TABLE: Academic Program Assessment Conclusions for AY 2008-2009. For each undergraduate major, stand alone minor, graduate program and Core 1, a table below provides the Program Learning Outcome (PLO) assessed, the program's conclusions regarding student performance based on the assessment results (Student Learning Conclusions), the curricular actions taken in response to the assessment results (Curricular Actions), and revisions the program is making to the assessment process (Assessment Actions). Programs appear in alphabetical order by name.

ANTHROPOLOGY, B.A.

PLO: Possess and apply fundamental anthropological knowledge, including terminology, concepts, intellectual traditions, and theoretical approaches.

Student Learning Conclusions: All students demonstrating at least adequate achievement relative to rubric.

Curricular Actions:

- All students demonstrating at least adequate achievement; on the basis of this, the small sample size, and lack of comparative data, the faculty will not make any changes to the curriculum.
- Encourage students to work with writing tutors as develop essays to strengthen writing; possibly require a draft paper.
- Increase attention to appropriate use of citations and instruction on how to use citations in the construction of arguments.
- Implement a file of student work that demonstrates mastery to share with future students.
- Under consideration:
    - Changing course prerequisites
    - Addition of capstone or honors thesis

Assessment Actions:

- Add second form of evidence.
- Increase specificity of instructions regarding the Program Learning Outcomes and the criteria for evaluating the learning outcomes.
- Revise rubric
- Simplify assessment process by focusing on fewer criteria at a time in order to facilitate production of more meaningful data

APPLIED MATHEMATICS, B.S.

PLO 1: Solve mathematical problems using analytical methods.
PLO 2: Solve mathematical problems using computational methods.

Student Learning Conclusions: Pleased with the student work and focus group feedback.

Curricular Actions:

- Integrating programming skills throughout the curriculum.
- Develop lower division programming class.
- Develop a continuous thread throughout the curriculum to help develop student skills in communicating mathematics correctly and effectively.

Assessment Actions:

- Faculty will conduct assessments of embedded questions together, rather than individually, to promote an open dialogue about the criteria and standards for evaluating student work.
- Revise rubric.
- Seek more staff support for organizing data collection in order to make better use of faculty time.

BIOLOGY , B.S.

PLO: Graduates will have demonstrated an understanding of the tenets of modern biology and an understanding of how cellular functions are integrated from the molecular level to the cellular level, through to the level of the organism, populations, and functioning ecosystems.

Student Learning Conclusions: 68-72% of students were judged to meet at least medium proficiency for two key criteria: comprehensiveness and scientific accuracy of response. This is below the goal of at least 80% of students at medium or higher proficiency.

Curricular Actions:

- Ensuring a basic introduction to all 5 PLOs in the introductory, 1 year Biology series (Bio 1, 2)
- Emphasize the quantitative aspects of these PLOs
- Adjust chemistry-related content of Bio 2 to make it part of an integrated first-year biology curriculum

Assessment Actions:

- Improve alignment between PLO, the assessment prompt and the rubric to improve validity of the assessment, including
    - Increase specificity of the assessment question
    - Collaboratively develop rubric before designing the assessment
- Reduce dependency on embedded assessment

CHEMISTRY, B.S.

PLO: *Fundamental knowledge and skills*. Students are able to describe the major concepts and theoretical principles in chemistry. They can identify the central ideas underlying the principle subfields of chemistry – analytical, organic, inorganic, and physical chemistry – as well as the broader interdisciplinary subfields of biological, environmental and materials chemistry. Students are able to operate modern chemical instrumentation, perform chemical syntheses and carry out other essential chemical experiments with strict adherence to sound laboratory techniques as well as good safety and hygiene practices. They know how to use modern, web-based methods to effectively search the scientific literature.

Student Learning Conclusions: On average student responses to assessment prompts fall half way between fair and good.

Curricular Actions:

- Noted additional needs to ensure other PLOs are being addressed in the program, including the addition of new, 1 unit course, to address scientific ethics and communication.

Assessment Actions:

- Assess this PLO using a combination of externally calibrated, standardized testing (for concepts and theoretical skills; American Chemical Society test "Diagnostic of Undergraduate Chemistry Knowledge") and upper division laboratory courses (for laboratory skills). The former to determine how UCM students are doing relative to those at other institutions and relative to the expected standards of the discipline.

COGNITIVE SCIENCE, B.A.

PLO: Students will demonstrate the ability to a) interpret / evaluate / synthesize information in research papers, b) design a cognitive science research project, and c) write clearly and scientifically.

Student Learning Conclusions: In general, students were at the second-highest of four levels of assessment, i.e. "students exhibited some degree of ability". In terms of different aspects of ability, students were slightly better at the design component compared with literature review and writing criteria of the rubric.

Curricular Actions:

- The faculty will consider in Fall of 2010, for implementation in Spring 2011, whether to require students to take COGS 105 before COGS 101, as COGS 105 provides foundations for research methods that are applied and assessed for in COGS 101.
- Address the feasibility of developing writing sections, within the General Education curriculum, tailored for cognitive science and/or psychology courses.
- Revised the PLO.

Assessment Actions:

- Revised the PLO.

COMPUTER SCIENCE AND ENGINEERING, B.S.

PLO: An ability to apply knowledge of computing and mathematics appropriate to the discipline.

Student Learning Conclusions:

- Performance in recurrent equations was overall satisfactory.
- A sizable proportion of CSE students struggle with mathematical proofs.
- CSE students have a good grasp of programming small programs with various basic data structures and programming constructs.
- Students demonstrate a good theoretical understanding of data structures and algorithms.
- Student performance with respect to demonstrating knowledge of important data structures quite low.
- Student performance in programming with C++ quite good.
- Basic understanding of the concepts related to the use of basic Linear Algebra techniques for representing kinematic structures and solving direct and inverse kinematics problems was good.
- Low rate of mastery regarding ability to implement a PCA algorithm suggests students do not have an adequate foundation in linear algebra.
- Most students are acquiring some basic knowledge of probability theory.
- Students exhibit difficulties in more advanced application of probability concepts.
- About half of the students understand combinatoric search algorithms well enough to produce implementations.
- About 50% of students are not sufficiently developing basic programming skills in their freshman and sophomore CSE courses
- Students exhibit a moderately weak understanding of basic propositional logic concepts

Curricular Actions:

- The faculty will develop a course in Discrete Mathematics to support development of basic concepts such as number theory, set theory, proof, logic, combinatorics, graph, trees, and relations. These fundamental mathematical skills are important for students to learn advanced topics in CSE courses.
- The faculty will develop a course in Linear Algebra, a foundational topic.

Assessment Actions:

- None.

CORE 1, GENERAL EDUCATION

PLO: Critique diverse perspectives from scientific, historical, artistic, and personal standpoints and craft written arguments that draw connections between the arts and sciences.

Student Learning Conclusions: Students were not performing as well on the Cumulative Essay as anticipated with 49% of sampled essays earning a passing grade or better (as judged against a rubric calibrated to grades) on this capstone assignment for this foundational course.

Curricular Actions:

- If the Cumulative Essay is to remain the capstone for the course, instructors need to focus on it throughout term and not leave students to pursue it exclusively at term's end
- Practice thesis-building—and therefore the building of connections—throughout term, perhaps by focusing on the "bigger picture" of the course more often, doing more connective in-class exercises, and by assigning more cumulative work earlier in the course.
- Track earlier coursework into/toward the Cumulative Essay
- Share the Cumulative Essay rubric much earlier in term, and apply it to other essays written for class (so as to cultivate students' awareness of and conversance with it)

Assessment:

- Consider revising scale associated with the rubric such as the AWPE holistic scale for essay grading.
- Consider building more connective suggestions into the essay prompt

PLO: Not investigated, too few graduating students.

Student Learning Conclusions: N/A

Curricular Actions: To evolve the major such that:

- Course work and undergraduate experiences required for the major have the appropriate breadth and depth for the interdisciplinary subjects associated with Earth Systems.
- Students exhibit knowledge and skills at graduation that demonstrate mastery or the core pedagogy.
- The ESS major is formally supported by a sufficient number of core faculty with expertise in relevant areas to deliver required and elective courses.
- The program is distinguished from other majors (such as Environmental Engineering or Biology) even though the majors may share (i.e. cross-list) courses.
- The major and any new minors are known among students as great options for pursuing their interests in an environmental degree and/or career.

Assessment Actions:

- Beginning in 2010, implement direct and indirect assessment of Program Learning Outcomes at rate of one annually.

ENVIRONMENTAL ENGINEERING, B.S.

PLO: Environmental Engineering graduates will be adept at applying critical thinking, problem solving, engineering principles and reasoning, the scientific method, and teamwork to solve environmental resource problems and to restore and sustain the global environment.

Student Learning Conclusions: Using a success criterion of average student performance of 70% or better on assessed assignments, the results begin to support the conclusion that students are achieving this PLO, excepting team-based problem solving which was not evinced in submitted student work.

Curricular Actions:

- Examine further engagement in team-based learning in these core courses and, as necessary, integrate into the curriculum.

Assessment Actions:

- Develop indirect lines of evidence.
- Encourage faculty to use multi-step problems as assessment evidence.
- Familiarize instructors with assessment methods and provide a standardized instructor reporting format.

ENVIRONMENTAL SYSTEMS, M.S. AND PH.D.

PLO: Core Knowledge: Graduates will knowledgeable, skillful and self-directed in the observation and analysis of environmental systems in terms of their capacity to:

- (M.S. graduates) Design experiments with appropriate controls and conduct original research, with appropriate level of supervision, in the context of an M.S. project or thesis.
- (Ph.D. graduates) Independently identify important research questions, formulate experimental plans, data analysis, and formulation of conclusions in the context of a doctoral dissertation.

Student Learning Conclusions: Achievement of this PLO is being well-initiated for many of the ES graduate students by the ES 200 course.

Curricular Actions:

- Consider developing a rubric to increase consistency of feedback to students and to make expectations about the scope and quality of this key project more transparent.
- Consider implementing peer review of project.

Assessment Actions:

- Develop a scoring rubric.
- Develop indirect lines of evidence.

PLO: Describe art works in technical or theoretical terms.

Student Learning Conclusions: While it is difficult to extract from a single course the entire GASP curriculum's results, we are confident that students are ending the semester considerably better equipped to describe cultural productions in various media, assess their meanings, and analyze their value critically.

Curricular Actions:

- None; continue as is.

Assessment Actions:

- None; continue same approach.

HISTORY, B.A.

PLO: Critically read, analyze, and synthesize primary and secondary sources.

Student Learning Conclusions: Students are fairly competent in evaluating secondary sources and are less skillful in analyzing primary sources.

Curricular Actions:

- Change thesis project to capstone with a shorter assignment that will allow students to utilize their skills in synthesizing sources in a more manageable fashion
- Provide a more structured format for HIST 191, with regular meetings that provide a framework for pursuing research
- Revise History 100, the required course on historiography, to prepare students for capstone
- In upper division courses emphasize the development of skills in research and analysis

Assessment Actions:

- Re-evaluate the phrasing of the PLO
- Reconsider structure and use of rubric

LITERATURES AND CULTURES, B.A.

PLO: Interpret texts with due sensitivity to both textual and contextual cues

Student Learning Conclusions: On the basis of eleven essays, it appears that the majority of our [senior] students are reaching the target score, indicating that most of our students are, in fact, suitably able readers of literary texts.

Curricular Actions:

- Do not yet have sufficient evidence to draw conclusions about student learning; these early results do not support major changes in instruction, curriculum, or course sequencing.
- Recommend the regular inclusion of revision into assignments, and require that students document the process of revision
- Have students write more 15+ page papers before they enroll in LIT 190
- Formalize the way we communicate expectations to students. Insofar as we are relying on portfolios to be a teaching tool, we need to embed those expectations in every class, post our portfolio requirements and templates on our web-site, and make these expectations part of regular advising.

Assessment Actions:

- Nothing in this first assessment would suggest that the basic approach to assessment needs improvement; the research questions still seem pertinent and probably will be answerable with the evidence we will accumulate.
- Either refine the rubric, separating more carefully evidence of skill in interpretation from skill in communication, or recognize that skill in communication will need to be part of every rubric and should thus not be treated as a separate learning outcome.

MECHANICAL ENGINEERING, B.S.

PLO: A working knowledge of the principles of Mechanics and Thermodynamics and how these principles evolve into other disciplines such as Heat and Mass Transfer, Vibration and Control, Computational Engineering, Mechanical Design, etc.

Student Learning Conclusions: Students self-report strong preparation for exercising their engineering knowledge professionally.

Curricular Actions:

- None.

Assessment Actions:

- Enhance specificity of the descriptions of course learning outcomes and how they are measured by assessment activities in the Accreditation Database.
- Archive grade statistics for each assignment in each course in order to support assessment process.
- Clarify relationship between assignments and exams to clarify if asking students to engage in solving unfamiliar problems.
- Improve assessment-related communication within program.

MEDIA ARTS PROGRAM (MAP), MINOR

PLO: Understand and acquire (through hands-on projects) the principal attributes and mechanics of art technique(s) in medium of choice.

Student Learning Conclusions: Instructors learned what methods of instruction and techniques of material presentation were viewed as effective by the students.

Curricular Actions:

- Revised syllabi to engage students more directly with the content
- Revised lectures to cover certain areas in more detail than before
- Altered and/or revised assignments based on observations about effectiveness in communicating central topics and themes of the courses
- Altered and/or revised assignments based on observations about student education and preparedness levels
- Altered reading selections based on observations as to which were effectively comprehended
- Introduced discussion groups to courses that did not have them before or lengthening existing discussion segments
- Added more actual examples of techniques or assignments

Assessment Actions:

- Revised PLOs.
- Created pre-instruction and post-instruction assessments
- Developed more standardized assessment tool for PLO#2.

MERRITT WRITING PROGRAM

PLO: Students will be able to demonstrate thorough engagement with the iterative processes of reading, writing, and speaking.

Student Learning Conclusions: Student self-report data indicate incremental improvements in PLO understanding and skill. However, implementation processes call into question the validity and reliability of these results. Portfolio-based student learning results will not be available until after Spring 2010.

Curricular Actions:

- Faculty in our program adopt a common portfolio rubric that provides guidelines for a range of criteria
- Be more routinely explicit about student learning outcomes

Assessment Actions:

- Continue to review PLOs in course evaluations
- Shift our program-wide assessment focus to assessing portfolios exclusively
- Distribute assessment workload so that timed writing exams will be reviewed in fall semesters, and portfolios in spring semesters. This way we attend equally to product and process oriented writing.

NATURAL SCIENCES EDUCATION (NSED), MINOR

PLO 1: Be able to comprehensively articulate what constitutes a profession of a science or mathematics teacher and to demonstrate familiarity with the structure of California educational system, including being able to address the following questions:

a. What constitutes responsibilities and duties of a teacher
b. What skills and knowledge are necessary to become a successful professional?
c. Credentialing process,
d. Instructional state standards and requirements,
e. Strategies to address diverse demographics of California schools such as instruction to English Learners.

PLO 2: Demonstrate basic teaching skills and familiarity with effective teaching methodologies and learning strategies in science and mathematics, including being able to

a. Develop a lesson plan and deliver an effective lesson at the secondary school level,
b. Design different types of assessments to evaluate students learning,
c. Distinguish between students with different learning abilities and needs and adapt their teaching methodology to address this diversity,
d. Incorporate innovative teaching methodologies and to use learning-enhancing technology in the classroom.

Student Learning Conclusions: The data collected from both the direct and indirect portions of the assessment indicates that the NSED Minor coursework does achieve the desired program outcomes. In addition, to the positive evaluation of the courses by students in terms of meeting PLO 1, 2, the students' performance on the direct test assessment questions is also very good.

Curricular Actions:

- Augment instruction of the teacher credentialing process in California

Assessment Actions:

- Augment current direct assessment with questions of increased difficulty
- Work toward including mentor teachers in assessment
- Formalize interviews portion of the assessment

PHILOSOPHY, MINOR

PLO: Upon completion of the Philosophy Minor Program a student should be able to 1) distinguish between logically valid and invalid deductive arguments, 2) translate verbal statements into symbolic expressions having correct logical form, and 3) give proofs of elementary propositions of logic.

Student Learning Conclusions: Students are making adequate process fulfilling parts 1 and 3 of the PLO. The data do not clearly confirm that the philosophy minors are adequately fulfilling part 2 of the PLO. Students exhibited strong performance in theorem proving, which is typically one of the most challenging parts of an undergraduate curriculum.

Curricular Actions:

- Inform students in Philosophy 5 that they will be expected to make significant progress toward fulfilling all three parts of the PLO and that this performance will be evaluated in this course
- Increase the number of homework problems and examination questions that specifically require translation of English expressions into formal symbolic notation

Assessment Actions:

- Revised PLO
- Increase amount of student work able to collect, which is somewhat dependent upon size of minor
- Consider comparing progress related to this PLO at the beginning and end of the semester.

PHYSICS, B.S.

PLO: Students will be able to apply basic physical principles---including classical mechanics, electricity and magnetism, quantum mechanics, and statistical mechanics---to explain, analyze, and predict a variety of natural phenomena.

Student Learning Conclusions: 62% of the solutions were acceptable or better. When restricted to Physics majors/minors, this number improves somewhat to 66%. One common theme from this analysis is that our students have a tendency to be distracted by the abstract and advanced mathematics, missing some of the basic physical principles as a result.

Curricular Actions:

- Increase attentiveness to incorporating PLO #1 into the syllabus and course objectives and to aligning homework and exam questions with this PLO
- Include more conceptual "physical intuition" problems on homeworks and exams, since our students often miss the basic physical principles due to abstract and difficult mathematics.
- Make more extensive use of available online applets to give a greater conceptual illustration of fundamental principles.
- Add an additional required thermodynamics course at the sophomore or junior level to address deficiency in thermodynamics preparation.
- Add Math 24 as a (concurrent) prerequisite for Phys. 10, so students have the necessary mathematical background to succeed in this course.
- Add Math 23 and Math 24 as (concurrent) prerequisites for PHYS. 105, so students have the necessary mathematical background to succeed in this course.
- Eliminate PHYS 10 as a prerequisite for the Waves minicourse, as this prerequisite is unnecessary, and its elimination would open up the course to more students.
- PHYS 124: Rotational Mechanics Minicourse will be recast as a course primarily covering the hydrogen atom and quantum angular momentum. This will help reinforce the material from PHYS 137. Classical rotational dynamics will be covered in PHYS 105.

Assessment Actions:

- When each core course is taught, include a couple of final exam questions specifically written to assess PLO #1. Such questions would emphasize the conceptual understanding of physical principles and downplay the use of sophisticated mathematics.
- As the size of the faculty increases, we should have at least three reviewers for each exam question.
- Correlation data between different reviewer responses should be computed between all pairs of reviewers to determine whether reviewers are applying similar standards.
- Continue focus group annually but increase student participation by moving it from the summer to the middle of the spring semester.

- As the Physics program matures, we will also consider additional data streams in our assessment of PLO #1, including student self-reported GRE results, student written theses, and student oral thesis presentations

PLO: Students will understand the processes, theories, and empirical regularities of political institutions and political behavior in the student's chosen emphasis area: American politics, comparative politics, or international relations.

Student Learning Conclusions: The evidence indicates that the students have grasped much of the process, theories, and empirical regularities of American politics (the relevant area of emphasis given the composition of the focus group and the nature of the exam in which the questions were embedded). What is less clear is whether the students understand the distinction between facts, theories, and systematic data.

Curricular Actions:

- Improve student understanding of the nature and role of theory in political science. Potential solutions include offering Theoretical Models of Politics relatively regularly (it has yet to be offered) or, alternatively, making Theoretical Models of Politics a required course for all political science majors.

Assessment Actions:

- Potentially revise PLO to make it more assessable.
- Increase student involvement in focus groups through incentives or increased recruitment effort.
- Assess all three areas of emphasis (American politics, comparative politics, international relations) by employing embedded questions in multiple upper division classes.

PSYCHOLOGY, B.A.

PLO: Students who complete the Psychology major will show knowledge of the key substantive content of the field of psychology, including memory and thinking, sensory psychology and physiology, developmental psychology, clinical and abnormal psychology, and social psychology.

Student Learning Conclusions: Strong evaluative conclusions about student learning based on the ETS major field test are not warranted, substantially because of the small sample size of entirely volunteer students, at least some of whom may have been poorly motivated. However, taken at face value, more than half the students performed at a level well-below average by any standard. In the interviews, students expressed substantial satisfaction with the Psychology program.

Curricular Actions:

- Faculty conveyed student concerns about academic advising to the SSHA advisors.
- Faculty organized methods for disseminating information to undergraduates regarding how to gain research experience, how to apply for grad school, GRE preparation, and similar matters, starting at least in junior year.
- Faculty recommended use of cumulative final examinations in courses.

Assessment Actions:

- After discussing concerns about the ETS test as an assessment tool, and given the pilot nature of the present test administration, the faculty agreed it is premature to make any assessment changes. The faculty concluded that it needs several more years of test data, especially under conditions where all graduating seniors must take the test, before considering important program changes.
- Faculty are considering possible ways to address the low motivation some students may have towards taking this exam.
- The faculty discussed whether to consider a poor performance as a department mean less than the 25th percentile, fair as less than 50th percentile, good as less than 75th percentile and excellent as above the 75th percentile. The faculty decided to postpone such standards until we have more experience with this test.
- The faculty agreed to use the SATAL program to support student interviews for assessment purposes.
- The faculty agreed to continue the use of NSSE and UCUES survey data for assessment purposes.

SOCIOLOGY, B.A.

PLO: Design and evaluate empirical sociological research.

Student Learning Conclusions: Students demonstrated acceptable performance on all four of the criteria assessed, falling primarily into the satisfactory to good range in use of evidence, use of research methods, and writing style. Scores for the use of sociological concepts criterion were slightly better than good. The data suggest some attention to building student ability to conduct research is necessary.

Curricular Actions:

- Developed Soc 15, a lower division course dedicated to teaching research methods and the evaluation of evidence, which is required of all majors and minors.
- To ensure majors receive training in the three core aspects of sociological analysis, the major was designed to require Soc 10 a statistics course and Soc 100 a theory course as well as Soc 15.

Assessment Actions:

- Determined that shorter, embedded questions would serve the faculty better as the program grew. Toward that end, the faculty will
  - Develop pre and post test assessment tool to gain information on student gains rather than inferring them from an end-product.
  - Engage in a rubric-based examination of student proficiency in finding and summarizing relevant peer-reviewed articles.

SPANISH LANGUAGE, MINOR

PLO: Students completing the minor in Spanish possess Spanish writing skills equivalent at least to the advanced level of the ACTFL Proficiency Guidelines: the student will be able to write about a variety of topics with significant precision and detail, and to produce organized compositions and short research papers.

Student Learning Conclusions: The direct and indirect evidence shows that all students reached an advanced level of written Spanish.

Curricular Actions:

- Across the program address use of accent marks and promote development of student ability to write in Spanish without inferring from English.

Assessment Actions:

- Introduce a value-added approach by assessing student writing as they enter the minor for comparison to skill levels upon completing the minor.
- Capitalize on faculty interest in assessment and decrease individual workload by increasing the number of faculty involved in assessment to more than three.
- Improve directions for developing reflective essays.