
Science 10 – Bringing a Course to Life at Santa Monica College

The national and local need for a larger and more diverse workforce in the areas of science, technology, engineering, and mathematics (STEM) has led to increased support for programs in these fields at educational institutions throughout the nation. In 2011, Santa Monica College's Science and Research Initiative (SRI), in partnership with University of California, Los Angeles, received funding from the U.S. Department of Education's Title III Hispanic Serving Institutions and STEM Articulation grant program to strengthen its STEM programming and increase the number of students pursuing degrees and careers in STEM. Faculty from the College's STEM programs realized that STEM students who have the opportunity to participate in a research project while at the undergraduate level, and particularly at the lower division level, develop a heightened level of excitement and motivation for their chosen areas of study. Applying the theories and principles learned in the classroom to a specific project and being able to participate in that project create powerful experience that boosts students' skills, understanding, and confidence.

For these reasons, the STEM faculty sought a mechanism to provide more students, including demographic groups traditionally underrepresented in STEM, an opportunity to share in a research experience. Working across disciplines, STEM faculty created a detailed course outline for an *Introduction to Scientific Research* course that first year students could take. The course provides an introduction to how and where scientific research occurs but also immerses students in a hands-on research experience. Successful completion of the course also qualifies students to apply for summer placement in a research lab at UCLA.

To bring their idea for this new course to fruition, the discipline faculty reached consensus on the content and structure of the course, and then used the College's online CurricUNET system to build a detailed course outline of record for the new course and submitted it for approval. The Curriculum Committee's technical review team (composed of the committee chair, vice chair, secretary, and the College articulation officer) examined the outline to ensure the following:

- All mandatory components had been provided and that the course objectives and learning outcomes were stated clearly and measurably;
- Course prerequisite of one college level laboratory science class was supported via appropriate content review documentation; and
- All other state and local requirements were met.

Once this was verified, the course was routed to the department chairs of the College's Earth, Life, and Physical Science departments for the review and approval of each department's faculty. Each chair recorded their department's vote on the course within the CurricUNET system.

Upon department approval, the course documents were routed to the College librarian who conducted a review to ensure that necessary support resources were available. In this case, it was determined that additional research journal subscriptions would be needed for students to

complete assigned projects, so appropriate journals were identified by the STEM faculty and purchased by the College librarians. The course documents were also routed to the Institutional Effectiveness Committee for review of the proposed student learning outcomes (SLO). This committee approved the course SLOs and made the recommendation that one of the outcomes also align with the College's newest institutional learning outcome which relates to students' authentic engagement in course material. Discipline faculty reviewed and accepted this suggestion, adding the Institutional Learning Outcomes (ILO) to their course. In the end, faculty developed five specific course learning outcomes that state what students will be able to do upon completion of the course. These course learning outcomes support the College's ILOs and are aligned with the College's Core Competencies as outlined in the following table:

Relevant Institutional Learning Outcomes	Alignment with SMC Core Competencies
SLO #1: Demonstrate the ability to formulate a scientifically testable hypothesis and design experiments to test the hypothesis.	
ILO 2: Obtain the knowledge and academic skills necessary to access, evaluate, and interpret ideas, images, and information critically in order to communicate effectively, reach conclusions, and solve problems.	<ul style="list-style-type: none"> o Content knowledge o Skills o Critical thinking
ILO 5: Demonstrate a level of engagement in the subject matter that enables and motivates the integration of acquired knowledge and skills beyond the classroom.	<ul style="list-style-type: none"> o Interest o Valuing academic task beyond the task itself o Professional relevance
SLO #2: Demonstrate the ability to generate and analyze scientific data.	
ILO 2: Obtain the knowledge and academic skills necessary to access, evaluate, and interpret ideas, images, and information critically in order to communicate effectively, reach conclusions, and solve problems.	<ul style="list-style-type: none"> o Skills o Quantitative reasoning o Critical thinking
ILO 5: Demonstrate a level of engagement in the subject matter that enables and motivates the integration of acquired knowledge and skills beyond the classroom.	<ul style="list-style-type: none"> o Interest o Valuing academic task beyond the task itself o Professional relevance
SLO #3: Describe how modern scientific research is conducted, reviewed, disseminated, and accepted.	
ILO 2: Obtain the knowledge and academic skills necessary to access, evaluate, and interpret ideas, images, and information critically in order to communicate effectively, reach conclusions, and solve problems.	<ul style="list-style-type: none"> o Content knowledge o Oral and written communication skills
SLO #4: Distinguish between ethical and unethical behavior in experimental design, data collection, and presentation of scientific results.	
ILO 2: Obtain the knowledge and academic skills	<ul style="list-style-type: none"> o Content knowledge

Relevant Institutional Learning Outcomes	Alignment with SMC Core Competencies
necessary to access, evaluate, and interpret ideas, images, and information critically in order to communicate effectively, reach conclusions, and solve problems.	o Critical thinking
SLO #5: Demonstrate the ability to communicate scientific work effectively.	
ILO 2: Obtain the knowledge and academic skills necessary to access, evaluate, and interpret ideas, images, and information critically in order to communicate effectively, reach conclusions, and solve problems.	o Information literacy o Critical thinking o Oral and written communication skills
ILO 5: Demonstrate a level of engagement in the subject matter that enables and motivates the integration of acquired knowledge and skills beyond the classroom.	o Interest o Valuing academic task beyond the task itself o Professional relevance

Having completed all of these preliminary review steps, the course was then placed on the Curriculum Committee meeting agenda. Prior to the committee meeting, members reviewed the proposed course and accompanying documentation. The course authors and relevant department chairs were notified of the date and time when the committee would review and discuss the proposed course and were invited to attend. At the committee meeting, the course authors were given an opportunity to present their proposal and explain the rationale for creating the course and how it would benefit students. Committee members then discussed the course by posing questions and raising concerns.

In the spirit of open access, a few committee members questioned the need for any prerequisite for the course, but discipline faculty explained the need for basic laboratory skills before students could safely and effectively participate in the hand-on components of the course. After thorough discussion and once all committee questions had been answered, approval of the course was granted via a committee vote. Had there been serious concerns or a need for additional information, the committee would have returned the course to its authors without taking action. The course authors could then determine if and how to address the committee concerns and, if so determined, submit the modified course for the committee's reconsideration.