# PROGRAM REVIEW AND PLANNING

**Approved 9/2/08 Governing Council**

*The Program Review process should serve as a mechanism for the assessment of performance that recognizes and acknowledges good performance and academic excellence, improves the quality of instruction and services, updates programs and services, and fosters self-renewal and self-study. Further, it should provide for the identification of weak performance and assist programs in achieving needed improvement. Finally, program review should be seen as a component of campus planning that will not only lead to better utilization of existing resources, but also lead to increased quality of instruction and service. A major function of program review should be to monitor and pursue the congruence between the goals and priorities of the college and the actual practices in the program or service.*

~Academic Senate for California Community Colleges

**Department or Program: Geology, Paleontology & Oceanography (GPO)**
**Division: Math/Science**

## I. DESCRIPTION OF PROGRAM *(Data resources: "Number of Sections" data from Core Program and Student Success Indicators; CSM Course Catalog; department records)*

Geology, paleontology and oceanography are all small programs, each primarily offering one lecture course (Geol 100, Paln 110 and Ocen 100) and one lab course (Geol 101, Paln 111 and Ocen 101). The majors' geology course, Geol 210, is not currently being offered due to enrollment minimums. Oceanography offers the most sections, 9-10 annually, while geology typically offers 6-7, and paleontology offers 3. All courses are CSU/UC transferable and fulfill GE requirements in science.
Three faculty members, only one of which is full-time, currently cover all of the sections in all three programs.

## II. STUDENT LEARNING OUTCOMES *(Data resources: SLO records maintained by the department; CSM SLO Coordinator; SLO Website)*

a. Briefly describe the department's assessment of Student Learning Outcomes. Which courses or programs were assessed? How were they assessed? What are the findings of the assessments?

See attached SLO templates, steps 1-4.

b. Briefly evaluate the department's assessment of Student Learning Outcomes. If applicable, based on past SLO assessments, 1) what changes will the department consider or implement in future assessment cycles; and 2) what, if any, resources will the department or program require to implement these changes? (Please itemize these resources in section VII of this document.)

See attached SLO templates, steps 5 & 6.

c. Below please update the program's SLO Alignment Grid. The column headings identify the GE-SLOs. In the row headings (down the left-most column), input the course numbers (e.g. ENGL 100); add or remove rows as necessary. Then mark the corresponding boxes for each GE-SLO with which each course aligns. The definitions of the GE-SLOs can be found on the CSM SLOAC website: http://www.smccd.net/accounts/csmsloac/sl_sloac.htm (click on the "Institutional" link under the "Student Learning Outcomes" heading.) If this Program Review and Planning report refers to a

vocational program or a certificate program that aligns with alternative institutional-level SLOs, please replace the GE-SLOs with the appropriate corresponding SLOs.

| GE-SLOs → Program Courses ↓ | Effective Communication | Quantitative Skills | Critical Thinking | Social Awareness and Diversity | Ethical Responsibility |
|---|---|---|---|---|---|
| Geol 100 | 1a, 1b, 1c | 2a, 2b | 3a, 3b | | |
| Geol 101 | 1a, 1b | 2a, 2b | 3a | | |
| Geol 210 | 1a, 1b, 1c | 2a, 2b | 3a, 3b | | |
| Paln 110 | 1a, 1b, 1c | 2a, 2b | 3a, 3b | | |
| Paln 111 | 1a | 2a, 2b | 3a, 3b | | |
| Ocen 100 | 1a, 1b, 1c | 2a, 2b | 3a, 3b | | |
| Ocen 101 | 1a | 2a, 2b | 3a, 3b | | 5 |

## III. DATA EVALUATION *(Data resources: Core Program and Student Success Indicators from the Office of Planning, Research, and Institutional Effectiveness)*

a. Referring to the Enrollment and WSCH data, evaluate the current data and projections. If applicable, what programmatic, course offering or scheduling changes do trends in these areas suggest? Will any major changes being implemented in the program (e.g. changes in prerequisites, hours by arrangement, lab components) require significant adjustments to the Enrollment and WSCH projections?

Geology enrollments and WSCH have decreased as the number of sections offered has decreased.
Paleontology enrollments and WSCH have increased as the number of sections offered has increased.
Oceanography enrollments and WSCH increased in spite of a reduction in the number of sections offered. The evening sections of the oceanography lecture and lab will switch weekdays starting in fall of 2009, so that students taking the evening lecture elsewhere can take our lab concurrently. It is unclear what effect, if any, this will have on overall enrollment.

b. Referring to the Classroom Teaching FTEF data, evaluate the current data and projections. If applicable, how does the full-time and part-time FTE affect program action steps and outcomes? What programmatic changes do trends in this area suggest?

Geology FTEF has steadily decreased as the program has decreased the number of courses offered. We have stopped offering Geol 118, Natural Disasters, which was taught in spring semester only. Geol 210, General Geology, if offered again, will share a lecture with Geol 100 as it did in fall 2007.
Paleontology FTEF has increased as the number of lecture sections offered in spring semesters has increased from 1 to 2. Paln 111, Paleontology Laboratory/Field Studies, was cancelled the first time it was offered in spring 2009. If Paln 111 is a successful offering in spring 2010, FTEF will increase accordingly.
Oceanography FTEF has decreased as evening sections have been cancelled due to the current enrollment minimums.

c. Referring to the Productivity data, discuss and evaluate the program's productivity relative to its target number. If applicable, what programmatic changes or other measures will the department consider or implement in order to reach its productivity target? If the productivity target needs to be adjusted, please provide a rationale. (Productivity is WSCH divided by FTE. The College's general target productivity will be recommended by the Budget Planning Committee.)

Geology LOAD has increased steadily with the decrease in course offerings. The LOAD in 2005-6 was 553 and is currently 707, greatly surpassing the college target of 525 for instructional LOAD.
Paleontology LOAD is currently 527, with a 3-year average of 526, both of which are just above the college target of 525.

Oceanography LOAD is currently 708 with a 3-year average of 699. The oceanography LOAD is consistently well above the college target. The trend is similar to the college LOAD trend in that the lowest LOAD of the 3-year period (601) was in 2006-7.

## IV. STUDENT SUCCESS EVALUATION AND ANALYSIS *(Data resources: Educational Master Plan; "Success Rates," "Dimension" data from Core Program and Student Success Indicators; previous Program Review and Planning reports; other department records)*

a. Considering the overall "Success" and "Retention" data from the Dimension section of Core Program and Student Success Indicators, briefly discuss how effectively the program addresses students' needs relative to current, past, and projected program and college student success rates. If applicable, identify unmet student needs related to student success and describe programmatic changes or other measures the department will consider or implement in order to improve student success. (*Note that item IV b, below, specifically addresses equity, diversity, age, and gender.*)

The data for the all three programs show retention rates that are fairly consistent, ranging from 80-85%. The 3-year averages are: geology 82%, paleontology 84% and oceanography 82%, which is slightly higher than the Math/Science Division 3-year average, and slightly higher than the college 3-year average of 85%.
The success rates have varied more than the retention rates with 3-year averages of 62% for geology, 71% for paleontology, and 69% for oceanography. These numbers are comparable to the success rates of Math/Science Division at 65% and the college at 70%.
All three programs use a variety of teaching & learning methods to accommodate learners of different learning styles and levels of academic preparation, but the smaller laboratory classes and lectures (30 students or less) afford a greater amount of hands-on learning than the large lectures (45-60 students). This may account for the higher average success rate of Paleontology, which has no large lecture, but averages based on such a small numbers of students are not necessarily meaningful.
Substantial changes to the format of the traditional (not TV) geology lecture and 2 of the oceanography lecture sections were implemented in fall 2008. This involved a more graphics-intensive approach to both homework and assessment in an effort to improve student success.

b. Briefly discuss how effectively the program addresses students' needs specifically relative to equity, diversity, age, and gender. If applicable, identify unmet student needs and describe programmatic changes or other measures the department will consider or implement in order to improve student success with specific regard to equity, diversity, age, and gender.

All three programs are small, and therefore many of the demographic statistics are based on too few samples to be statistically valid. At this point, the small numbers of students and lack of data from other years is insufficient for the determination of trends that might require attention, but the lowest numbers are presented here so that these demographic categories can be revisited when more data is available.
In the geology courses, the demographic groups that have less than a 50% success rate are the black (29%), native American (0%) and pacific islander (22%) populations. Theses percentages are based upon 17, 1 and 9 students, respectively.
In the paleontology course, the demographic group that has less than a 50% success rate is the black (0%), population, based upon 1 student.
In the oceanography courses, the demographic group that has less than a 50% success rate is the unrecorded gender (25%) population based upon 8 students. Hopefully this will not be part of a trend, because I have no clue what that would imply.

## V. REFLECTIVE ASSESSMENT OF INTERNAL AND EXTERNAL FACTORS AND PROGRAM/STUDENT SUCCESS *(Data Resources: Educational Master Plan; "Dimension: Retention and Success" data from Core Program and Student Success Indicators; previous Program Review and Planning reports; department records)*

a. Using the matrix provided below and reflecting on the program relative to students' needs, briefly analyze the program's strengths and weaknesses and identify opportunities for and possible threats to the program (SWOT). Consider both external and internal factors. For example, if applicable, consider changes in our community and beyond (demographic, educational, social, economic, workforce, and, perhaps, global trends); look at the demand for the program; review program links to other campus and District programs and services; look at similar programs at other area colleges; and investigate auxiliary funding.

| | **INTERNAL FACTORS** | **EXTERNAL FACTORS** |
|---|---|---|
| **Strengths** | These programs provide students with options for fulfilling the CSU/UC GE transfer requirements and CSM natural science AA/AS degree requirements. | Geology and oceanography are so pertinent to people living in the Bay Area. |
| **Weaknesses** | Geology TV course is not up to par with the traditional on-campus lecture course.<br><br>Too few geology courses to attract geology majors. | Earth science is not offered at most of the local high schools, so students have very little or no prior exposure to most of the material. |
| **Opportunities** | Continued growth of paleontology program could lead to more sections of classes that are not offered elsewhere in the district. | A sizable earthquake, volcanic eruption, landslide or tsunami might boost geology enrollments and/or allow for the resurrection of Natural Disasters (Geol 118).<br><br>Retiring geologists and relatively few geology majors should provide good job opportunities within the next decade. |

| | | |
|---|---|---|
| **Threats** | Enrollment minimums could prevent Paln 111 from being offered for years.<br><br>Adoption of a compressed calendar could make these content-rich courses too intense, hurting student success and/or enrollments.<br><br>Adoption of a compressed calendar could also push GE courses into lower-enrollment time slots due to the lack of available lecture halls.<br><br>Faculty burnout from too much additional administrative work. | Skyline offers a greater variety of geology courses.<br><br>Changes in state requirements for hours-by-arrangement could result in lower WSCH and LOAD. |

b. If applicable, discuss how new positions, other resources, and equipment granted in previous years have contributed towards reaching program action steps and towards overall programmatic health (you might also reflect on data from Core Program and Student Success Indicators). If new positions have been requested but not granted, discuss how this has impacted overall programmatic health (you might also reflect on data from Core Program and Student Success Indicators).

not applicable

## VI. Action Steps and Outcomes *(Data resources: Educational Master Plan, GE- or Certificate SLOs; course SLOs; department records; Core Program and Student Success Indicators; previous Program Review and Planning reports; Division work plan)*

a. Identify the program's action steps. Action steps should be broad issues and concerns that incorporate some sort of measurable action and should connect to the Educational Master Plan, the Division work plan, and GE- or certificate SLOs.

1. Geology, Paleontology & Oceanography: continue to update course outlines
2. Geology & Oceanography: continue refinement of graphic-intensive format
3. Geology, Paleontology & Oceanography: continue to maintain & expand fossil, sedimentary structure and marine sample collections and replace consumable laboratory materials

b. Briefly explain, specifically, how the program's action steps relate to the Educational Master Plan.

1. Students Transferring to a 4-year university - Necessary for continued articulation of courses with CSU/UC to ensure transferability.
2. Embracing instructional flexibility - Modifying delivery methods to meet the needs of today's video-oriented students
3. Embracing instructional flexibility - Increase hands-on active learning to keep students motivated and demonstrate concepts and features using actual samples and lab experiments

c. Identify and explain the program's outcomes, the measurable "mileposts" which will allow you to determine when the action steps are reached.

1. Completed course outline updates.
2. Compare success rates with previous semesters.
3. Collection of enough samples or laboratory consumables to facilitate one of the following
   a) efficient passing of samples in large lecture halls
   b) multiple sets to allow students to work in groups of 5 or less students

c) continued use and/or upgrade of current laboratory experiments

## VII. SUMMARY OF RESOURCES NEEDED TO REACH PROGRAM ACTION STEPS *(Data resources: Educational Master Plan, GE-SLOs, SLOs; department records; Core Program and Student Success Indicators; previous Program Review and Planning reports)*

a. In the matrices below, itemize the resources needed to reach program action steps and describe the expected outcomes for program improvement.* Specifically, describe the potential outcomes of receiving these resources and the programmatic impact if the requested resources cannot be granted.
**Note:* Whenever possible, requests should stem from assessment of SLOs and the resulting program changes or plans. Ideally, SLOs are assessed, the assessments lead to planning, and the resources requested link directly to those plans.

| **Full-Time Faculty Positions Requested** | **Expected Outcomes if Granted and Expected Impact if Not Granted** | **If applicable, briefly indicate how the requested resources will link to achieving department action steps based on SLO assessment.** |
|---|---|---|
| none | not applicable | not applicable |

| **Classified Positions Requested** | **Expected Outcomes if Granted and Expected Impact if Not Granted** | **If applicable, briefly indicate how the requested resources will link to achieving department action steps based on SLO assessment.** |
|---|---|---|
| none | not applicable | not applicable |

b. For instructional resources including equipment and materials, please list the exact items you want to acquire and the total costs, including tax, shipping, and handling. Include items used for instruction (such as computers, furniture for labs and centers) and all materials designed for use by students and instructors as a learning resource (such as lab equipment, books, CDs, technology-based materials, educational software, tests, non-printed materials). Add rows to the tables as necessary. If you have questions as to the specificity required, please consult with your division dean. Please list by priority.

| **Resources Requested** | **Expected Outcomes if Granted and Expected Impact if Not Granted** | **If applicable, briefly indicate how the requested resources will link to achieving department action steps based on SLO assessment.** |
|---|---|---|
| **GPO Shared Items:** fossils, sedimentary structures and marine samples (see list attached)<br>**Number:** (see list attached)<br>**Vendor:** These are not items that can be ordered from the usual vendors (Ward's, Carolina, Cenco, etc.) and will require much research and possibly travel to obtain usable specimens.<br>**Unit price:** generally between $20-$400<br>**Total Cost:** unknown, but chances of finding all of these items in the numbers needed is extremely low, so half of the maximum budget would probably suffice for | **Expected Outcomes if Granted**<br>more engaged, motivated students; concepts reinforced; better student participation in smaller groups; more opportunities to develop teamwork and problem-solving skills<br>**Expected Impact if Not Granted**<br>continuation of status quo; students have few hands-on learning experiences, especially in the large lectures; students working in groups that are too large don't fully participate | refer to action step #3 |

| | | |
|---|---|---|
| a year<br>**Status*:** New & Upgrade. | | |
| **Oceanography Lab Items:**<br>1. Silica refill kit 21 W9064<br>2. Dissolved oxygen refill kit 21 W9057<br>3. Calcium hardness 21 W9068<br>4. Vertebrate collection 62WO084<br>5. Fish scale kit 69Wl 548<br>6. Gumshoe chitin 68W7018<br>7. Calcareous sponge 68WO118<br>8. Echinoderm collection 68W7708<br>9. Salinity 21 W0046<br>**Number:** 1 of each<br>**Vendor:** Ward's Natural Science<br>**Unit price:**<br>1. $31.50<br>2. $31.50<br>3. $34.50<br>4. $26.75<br>5. $18.50<br>6. $10.75<br>7. $7.25<br>8. $14.50<br>9. $53.50<br>**Total Cost:** $270.50<br>**Status*:** 1-3 replacement of consumables; 4-8 new; 9 upgrade | **Expected Outcomes if Granted**<br>more engaged, motivated students; concepts reinforced; continued use of laboratory experiments; improvements made to some laboratory experiments/lessons<br>**Expected Impact if Not Granted**<br>laboratory students have fewer hands-on experiences and less opportunities to explore many of the important and unique features of marine organisms | refer to action step #3 |

** Status = New, Upgrade, Replacement, Maintenance or Repair.*

## VIII. Course Outlines *(Data Resources: department records; Committee On Instruction website; Office of the Vice President of Instruction; Division Dean)*

a. By course number (e.g. CHEM 210), please list all department or program courses included in the most recent college catalog, the date of the current Course Outline for each course, and the due date of each course's next update.

| Course Number | Last Updated | Six-year Update Due |
|---|---|---|
| GEOL 100 | Jan. 2008 | Spring 2014 |
| GEOL 101 | Jan. 2008 | Spring 2014 |
| GEOL 210 | May 1988 | now or bank |
| PALN 110 | Dec. 2000 | now |
| PALN 111 | Jan. 2008 | Spring 2014 |
| OCEN 100 | Jan. 2008 | Spring 2014 |
| OCEN 101 | Spring 1988 | now |

## IX. Advisory and Consultation Team (ACT)

a. Please list non-program faculty who have participated on the program's Advisory and Consultation Team. Their charge is to review the Program Review and Planning report before its submission and to provide a brief written report with comments, commendations, and suggestions to the Program Review team. Provided that they come from outside the program's department, ACT members may be solicited from faculty at CSM, our two sister colleges, other community colleges, colleges or universities, and professionals in relevant fields. The ACT report should be attached to this document upon submission.

| |
|---|
| Charlene Frontiera |

Geology, Paleontology and Oceanography
Outside Editorial

First of all, it is very clear that Linda Hand has done a thorough analysis of the program, division and college-wide data made available. While the total enrollment for the three programs is not huge, this is a result of the low number of course offerings in these departments. The excellent LOAD data indicates that the courses, when offered, are well-filled and time is efficiently used by the faculty. More importantly, the retention numbers are outstanding. Linda has also drawn a nice parallel between the high retention rates and the high SLO achievement. The faculty have clearly identified the SLOs and have assessed most of them. They are using that information to inform future decisions.
There is only one full-time faculty member to direct all of the activities for these three programs. Linda Hand is doing an outstanding job of representing these three programs and directing the associated part-time faculty.

b. Briefly describe the program's response to and intended incorporation of the ACT report recommendations.

| |
|---|
| I agree with the ACT assessment. There were no recommendations. |

---

**Upon its completion, please email this Program Review and Planning report to the Vice President of Instruction, the appropriate division dean, and the CSM Academic Senate President.**

**Date of evaluation:**

**Please list the department's Program Review and Planning report team:**

| |
|---|
| Primary program contact person: Linda Hand<br>Phone and email address: 574-6633<br><br>Full-time faculty: Linda Hand<br>Part-time faculty: none<br>Administrators: none |

| |
|---|
| Classified staff: none<br>Students: none |

_____

*Faculty's signature* *Date*

_____

*Dean's signature* *Date*

# 2008-2009 CSM Course SLO Form

## Course Name: __Geol 210__

### Course Mission/Purpose:

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Demonstrate an understanding of the scientific method by using the scientific method in laboratory exercises | identification of minerals by observing and testing physical properties of 15 samples | 100% of the students were successful in identifying all 15 samples, 14% needed only 1 attempt, 43% needed 2 attempts on 2 samples, 43% needed 3 attempts on 1-2 samples | fall 2007 | Instructor evaluated all students as successful since none missed more than 4 of 15 on the first attempt (73%) and all needed to return to at least one sample that they previously tested to retest before submitting their results for the first time | no changes recommended |
| **SLO #1b:** Demonstrate an understanding of the structure, materials, internal processes and external processes of the Earth within the framework of plate tectonics<br>Be able to apply these concepts to identify and/or interpret facets of plate tectonics, earth materials, geologic dating or maps | Test question on what happens at an ocean-continental convergent plate boundary and why | | next time offered | | |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #1c:**<br>Effectively describe multiple lines of evidence that support the theory of plate tectonics and/or earth structure | homework question on evidence for plate tectonics | | next time offered | | |
| **SLO #2a:**<br>Solve quantitative problems associated with plate tectonic rates, earthquake epicenter determination, topographic maps or radiometric dating | test questions requiring calculation of plate rates and unit conversions from a map of hot-spot islands | average on 2 test problems was 76%<br>22% scored 100%,<br>22% scored 90%<br>23% scored 80%,<br>11% scored 70%<br>22% scored 60% or less | fall 2007 | instructor graded test problems and determined 67% of the students were successful with scores of 80%-100% | recommended offering additional but optional homework for those students needing more practice in quantitative problem solving |
| **SLO #2b:**<br>Interpret graphical representations of seismic activity, seismic-wave travel-time curves, topographic contours, map scales or mapping coordinates | 12-step test problem requiring students to interpret seismograms, calculate time differences, and use travel-time curves and map scales to determine an earthquake's epicenter | 67% were successful in all steps of the problem,<br>11% made one error in the process,<br>22% made 2 errors in the process | fall 2007 | Instructor graded test problems and evaluated scores of 91% and above as highly successful<br>this included 78% of the students. The remaining 22% of the students had mastered all but the actual mapping portion of the process | recommended an increase in the amount of instruction on basic map skills |
| **SLO #3a:**<br>Evaluate the logic, validity and relevance of information in assessing evidence of earth structure and/or plate tectonics | pairs exercise investigating unidentified plate boundaries using several lines of graphically-presented data | all 4 of the pairs were able to develop 1-3 reasonable hypotheses about the type of plate boundary and could propose additional tests or data that would help to test their hypotheses | fall 2006 | Instructor reviewed hypotheses and proposed tests/additional data, and led a peer-review discussion of the students' results. All sources evaluated the results as very successful and many comments expressed awe for thinking outside the box. | recommend another assessment on a larger class because the instructor deemed the class to be unusually small and capable |
| **SLO #3b:**<br>Draw appropriate conclusions from the application of principles of plate tectonics, isostasy or relative dating Identify earth materials using empirical results | test problem requiring relative dating of rocks and events in a cross-section diagram | 62% scored 100%<br>19% scored 88%<br>11% scored 75%<br>4% scored 63%<br>4% scored 0% (did not attempt to answer) | fall 2007 | Instructor evaluated scores of 88% and above as successful, which included 81% of the students. | Increase "thinking-out-loud" commentary during modeling of the problem solving process in class |

# 2008-2009 CSM Course SLO Form

## Course Name: __Geol 100__

### Course Mission/Purpose:

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Demonstrate an understanding of the scientific method | test question | 59% answered correctly | spring 2009 | instructor graded answers and concluded that the SLO was achieved by 59% of the students | recommend more classroom discussion on the scientific method |
| **SLO #1b:** Demonstrate an understanding of the structure, materials, internal processes and external processes of the Earth within the framework of plate tectonics | quiz on earth structure and composition with 10 pts possible | 76% scored 100%, 6% scored 90%<br>7% score 80%<br>2% scored 70%,<br>2% scored 50%,<br>2% scored 40%,<br>2% scored 30%,<br>2% scored 10% | fall 2008 | instructor graded quiz and concluded that the SLO was achieved by 89% of the students | no changes recommended |
| **SLO #1c:** Effectively describe multiple lines of evidence that support the theory of plate tectonics and/or earth structure | homework question on evidence for plate tectonics | 74% scored a B- or better, while 26% scored a C- or worse | fall 2008 | instructor graded homework and concluded that the SLO was achieved by 74% of the students with many of the unsuccessful students listing evidence rather than describing it | recommend changing the wording of the instructions and perhaps providing an example |
| **SLO #2a:** Solve quantitative problems associated with plate tectonics and/or radiometric dating | test question requiring calculation of number of half-lives and age | 23% answered correctly<br>77% answered incorrectly | spring 2008 | Instructor evaluated answers and concluded that the SLO was not achieved for the majority of students | recommended instituting graphical homework on quantitative topics since there is no math prerequisite and math skill levels vary greatly |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #2b:**<br>Interpret graphical representations of seismic activity | test questions on diagram of seismic activity that includes seismic gaps | 80% answered the question correctly | spring 2009 | Instructor evaluated answers and concluded that the SLO was achieved for the majority of students | no changes recommended |
| **SLO #3a:**<br>Evaluate the logic, validity and relevance of information in assessing evidence of earth structure and/or plate tectonics | Critical thinking test questions on evidence for categorizing a hypothetical new discovery | 27% answered the first question correctly<br>27% answered the second question correctly | spring 2009 | Instructor evaluated answers and concluded that the SLO was not achieved for the majority of students | recommend including more critical thinking questions as homework |
| **SLO #3b:**<br>Draw appropriate conclusions from the application of principles of isostasy or relative dating | test problem requiring relative dating of rocks and events in a cross-section diagram | 62% scored 100%<br>19% scored 88%<br>11% scored 75%<br>4% scored 63%<br>4% scored 0% (did not attempt to answer) | fall 2007 | Instructor evaluated scores of 88% and above as successful, which included 81% of the students. | Increase "thinking-out-loud" commentary during modeling of the problem solving process in class |

# 2008-2009 CSM Course SLO Form

## Course Name: __Geol 101__

**Course Mission/Purpose:**

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Demonstrate an understanding of the scientific method by using the scientific method in laboratory exercises | identification of minerals by observing and testing physical properties of 15 samples, 3 pairs of which were similar in many of their physical properties | 100% of the students were successful in identifying all 15 samples, 19% needed only 1 attempt, 43% needed 2 attempts on 1-4 samples, 19% needed 3 attempts on 1 sample, and 19% needed 4 attempts on 1 sample | spring 2008 | Instructor evaluated all students as successful since none missed more than 4 of 15 on the first attempt (73%) and all needed to return to at least two samples that they previously tested to retest before submitting their results for the first time (demonstrating the iterative nature of the scientific method) | no changes recommended |
| **SLO #1b:** Demonstrate an understanding of geologic concepts by being able to apply these concepts to identify and/or interpret facets of plate tectonics, earth materials, geologic dating or maps | 3 test questions requiring an understanding of rock textures and their interpretation | students averaged an 72% success rate for all 3 questions with individual questions answered correctly 46%, 69% and 100% of the time | spring 2008 | Instructor tallied test question scores and determined that the students were successful 72% of the time. The assessment should have been tallied by student as well as by question number for more meaningful data. | Recommended assessing again and grouping results by the number that students that answered all 3 correctly, 2 correctly, etc. |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #2a:**<br>Solve quantitative problems associated with plate tectonic rates, earthquake epicenter determination or topographic maps | 2 test problems requiring calculation plate rates and unit conversions from hot spot island map | 40% scored 100%,<br>27% scored 90%<br>13% scored 80%<br>20% scored 60% or lower | spring 2008 | instructor graded the test problems and determined that 80% of the students were successful with scores of 80% and above | Recommended offering additional but optional homework for those students needing more practice in quantitative problem solving. Math skill levels vary greatly throughout the class. |
| **SLO #2b:**<br>Interpret seismic-wave travel-time curves, topographic contours, map scales or mapping coordinates | 3 test questions requiring interpretation of seismic travel-time curves, and 1 extra credit question requiring more critical thinking | students averaged an 80% success rate for all 3 questions, with each question individually answered correctly 67% or 87% of the time<br>40% answered the extra point question correctly | spring 2008 | Instructor tallied test question scores and determined that the students were successful 80% of the time. The assessment should have been tallied by student as well as by question number for more meaningful data. Some students didn't answer the extra point question. | Recommended making all 4 questions mandatory and assessing again and grouping results by the number that students that answered all 4 correctly, 3 correctly, etc. |
| **SLO #3a:**<br>Draw appropriate conclusions from the application of principles of plate tectonics or relative dating<br><br>Identify earth materials using empirical results | test problem requiring relative dating of 16 rocks and events in a cross-section diagram | 89% scored 100%,<br>11% scored 81% | spring 2008 | Instructor graded test problem and determined that 89% of the students were successful. The 11% that scored 81% were not considered successful because they misplaced at least 2 of the 3 misplaced events far out of order | no recommended change |

# 2008-2009 CSM Course SLO Form

## Course Name: __Ocen 100__

**Course Mission/Purpose: _____**

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Comprehend, interpret and analyze written and oral information about the scientific method in the study of natural science | questions about visual presentation & test question | 88% answered correctly | spring 2007 | instructor graded test question and deemed 88% of the students to be successful<br>other students may need to apply the concepts to truly understand them | recommend the instructor guide discussion rather than lecture on nature of science and the scientific method |
| **SLO #1b:** Demonstrate an understanding of the geographic, geologic, chemical, physical and biological concepts of ocean science | written report - | all students ultimately succeeded because 5 were instructed to resubmit for passing grade | spring 2006 | instructor graded reports and deemed 100% of the students to be successful but some students need more specifics about paper expectations to reduce need for resubmission | recommend more specific instructions on how the report is to be written and format of report |
| **SLO #1c:** Effectively describe multiple lines of evidence that support our knowledge of plate tectonics, seawater and its movement, coastal environments or the marine ecosystem | homework assignment on continental drift evidence | 90% scored 75% or higher | spring 2007 | instructor graded assignment and deemed 90% of the students to be successful<br>other students need to improve discussion of their understanding of the concept | recommend rewording question to elicit more discussion |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #2a:**<br>Solve quantitative problems associated with navigation and/or plate motion | exam questions following homework | 76% successful | spring 2006 | instructor graded exam questions and deemed 76% of the students to be successful<br>other students need more practice | recommend more classroom examples |
| **SLO #2b:**<br>Interpret graphical representations of bathymetry, tides, salinity, temperature or pressure | exam questions following homework | 82% answered correctly | spring 2006 | instructor graded exam questions and deemed 82% of the students to be successful<br>other students need example in class | recommend incorporation of additional classroom examples |
| **SLO #3a:**<br>Evaluate the logic, validity and relevance of information in assessing evidence in plate tectonics and/or earth structure | exam question following homework | 75% answered correctly<br>25% did not answer question | spring 2007 | instructor graded exam questions and deemed 75% of the students to be successful, 25% unsuccessful<br>possibly intimidated by essay question if they possess poor writing skills | recommend changing question to require a list of the main ideas rather than an essay |
| **SLO #3b:**<br>Draw appropriate conclusions from the application of scientific principles to predict future trends based upon current analytical data | classroom discussion of ecosystem changes | 99% came to a correct conclusion | spring 2008 | instructor evaluated students' comments, questions and conclusions and determined that 99% of the students were successful<br>many expressed an interest in learning more | recommend extra assignments available on voluntary basis |

# 2008-2009 CSM Course SLO Form

## Course Name: ___Ocen 101____

**Course Mission/Purpose:**

_____

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Demonstrate an understanding of the geographic, geologic, chemical, physical and biological concepts of ocean science by being able to apply these concepts to identify and/or interpret various features & processes | Test questions | 78% scored a C or better on the question | Spring 2007 | Instructor graded tests and determined that 78% of the students were successful | recommend more review |
| **SLO #2a:** Solve quantitative problems associated with navigation and/or plate motion | student survey | 80% reported at least an understanding of navigation<br>78% reported at least an understanding of plate motion | spring 2007 | instructor tallied survey results and deemed that 80% of the students were successful in navigation and 78% were successful in plate motion | recommend introduction of additional classroom activities |
| **SLO#2b:** Interpret graphical representations of bathymetry, tides, salinity, CCD, temperature or pressure | student survey | 95% reported at least an understanding of bathymetry | Spring 2007 | instructor tallied survey results and deemed 95% of the students to be successful | no changes recommended |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #3a:**<br>Evaluate physical adaptations to the deep sea environment | Test scores | 77% passed the exam (C or better) | Spring 2007 | instructor graded the exam and determined that 77% of the students were successful | recommend additional discussion and review before exam |
| **SLO #3b:**<br>**Draw appropriate conclusion s from the application of scientific principles in the analysis of water samples and/or sediment samples** | Lab practical exam | 75% of the students answered correctly on the practical exam | Spring 2007 | Instructor graded exam and determined that 75% of the students were successful | recommend more review of samples before exam; addition of samples into instructional resource center for students to study |
| **SLO #5**<br>**Understand ramifications of human induced waste and /toxins that enter the marine environment** | Field trip discussion groups | Pro-con groups at Close of activity | Spring 2006 | Instructor observed student contributions to the discussion and deemed that 100% of the students were successful | no changes recommended |

# 2008-2009 CSM Course SLO Form

## Course Name: __Paln 110__

**Course Mission/Purpose:**

_____

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Demonstrate an understanding of the nature of scientific knowledge and distinguish between true science and pseudoscience | test question | 74% of the students recognized at least 4 ways to distinguish science from pseudo science.<br>26% of the students demonstrated knowledge of one way to distinguish between the 2 | fall 2007 | instructor graded test question and determined that 74% were highly successful while 26% were minimally successful | recommended assigning homework on a pseudoscience |
| **SLO #1b:** Demonstrate an understanding of geologic time, evolution by natural selection, plate tectonics, ecosystems and the history of life on Earth | test question on evolution by natural selection | 65% answered correctly | fall 2007 | Instructor graded test questions and determined that 65% of the students were successful.<br>Improvement is needed in this area | recommended homework on the 4 basic tenets of natural selection with examples/descriptions of each |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #1c:**<br>Effectively describe multiple lines of evidence that support the theory of evolution by natural selection, plate tectonics theory or the immensity of geologic time | test question on evidence for evolution by natural selection | only 13 students chose to answer this 5-point question<br><br>2 earned 1 point<br>2 earned 2 points<br>2 earned 2.5 points<br>1 earned 3.5 points<br>4 earned 4 points<br>2 earned 5 points | fall 2008 | Instructor graded test questions and determined that 6 of the 13 (46%) students were successful. A larger number of students and a higher percentage of students scoring a 4 or better is considered necessary for this SLO to be successfully achieved. | recommend assigning as homework to increase the number of students responding and provide more time so that they may edit their responses before submitting |
| **SLO #2a:**<br>Solve quantitative problems associated with genetics and/or radiometric dating | test question requiring calculation of number of parent atoms remaining after a given number of years & half-life | 50% answered correctly | spring 2008 | Instructor graded test questions and determined that 50% of the students were successful.<br>Improvement is needed in this area. | recommended having the students graph half-lives vs parent/daughter ratios based upon a given number of original parent atoms |
| **SLO #2b:**<br>Interpret graphical representations of isotope ratios and/or entire leaf margin ratios | test question on graph of entire leaf margin ratios | 96% answered correctly | fall 2008 | Instructor graded test questions and determined that 96% of the students were successful in achieving the SLO | no changes recommended |
| **SLO #3a:**<br>Evaluate the logic, validity and relevance of information in assessing evidence for evolution by natural selection and/or Intelligent Design | test question on evidence of eye evolution | 77% answered the question correctly | fall 2008 | Instructor graded test questions and determined that 77% of the students were successful in achieving the SLO | no changes recommended |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #3b:**<br>Draw appropriate conclusions from the application of scientific principles in interpretation of rocks & geologic features, cladograms or ecosystem interactions | test problem requiring relative dating of rocks and events in a cross-section diagram | 62% scored 100%<br>19% scored 88%<br>11% scored 75%<br>4% scored 63%<br>4% scored 0% (did not attempt to answer) | fall 2007 | Instructor evaluated scores of 88% and above as successful, which included 81% of the students. | Increase "thinking-out-loud" commentary during modeling of the problem solving process in class |

# 2008-2009 CSM Course SLO Form

## Course Name: __Paln 111__

**Course Mission/Purpose:**

_____

| **Step 1. Student Learning Outcome(s) Defined** (what students will learn, know, do or value at course end) | **Step 2. Assessment Tool/ Measurement Instrument** (identify methodology or tool for collection of evidence of learning e.g., pre/post tests, surveys, papers, anecdotal evidence, etc.) | **Step 3. Assessment of SLO(s)** (what were the assessment tool results e.g., raw data, scores, etc.?) | **Step 4. Timelines/ Term Assessed** (list dates when assessment tool will be administered and assessment data will be collected and analyzed) | **Step 5. Analyze/Evaluate Assessment Results** (identify who will review and analyze data from tests, surveys, etc. What do the measurement results reveal in relation to the learning outcome? ) | **Step 6. Recommendation/ Action** (using assessment results and analysis, what changes, if any, will be made to instruction methodologies or SLO assessment design? Or if SLO results positive, will a new SLO be identified?) |
|---|---|---|---|---|---|
| **SLO #1a:** Demonstrate an understanding of paleontologic concepts by being able to apply these concepts to identify and interpret facets of evolution, earth materials, plate tectonics, fossils or ecosystems | test questions | | spring 2010 | instructor will grade test questions | |
| **SLO #2a:** Solve quantitative problems associated with plate tectonic rates and/or dinosaur speed | lab exercise | | spring 2010 | Instructor will grade lab exercise | |

| | | | | | |
|---|---|---|---|---|---|
| **SLO #2b:** Interpret graphical representations of speed versus stride and/or growth rates | lab exercise | | spring 2010 | Instructor will grade lab exercise | |
| **SLO #3a:** Evaluate the logic, validity and relevance of information in assessing evidence for past bolide impacts | lab exercise | | spring 2010 | Instructor will grade lab exercise | |
| **SLO #3b:** Draw appropriate conclusions from the application of scientific principles and/or empirical results of plate tectonics or ecosystem interactions | test question | | spring 2010 | Instructor will grade test question | |

| vendor | item name | estimated unit price | # needed | estimated maximum extended price | |
|---|---|---|---|---|---|
| | | | | | |
| unidentified | | | | | |
| | mastodon tooth | 150 - 400 | 2 | $800.00 | |
| | fossil trackways | 65 -100 | 2 | $200.00 | |
| | crinoid fossils | 50 -100 | 3 | $300.00 | |
| | cross-beddded sandstone | 20 - 80 | 4 | $320.00 | |
| | graded bedding | 20 - 80 | 4 | $320.00 | |
| | phosphate nodules | 20 - 80 | 11 | $880.00 | |
| | carnasial teeth | 20 - 80 | 4 | $320.00 | |
| | | | | | |
| | | | | 3140.00 | subtotal |
| | | | | 259.05 | tax |
| | | | | 354.00 | shipping |
| | | | | 3753.05 | total |