Student Learning

It is fitting to begin a report on the Educational Effectiveness Review with a chapter on the assessment and improvement of student learning, which Cal Poly sees as integral to a broad conception of student success. This chapter focuses on two institutional projects that Cal Poly has undertaken since the Academic Senate's approval of the University Learning Objectives (ULOs) in 2007. One is a ULO-based pilot focused on five areas of student learning; the other is a campus-wide assessment of the senior project, a capstone experience that has long been a feature of the Cal Poly undergraduate education. The chapter also addresses employer feedback on the overall quality, industry readiness, and skill attainment of Cal Poly graduates.

In general, this chapter addresses aspects of Standard 1, Defining Institutional Purposes and Ensuring Educational Objectives, which include developing educational objectives and measuring student achievement (CFR 1.2) and responding to diversity through educational programs (1.5). The chapter also addresses many aspects of Standard 2, Achieving Educational Objectives Through Core Functions, by exploring how the university states expectations for student learning and demonstrates student achievement of a set of core competencies (2.2, 2.3, 2.4, 2.6, and 2.10).

In its discussion of governance issues, the section on ULO-based assessment addresses aspects of Standards 1, 2, and 3, Developing and Applying Resources and Organizational Structures to Ensure Stability, which relate to the institution's organizational structures and the faculty's exercise of academic leadership and responsibility (1.3, 2.4, 3.8, 3.11). The section also addresses other aspects of Standard 3, which include maintaining appropriate faculty and staff development activities (3.4) and coordinating and supporting IT resources (3.7), and one aspect of Standard 4, Creating an Organization Committed to Learning and Improvement, which is having institutional research capacity to support the assessment of student learning (4.5). Finally, the section on employer surveys also addresses one aspect of Standard 4, which is involving appropriate stakeholders in assessment (4.8).

ULO-Based Assessment in GE and the Majors

Begun in Fall 2008, the ULO-based assessment commonly known as the ULO Project was coordinated by the Director of General Education (GE) under the auspices of Academic Programs. The project marked a concerted effort to define measurable outcomes for the ULOs and to directly assess student attainment of these outcomes. Although the individual assessments are at various stages of completion, the project as a whole has as its major aims to measure "value added," i.e., progress from the freshman year to the senior year, and, where possible, to close the loop by recommending improvements to pedagogy and curriculum.

Background. The project began with the appointment of five faculty members as ULO Consultants, each representing a different ULO-based skill: writing, oral communication, diversity learning, lifelong learning, and ethics. Each consultant formed a broadly representative committee composed of faculty members representing GE and various majors across the university, as well as staff members from Student Affairs. After reviewing nationwide best practices, two committees (Writing and Oral Communication) reviewed class assignments, three (Diversity Learning, Lifelong Learning, and Ethics) developed survey/test instruments to collect essay/multiple-choice responses, and one (Diversity Learning) used focus groups to explore student attitudes; all developed rubrics to identify traits and articulate levels of development. The committees intended to use student work from lower- and upper-division GE as well as major courses to determine freshman/sophomore and junior/senior levels of attainment and thereby measure the value added during a Cal Poly education; only three were able to accomplish this goal (Writing, Diversity Learning, and Lifelong Learning).

While these assessments are best considered as pilots, the committees have made some modest recommendations for educational improvement based on the evidence collected. The university has already implemented some, most notably workshops sponsored by the Center for Teaching and Learning (CTL) on ULO-based assessment of writing and critical thinking in the senior project. In connection with the ULO Project, Academic Programs revised the program review process to include the mapping of major courses and co-curricular activities onto the ULOs. Each program identifies where the ULOs are introduced, developed, and mastered in the major curriculum. A map of the GE curriculum is provided, although programs are not expressly required to consider the GE and major maps together. The intention is to encourage the faculty to locate and address any significant gaps in the students' education.

As an experiment in the assessment of transferable skills across the GE/major divide, faculty members from GE and the Orfalea College of Business ran a pilot of Integrated Program Review in Spring 2009. They applied the University

Expository Writing Rubric to the work of Business students and used the assessment results to discuss how to improve student attainment of the ULO on effective communication. Though the group identified a number of opportunities for strengthening student writing, the integrated model has not been repeated nor revisited.

The ULO Project has come under some scrutiny during recent years. The financial crisis affecting the state, system, and university has necessitated a review of all resource allocations. The provost, concerned about the project's use of faculty release time for the ULO consultants, suspended funding for AY 2011-12. Shared governance has also been an issue; the WASC visiting team in its CPR report encouraged the faculty "to invest time in reviewing the role and critical nature of faculty governance in academic decision-making," while the provost and Academic Senate Chair have shared a particular concern for faculty governance as it applies to academic assessment. This concern applies to the ULO Project; while involving a significant number of faculty and staff members as consultants and committee members, the project was still an initiative of Academic Programs. In AY 2010-11, the Senate responded to this situation and the WASC recommendation by adopting the following:

- AS-716-10 Resolution on Academic Assessment at the Program and University Levels established Senate oversight for institutional assessment in addition to clarifying the meaning of assessment and the use of assessment results.
- AS-713-10 Resolution on the Establishment of an Academic Senate General Education Governance Board transferred responsibility for GE from the Provost's Office, i.e., Academic Programs, to the Senate. With its location resolved, the GE Committee could return to the issue of GE program assessment, which has been the foundation of the ULO Project.
- AS-735-11 Resolution on Coordinated Campus Assessment Efforts approved a task force report that recommended revising the membership of the Academic Assessment Council, in its existing form a committee of managers, to include faculty members from each college. The report also affirmed the council's responsibility for planning and coordinating institutional assessment efforts like the ULO Project.

The university hopes these resolutions will address the governance issues surrounding assessment and, by extension, the ULO Project.

ULO Project 1: Writing

To measure value added, the ULO Project on Writing assessed skill attainment at three key educational levels: first-year, 100-level GE composition courses; 200- and 300-level GE writing-intensive courses; and discipline-specific senior courses that emphasize writing.[i] The chair of the ULO Writing Committee was the English Department's Director of Writing, whose specialty is composition assessment and pedagogy. To obtain a consistent framework, the committee developed the four-point University Expository Writing Rubric based on five traits of effective writing: purpose, synthesis, support, style, and mechanics. The committee examined persuasive essays of four to six pages in length because curricula across all levels and majors emphasize this type of writing.

Method. The committee collected work from 56 class sections that either had a GE designation of "writing intensive" or were taught by faculty members who made writing a priority. In total, the committee collected 1,147 essays. From this pool, the committee randomly selected 272 essays for scoring: 88 from freshmen, 41 from sophomores, 54 from juniors, and 89 from seniors. 153 of the essays were from men (56%), and 119 were from women (44%), which approximates the university's gender mix. Figure 1.1 shows the sample's college breakdown.

There were three norming and scoring sessions. Once inter-rater reliability was established, two readers scored each essay, from which all identifying information about student or class level had been removed. Because of time constraints, the two scores were averaged rather than using a third reader to resolve discrepancies. The average scores were used in the following analyses.[ii]

Results: Class Level Comparisons. A statistical analysis compared the variables of Class Level (freshman, sophomore, junior, senior), College, Gender, and Trait. Only Class Level and Trait were significant (see Appendix 1.1 for full statistical analysis). Figure 1.2 presents student scores across all traits. A follow-up analysis showed that freshmen scored significantly lower than sophomores, juniors, and seniors; no additional progress in the mean total was evident after students' sophomore year. In other words, seniors differed from freshmen in skill attainment but did not differ from sophomores and juniors. No other significant differences were found for Class Level. The data also show that about 20-25% of sophomores, juniors, and especially seniors did not earn a score of 2 (average attainment) in their writing overall.

Results: Trait Comparisons. Follow-up comparisons showed that students were significantly stronger on both Purpose and Mechanics, which did not differ from each other, than on Synthesis, Support, and Style, which also did not differ from each other. The trait results suggest that these three higher-level writing skills need further development regardless of class level.

The scores in Figure 1.3 present student attainment as a function of the specific trait assessed. For each trait, the figure shows the percentages of students earning a score of 2 or better on the rubric, as well as the mean score for each trait, all as a function of Class Level. For Purpose, freshmen scored significantly lower than both sophomores and seniors. No other Class Level comparisons were significant. For Synthesis, freshmen scored lower than both juniors and seniors. For Style, only the difference between seniors and freshmen was significant, with freshmen scoring lower. Finally, for both Support and Mechanics, follow-up comparisons showed that freshmen scored significantly lower than sophomores, juniors, and seniors, with no significant differences among these latter groups. It should be noted that most students reached average attainment on at least one trait. Mechanics was especially strong, with 73% of freshmen reaching average attainment or above; this increased to 83% of seniors, 89% of juniors, and 93% of sophomores.

In sum, analyses of the mean scores for each trait yielded the following observations:

- Seniors had higher scores across all rubric traits than freshmen.
- Juniors scored higher than freshmen on Synthesis, Mechanics, and Support.
- Sophomores scored higher than freshmen on Purpose, Mechanics, and Support.
- Sophomores, juniors, and seniors exhibited statistically equivalent levels of attainment across all traits.

Other Writing Assessments

English 134. In AY 2008-2009, the Associate Dean in the College of Liberal Arts and the ULO Writing Consultant conducted an assessment that compared students' initial and final essays in the first-year composition course, English 134 Writing and Rhetoric. The original sample was 156 students from 7 classes. First and last essays from 56 students—8 from each section—were randomly selected for assessment. Essays were scored using an earlier, holistic draft of the expository writing rubric. Final essay scores were significantly higher than those on the initial essays. As a follow-up, scores for both initial and final essays were compared to a constant of 3, indicating average attainment on the holistic rubric. Initial essay scores were significantly lower than 3; in contrast, final essay scores did not differ significantly from the constant. A separate test showed that initial and final essay scores were both correlated with final grades. Initial essay scores were weakly correlated with final grades, whereas final essay scores were significantly correlated with final grades.

The overall pattern of results with regard to the initial and final essay scores yielded promising evidence that students significantly improved in their writing during the quarter, that this improvement moved students to an average and acceptable level of attainment, and that the final essay scores were indicative of final grades. Importantly, the data showed that students progressed from minimal to average attainment of writing skills during the quarter. This finding is consistent with the ULO-based assessment results reported above that show gains following the freshman writing experience and suggest that students retain these initial gains.

Graduation Writing Requirement. All CSU students must satisfy the Graduation Writing Requirement (GWR). Cal Poly students can meet this requirement in two ways:

- Earn a C or better and successfully complete a timed essay in a GWR-designated, 300-level, writing-intensive GE course. Students who are unsuccessful receive feedback and at least one more opportunity to complete the essay. The pass rate was 84% for AY 2010-11.
- Pass the Writing Proficiency Exam (WPE), a 350-500 word, timed, expository essay test scored by writing experts and other faculty members. The WPE pass rate was 70% for AY 2010-11.

The essay and exam results likely constitute non-comparable samples for several reasons: students select the method of administration; the tests are administered in different environments; the content differs from test to test; the scoring differs across test types; and students taking the GWR course receive feedback and have a second opportunity to write the essay. In addition, each test may attract a different population, a factor that may interact with variables such as college, ethnicity, interest in writing, etc. To date, this question has not been looked at in a systematic way because the data have not been readily available. Finally, the essays administered in a GWR course may not be suitable for drawing university-level conclusions because they are only assessed by the instructors of record. However, multiple readers score the WPE using

the WPE scoring criteria, which differ from those of the expository writing rubric. WPE readers assign a single score ranging from 1, ineffectual paper, to 6, exemplary paper, based on four traits: comprehension, organization, development, and expression. Stronger connections could be made between the WPE and expository writing rubrics. The expository writing rubric could be revised to function holistically, allowing readers to assign one score to an essay. Conversely, the WPE rubric could be revised to function analytically and thus provide more formative results. The latter approach seems appropriate as the WPE rubric was developed some time ago outside the framework of university-wide assessment.

Employer Surveys. In various surveys, Career Services has asked employers to indicate both the importance they place on certain skills, including written communication, and the degree to which Cal Poly graduates demonstrate attainment of these skills. The data in Figure 1.4 show a discrepancy between the importance employers place on written communication and their perception of the skill level graduates demonstrate. For example, employers of graduates from the College of Engineering gave written communication a mean importance score of 4.41 on a scale of 1 to 5 with 1 being lowest and 5 being highest. Yet in assessing the industry readiness of engineering students, employers gave students a mean score of only 3.86. This discrepancy is especially important because employers consistently rank communication among the skills they value most in employees. Considering the ULO data showing that senior-level Cal Poly students generally do not outperform sophomores and juniors in writing, it would seem that additional instruction or an increased emphasis on this skill may be warranted.

Recommended Action Items

1. **Ensure that Cal Poly juniors and seniors continue to improve their writing skills (p. 4, 5).**
    - Coordinate efforts with the University Writing and Rhetoric Center to develop and raise awareness of outreach programs that target upper-division students.
    - Identify upper-division students who struggle with writing before their senior year, especially ESL students, and offer additional upper-division writing courses for these students.
    - Coordinate efforts with the CTL and the WINGED (Writing in Generally Every Discipline) program to offer workshops and develop learning communities for faculty members who teach upper-division, writing-intensive courses in GE and the major.
    - Emphasize the value of writing in every discipline by identifying non-GE, upper-division, writing-intensive courses in the majors and across colleges; if such courses are difficult to identify, work with departments to develop discipline-specific, advanced writing courses, possibly tied to the senior project.
    - Actively support Cal Poly's acquisition of an e-portfolio and assessment management system so that students can document and assess their own progress as writers.
2. **Align learning experiences so that GE, the GWR, and the senior project form a coordinated assessment of writing skills at the beginning, developing, and mastery levels (5).**
    - Develop a single expository writing rubric for use by GE or GWR-designated courses, the WPE, and the senior project.
    - Require Cal Poly undergraduates to satisfy the GWR as juniors, i.e., as soon as possible after completing ninety units, so that they can receive additional writing instruction if necessary before attempting the senior project.
    - Make the WPE a formative assessment. The exam should be repurposed so that it becomes a formative tool for improvement rather than a summative gatekeeper to graduation.

ULO Project 2: Oral Communication

The ULO Project on Oral Communication began in September 2009. The ULO Oral Communication Committee adopted an operational definition from AAC&U's Oral Communication VALUE Rubric: "a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors." Based on this definition, the committee designed a five-point rubric with seven traits: verbal delivery, nonverbal delivery, presence of a central message, organization, language use, use of supporting material, and use of visual aids.

Method. In the first year, the committee sought to establish a benchmark of students' performance toward the beginning

of their academic careers. The assessment entailed videotaping oral presentations delivered by a sample of 102 freshmen enrolled in COMS 101 and 102 during Spring 2010. The sample was 51% female and 49% male and represented all six colleges: Engineering (24%), Agriculture (23%), Science and Math (20%), Liberal Arts (15%), Business (13%) and Architecture (7%). Frequencies for both gender and college distributions did not differ significantly from what would be expected.

Three faculty members from Communication Studies observed and evaluated the speeches. Training sessions ensured norming of scores and provided evaluators the opportunity to discuss, modify, and clarify the rubric as needed. Following these sessions, each evaluator scored a selection of speeches on each rubric trait on a scale of 1 to 5 with 1 being insufficient and 5 being excellent.

Results. Figure 1.5 shows the overall scores, with the rubric traits presented in order from highest to lowest means. In addition, the figure shows the percentages of students scoring at each level of the rubric. Because so few had scores of 1, percentages for scores of 1 and 2 (insufficient and below average) were added together (see Appendix 1.1 for full statistical analysis).

Because Use of Visual Aids was not a component of all speeches, two different statistical analyses were run on the differences in mean trait scores. One considered all 7 traits for the 75 students who had scores on all 7, while the second considered all 102 students but excluded Use of Visual Aids. A follow-up comparison showed the same basic pattern in both analyses: students' trait scores were significantly higher for Language Use and Use of Supporting Materials than for Verbal and Non-Verbal Delivery and for Presence of a Central Message than for Verbal Delivery. In the seven-trait analysis, scores were significantly higher for Presence of a Central Message than for Non-Verbal Delivery. There were no other significant differences.

These data suggest that the vast majority of Cal Poly freshmen meet an average (3) or better level of competence in oral communication, even with only introductory instruction. This is good news, but the data also suggest that students' verbal and nonverbal delivery could be developed further; only a quarter of the sample achieved a score of good (4) or excellent (5). Improvement in these areas would likely occur over time as students received further instruction and additional speaking opportunities. However, given that Cal Poly requires most students to take only one course focusing on oral communication, instructors of that course should consider spending additional time on improvement of verbal and nonverbal delivery.

During the second year of the project, the committee presented these results to the University Assessment Council and the Communication Studies faculty. In addition, the committee delivered a ULO-based oral communication workshop through the CTL in which twelve participants applied the rubric after watching both a below average speech and a good speech. The first speech received an average score of 2.2 and the second received an average score of 4.4. This consistency indicates that the participants used the rubric to make reliable distinctions of quality between the two speeches. The committee originally planned a third year of activity to assess senior-level presentations perhaps in connection with senior projects, but budget cuts curtailed this aspect of the project.

Recommended Action Items

3. **Identify areas of the curriculum outside the GE oral communication requirement in which the Communications Studies faculty can partner with other faculties to develop students' oral communication skills (p. 6).**
4. **Complete the ULO Project on Oral Communication by collecting data on upper-division student performance and making a value-added comparison to lower-division results (6).**

ULO Project 3: Diversity Learning

The ULO Project on Diversity Learning began in AY 2008-09. Based on faculty and staff feedback, the ULO Diversity Learning Committee designed separate surveys for each of the first three of Cal Poly's Diversity Learning Objectives (DLOs) and used a focus-group protocol to assess the last objective. The committee also developed four-point rubrics to score the data collected for each DLO**.**

Method for DLOs 1-3. In fall quarter, the committee collected responses to the DLO questionnaires from 320 freshmen enrolled in ENGL 134, ENGL 145, and ECON 303. In Fall 2009 and Winter 2010, the committee collected 380 responses

from juniors and seniors enrolled in several GE D5 (the upper division elective in Area D/E Society and the Individual) courses as well as ECON 303, IME 482, KINE 411, MATE 481 and ME 430. Students randomly assigned to respond to only one DLO survey completed either paper-and-pencil or online versions. Figure 1.6 shows the resulting sample as a function of College and Class Level, as determined by students' self-reported expected graduation date. Across the samples, there were 343 men (51%) and 324 women (49%), which approximates the university's gender mix. 400 students (60%) self-identified as white, the largest racial/ethnic group, while 86 (13%) self-identified as multiracial, the next largest group.

In Spring 2010, after ensuring inter-rater reliability, the committee conducted three scoring sessions with faculty and staff members. Although data were collected from all class levels, evaluators did not score the sophomore essays due to resource and time constraints and the assessment emphasis on value added.

For DLO 1, students answered four short essay questions, each corresponding to one of four traits in the rubric: knowledge and understanding, ability to apply a critical perspective, awareness of how personal values and/or ethical/moral frameworks shape individual beliefs, and self-reflection and engagement. Two evaluators scored each set of essays for each trait on a scale of 0 to 4 with 0 being no response and 4 being complex. The two scores were then averaged to obtain one score for each trait, and the four trait scores were then averaged to yield one total mean score for each participant in the assessment. The same process was employed to create mean scores for DLOs 2 and 3.

Results for DLO 1: Diversity, Inequality, and Power. A statistical analysis was conducted on the total mean scores for DLO 1 as a function of Class Level (freshman, junior, senior), College, Survey Mode (in-class, online), and Gender. Figure 1.7 shows the breakdown of scores by various student categories. The sample sizes were too small to support analyses of the interactions of more than two variables. The results were significant for Survey Mode, Gender, Class Level, and College. Significantly higher scores were evident for the online survey and for males. Follow-up analysis of Class Level yielded evidence of value added: both seniors and juniors scored higher than freshmen but did not differ from one another. With regard to College, the follow-up analysis showed that Agriculture students scored significantly lower than Business, Science and Math, and Engineering students. No other College differences were significant (see Appendix 1.1 for full statistical analysis).

There was also a significant interaction of Gender by Class Level. The value added was more apparent in men, such that male seniors had significantly higher scores than male freshmen. This was not so with women, whose scores did not differ as a function of Class Level. It should be noted that marginally significant interactions were also present for College by Class Level and College by Survey Mode, but these interactions were not broken down further because of concerns with sample sizes.

Results for DLO 2: Contributions by Diverse Groups. As with DLO 1, a statistical analysis was conducted on the total mean scores for DLO 2 as a function of Class Level, College, and Survey Mode. Gender was not included in the analysis. Figure 1.8 shows the breakdown of scores by various student categories. The results were significant for Survey Mode, Class Level, and College. Again, the online survey mode resulted in significantly higher scores. The Class Level effect showed that while there were no differences between junior and senior scores, both seniors and juniors scored significantly higher than freshmen. The College effect showed that Science and Math students scored significantly higher than Agriculture and Engineering students, with no other differences among colleges reaching significance. There was, however, a significant interaction between Class Level and College. Among freshmen, Science and Math students scored significantly higher than Business students; among seniors, Science and Math students scored significantly higher than Engineering students. Small, unequal sample sizes mean that caution should be used in interpreting these results.

Results for DLO 3: Perspectives of Diverse Groups. Figure 1.9 presents the mean scores for DLO 3. The results of the statistical analysis were significant for Class Level, College, and Gender. There were no significant interactions between variables. Men scored significantly higher than women; students in the College of Business scored significantly higher than students in all other colleges except Liberal Arts; Liberal Arts students scored significantly higher than Agriculture students. Finally, there was once more evidence of value added: both seniors and juniors scored higher than freshmen but did not differ from one another. The pilot nature of the project needs to be stressed, especially with regard to college results. The low and uneven numbers of participants make these patterns tentative at best.

Contribution of USCP Program. Starting with the 1994-97 catalog, Cal Poly students have had to satisfy the United States Cultural Pluralism (USCP) Requirement by completing a course focusing on diverse groups and social issues. Because

fulfillment of the requirement is the major curricular path for developing diversity-related competence, a separate analysis was conducted to compare mean DLO scores for juniors and seniors grouped together as a function of having taken a USCP course. Although the overall average score for juniors and seniors who had not completed a USCP course (2.02) was lower than the score for juniors and seniors who had completed a USCP course (2.18), this difference was not statistically significant. The percentage of student essays that scored in the 3 (moderate) or 4 (complex) levels was equal to 32% for juniors and seniors who had not completed a USCP course and 38% for juniors and seniors who had completed a USCP course. Although the average score and percentage of essays that met higher standards were both somewhat greater for students who had completed a USCP course, the results do not indicate that having taken a USCP course makes a large positive contribution to diversity learning as defined by the DLOs.

Contribution of Service Learning. Another avenue by which students may gain diversity-related competence is service learning. Although not a graduation requirement, a number of students take service learning courses in fulfillment of GE or major requirements.

The overall average score for juniors and seniors who had not completed a service learning course (2.08) was lower than the score for juniors and seniors who had completed a service learning course (2.19), but this difference was not statistically significant. The percentage of student essays with scores in the 3 or 4 levels was 32% for juniors and seniors who had not completed a service learning course and 40% for juniors and seniors who had completed a service learning course. Similar to USCP, these results do not indicate that service learning makes a large positive contribution to diversity learning as defined by the DLOs.

Method and Results for DLO 4: Professionals in a Diverse World. The committee conducted focus-group sessions with approximately 80 freshmen enrolled in Honors 100 during Fall 2009 and with approximately 90 seniors enrolled in ECON 303 during Winter 2010. These classes were selected because they were available and because students enrolled in these courses likely had the maturity level necessary to explore the issues seriously. Using transcripts of these sessions, the committee compiled a list of key themes discussed by students. The list served as the context for the committee's conclusions about student knowledge, perceptions, and beliefs about working together with people from diverse backgrounds—an appropriate focus for Cal Poly, whose institutional identity is marked by the preponderance of professional degree programs.

The focus-group responses reveal a negative student bias against diversity learning, especially in the context of classroom instruction, which seems to exist before students enter Cal Poly. Senior students were better able than freshmen to reflect on their experiences of diversity learning in the classroom but still gave mixed responses; some were positive about these experiences while others viewed them as a form of indoctrination. Virtually all students who spoke were positive about WOW (the Week of Welcome orientation for freshmen) and other cultural events outside the classroom and wished that there were more such opportunities and more campus diversity in general.

Recommended Action Items

5. **Coordinate diversity learning across the curriculum and co-curriculum to create a scaffold for the development of DLO-based skills (p. 8).**
    - Align the USCP requirement with the DLOs and review USCP courses to see whether they address the DLOs.
    - Align service learning policies with the DLOs and review service learning courses to see whether they address the DLOs.
    - Challenge every major to develop an upper-division experience that addresses the DLOs.

ULO Project 4: Lifelong Learning

The ULO Project on Lifelong Learning began in Spring 2010, when Kennedy Library conducted a survey of student information skills in consultation with the ULO Lifelong Learning Committee. Information skills are a foundational component of lifelong learning, and they contribute to other ULOs including written and oral communication.

Method. The survey was designed to identify student competencies by measuring performance on the Information Literacy Learning Objectives, which the library established in 2009. The survey presented students with a research scenario and asked them to respond to a series of 20 questions. Two versions were administered during a one-month period: one for lower-division and one for upper-division students. The versions differed by the order in which questions

were asked and the wording of some questions.

Invitations to participate were emailed to 1,332 lower-division and 2,905 upper-division students. In addition, an open invitation was posted on the library website, and instructors who had previously brought students for library instruction were encouraged to announce the survey to current students. Approximately 98% of the responses came from the email invitations. Without adjusting for the remaining 2%, the lower-division response rate was 28% (367 respondents) and the upper-division response rate was 20% (578 respondents). The high response rate likely resulted from the promise of cash prizes; however, not all respondents answered all questions.

Results. Figure 1.10 presents the mean scores in terms of percent correct for five questions for which there was a single response. A statistical analysis was conducted to determine whether the correct response to each item was related to Class Level and Instruction; the latter factor distinguished between students who had and had not received library instruction in research methods. In all cases, upper-division students did better than lower-division students. For three of the five items—thesis statement/promising research question, correct identification of citation example, and correct selection of the search term that would yield the fewest results—Class Level had a significant effect, demonstrating value added. There was a marginal effect of Class Level on the correct selection of the search term that would yield the most results. Significant effects of Instruction were found for the thesis statement and correct identification of the citation example. The question on the ethical use of ideas showed no significant effects of either Class Level or Instruction. Across all analyses, no significant interactions between variables were present (see Appendix 1.1 for full statistical analysis).

The results demonstrate value added across several items on the survey, indicating higher levels of information literacy at the upper-division level. In addition, promising results for the educational effectiveness of library-related instruction were also found, with some indication that lower-division students attending such instruction consistently scored almost as well as upper-division students who had not attended such sessions. It should be noted that the outcomes measured in this scenario-based questionnaire necessarily focused on the means of finding and identifying information rather than on the more complex evaluative and synthetic skills associated with the critical-thinking aspects of information literacy.

Future Plans. The library plans to re-administer the information literacy survey in Spring 2012 to provide more and better data about student learning as a function of Library Instruction and Class Level. When revising the survey, more attention will be paid to the planned analysis, making sure that the upper- and lower-division questions are directly comparable.

ULO Project 5: Ethics

The ULO Project on Ethics was developed for a portion of the ULO that reads, “Make reasoned decisions based on an understanding of ethics, a respect for diversity, and an awareness of issues related to sustainability.” The ULO Ethics Committee found AAC&U’s Ethical Reasoning VALUE Rubric to be the most appropriate to the project. While adapting the rubric, the committee identified five primary traits relevant to ethics and ethical reasoning: self-awareness, understanding different ethical theories/concepts, ethical issue recognition, application of ethical theories/concepts, and evaluation of different ethical perspectives/concepts.

Method. In the first year of the project, the committee created and piloted a 40-item online test to begin measuring student proficiency in ethical reasoning. Because the instrument was in development, the committee collected limited demographic information: class level, college, and location of administration, i.e., whether or not the test was administered in an ethics course. In addition, several open-ended questions asked respondents to comment on the structure and content of the test in order to collect input for further development.

The instrument included 37 multiple-choice questions. Six questions tested students’ level of self-awareness about the origins of their ethical beliefs. These items were scored on a scale of 1 to 5 with 1 being strongly disagree and 5 being strongly agree. Because these items could not be scored as correct or incorrect, they were not used to compute the score. Eleven questions tested students’ understanding of different ethical theories and concepts; seven tested their ability to recognize ethical issues; six tested their ability to apply ethical theories and concepts; and seven tested their ability to evaluate different ethical perspectives and concepts. These items allowed respondents to choose among four to five answers; responses were coded as correct/incorrect and summed together for a total test score. In addition, the mean score for each of these traits was also computed.

Participants were recruited in two ways. University Assessment Council members, college deans, ethics committee members, and others were asked to identify appropriate courses; the plan was to recruit participants who had been

formally exposed to the study of ethics at the university level. Because the resulting group was too small, committee members and others were asked to administer the test in their own classes, even if these were not related to ethics. Courses finally included BMED 420, BUS 424, ES 244, ES 322, PHIL 230, PHIL 231, PHYS 405, and PHYS 424. The pilot resulted in completed responses from 264 undergraduate students—more than expected—representing every college and class year (first year, second year, third year, fourth year) as well as varying levels of ethics coursework.

Results: Class Year and College Comparisons. Figure 1.11 shows the numerical breakdown by College and Class Year. Out of 31 points possible, the average exam score was 12.45; i.e., students answered 40% of the questions correctly (see Appendix 1.1 for full statistical analysis). Because of small and uneven sample sizes and concerns regarding the distributions of the data, separate statistical analyses were run to compare the total scores as a function of Class Year (see Figure 1.12) and College (see Figure 1.13). The result for Class Year was not significant; there was no evidence of value added on the ethics scores, though this may have been a function of small sample sizes. The visual pattern of the data when comparing first-year students to fourth- and fifth-year students is in the predicted direction, i.e., first-year students have lower scores than fourth- and fifth-year students. In contrast, the result for College was significant. Separate follow-up analyses showed that students in the College of Science and Math scored significantly higher than students in all other colleges. No other differences among colleges were significant.

Results: Trait Comparison. Figure 1.14 shows the mean trait results as a function of Course Enrollment, i.e., whether or not students had taken or were currently enrolled in a university-level ethics course. Because the different traits were tested with different numbers of items, the means shown for each trait are the mean percentages of correct answers. It should be noted that all responses are at a higher level of ethical reasoning than would be expected by chance.

A mixed-model analysis compared the four different traits as a function of Course Enrollment. There were no effects involving having taken an ethics course. Among the traits, students scored significantly higher on Application of Ethical Theories/Concepts as compared with both Understanding Different Ethical Theories/Concepts and Ethical Issue Recognition. Students also scored significantly higher on Evaluation of Different Ethical Perspectives/Concepts as compared with Understanding Different Ethical Theories/Concepts. Finally, students scored slightly higher on Ethical Issue Recognition as compared with Understanding Different Ethical Theories/Concepts. No other comparisons were significant.

The sample sizes were too small to allow an analysis by both College and Class Year. Being able to do so would have helped reveal whether the finding that students in Science and Math scored higher than students in other colleges can be better understood as a function of Class Level (freshman, sophomore, junior, senior). Recruiting Science and Math students from upper-division physics classes may have created selection problems that impact the generalizability of the results. Still, a positive result is that students are better at applying and evaluating different ethical perspectives and concepts, even if they are not as good at recognizing and understanding these concepts. It may be possible to use students' application and evaluation capabilities to help them better identify and understand ethical issues, especially when these issues are presented in more abstract terms as items on a test.

Due to budget cuts, the ethics project was only active for one of the three years originally proposed. Plans for the second year had included refining the test and assessing the achievement of a larger, more varied set of students. If the project is revived, it may be important to re-examine how ethics is defined for assessment purposes or to better align the instrument with the learning outcomes of ethics courses because having taken such courses did not improve students' performance on the assessment.

Recommended Action Items

6. **Complete the ULO Project on Ethics, taking into account the need to align the instrument with the learning outcomes of ethics courses (p. 10).**

Final Comments on the ULO Project

The ULO Project represents Cal Poly's first foray into institutional assessment, and the individual projects need to be viewed as pilots that should inspire further thinking about processes, measures, and resources. The ULO Project has required and institutional investment of time, effort, and support, but it has also involved a large number of participants from across the university, many of whom volunteered their time and expertise. The effort yielded important cross-unit conversations and collaborations on assessment that have not been part of Cal Poly's culture. This in itself is worth an investment.