He has published articles in* American Behavioral Scientist, the Journal of Information Technology and Politics, *and the* Southeastern Political Review.