3. Use the fundamentals of chemistry, physics, and math to solve geologic problems.
4. Classify and identify geological materials, such as minerals, rocks, and fossils, and understand their relationships to each other and interacting earth systems.

Initial Evidence of Student Learning:

SLO 3

The most systematic and thorough assessment of SLO3 takes place in Geology 122 (Petrology), a required class for the major, which is offered once a year. In two laboratory exercises for this class, students apply physical chemistry principles to the investigation of processes that form igneous and metamorphic rocks. In the first lab, students used simple phase diagrams to describe the melting and crystallization behavior of igneous rocks. In spring 2014, 12 of 12 students demonstrated a satisfactory to excellent understanding of binary phase equilibria; the majority of students (11 of 12) earned a score of 80% or better on this assignment. A second lab exercise focusing on metamorphic composition diagrams required students to use chemical analyses for rocks and mineral formulas, and to assess and graphically portray equilibrium mineral assemblages for different grades of metamorphism. In spring 2014, 11 of 12 students demonstrated at a satisfactory to excellent understanding of these principles, with the majority of students (9 of 12) earning a 90% or better on this lab.
SLO 4

The classification and identification of geological materials is treated in several classes in the major, but is most directly addressed in Geology 120 (Fundamentals of Mineralogy) and Geol 129 (Field Geology), both of which are required classes. Mineralogy is offered once a year and is one of the first upper division Geology courses taken by students pursuing the BS degree. Students in this course are expected to identify ~75 minerals based on their physical properties seen in hand sample and are required to recognize a smaller subset of minerals using properties observed under the polarizing microscope. Students study minerals based on their classification into chemical groups such as sulfides, oxides, carbonates, and silicates and each mineral group is presented in the context of its occurrence in common rocks and/or in economically important mineral deposits.

In fall 2013, students’ ability to identify minerals was assessed by two quizzes and two comprehensive lab practicals, one that focused on hand sample mineralogy and a second that involved identification of minerals using their optical properties. Eighty-six percent (12 of 14) of students demonstrated a satisfactory to excellent ability to identify minerals on each of the two quizzes. The comprehensive lab practicals proved more challenging with about 70% of students demonstrating an average to excellent ability to identify common minerals in hand sample and approximately 80% showing an average or better ability to recognize minerals under the microscope. The lower scores on the lab practicals may result from students not spending a sufficient amount of time outside of lab to prepare for the lab test.

Mastering mineral identification is typically challenging for students, as it requires them to spend a significant amount of time outside of class in order to gain sufficient familiarity with the minerals to perform satisfactorily on the Geology 120 lab practicals. Mineral identification is reinforced in the Geology 122 (Petrology) and other majors classes, affording students who may have struggled with identification in the Mineralogy course several additional opportunities to reinforce and practice this skill.

In Geology 129, all students must prepare a comprehensive geologic report, which is the primary assessment tool used in the course. The report includes: rock descriptions, stratigraphy, geologic maps and geologic cross-sections of the map area. Students must first identify and classify all of the rock units that are in their map area. The disposition of the rock units (i.e. their relationship to each other) is accomplished by the mapping of the rock units in the field and identifying the types of contacts between them (e.g. faulted, depositional). Students must also understand and be able to evaluate how lithospheric processes interact with the hydrosphere and atmosphere, (i.e. interacting earth systems) through the weathering cycle and modification of the land surface. The report is scored and evaluated using a standardized rubric that assesses how well the students perform on each individual part of the report as well as the writing. In Fall 2013 (instruction took place in summer 2013) there were 14 students who took Geology 129. Of these, 7 scored as good or excellent in meeting the PLO, and 6 scored as satisfactory to good.

Change(s) to Curriculum or Pedagogy:

No changes have been made in Geology 120.

We did not change the curriculum or pedagogy in Geology 129 since the last time this PLO was assessed. In the future, Geology 129 will be taught as a 2+(2 or 4) unit sequence with all students taking an introductory 2-unit section (Geol 129A) in the spring prior to the summer field course. This will be followed by the summer course where students can earn either 2 or 4 units of additional credit toward their degree, depending on whether they complete 1 or 2 geologic mapping projects with accompanying geologic reports. Four units of Geology 129 are required for the B.S. degree and 2 additional units may be counted as Geology elective units.
Evidence of Student Learning after Change.

Not Applicable