

PROGRAM REVIEW DRAFT

GEOLOGY

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1. Program Description And Scope

The Geology program at the Ohlone College is designed to provide the lower division transfer requirements for geology, earth science, and environmental science majors, general science education to other potential transfer students (both science and non-science majors), and personal growth toward improved scientific literacy to all other Ohlone students and the community at large. It involves the efforts of one full-time faculty member (Paul Belasky, Ph.D., Professor of Geology) and several part-time faculty members. It is a multi-faceted, interdisciplinary program that offers core classes in geology (GEOL 101), as well as oceanography (GEOL 102), paleontology and dinosaurs (GEOL 103), global change (GEOL 105, new course), California geology (GEOL 104, new course in development), and the associated laboratory courses (101L, 102L, 103L/105L). The program offers the Associate of Science Transfer Degree in Geology as well as certificates of completion in Geology, Earth & Environmental Sciences, and Paleobiology.

The Associate of Science Transfer Degree in Geology offered by Ohlone College is designed to prepare students for studying Geology at most universities. The core courses required in the A.S. Degree in Geology fulfill the lower division requirements for most campuses of the CSU and UC systems. The program will enable students to develop a strong foundation in the physical sciences.

Each year the program typically offers four sections of GEOL 101 (with labs), up to three sections of GEOL 102, one section of 102L, and one section of GEOL 103 and 103L (data on enrollment figures and trends will be attached to the final report). One area of concern is that the number of the earth science majors is relatively small (typically 5-10 majors at any given time). However, this is a national issue with the earth sciences and physical sciences, in general, and the number of majors at Ohlone College has remained steady. A number of them have transferred to nationally recognized programs in geology such as UC Santa Barbara.

The general scope of the Geology program at the Ohlone College is to provide an understanding of the processes that shape the Earth and to develop a view of the Earth from the physical, historical, and cultural perspective. Special attention is given to the global geological phenomena (moving plates, volcanoes, earthquakes, mountain-building, landslides, glaciers, etc.), “deep” time, and the interaction between humans and their environment. This program also explores examines the history of life from its beginnings to the dawn of civilization and provides a basic understanding of the prehistoric life in terms of the changing Earth and its climate, evolution, mass extinctions, and the fossil record.

The ultimate goal of the Geology program is to provide students with a sense of informed fascination with the Earth, its character, its history, and a perspective on their place in it.

2. Relationship to Ohlone College Mission and Goals

The Geology program directly supports the mission of the Ohlone College in offering university transfer, career entry, basic skills, and personal enrichment to all participating students in a supportive environment. The overwhelming majority of students taking geology courses are working toward a university transfer, many of them – non-science majors. In the process of studying geology (and especially working in geology labs), they acquire basic skills and scientific literacy that will aid university transfer and career entry. In addition, a number of students take geology for personal development and enrichment, and the program aims to provide a number of field trips and hands on experiences to suit the needs and interests of these students.

The earth sciences, in general, and geology, in particular, are highly visual, hands-on sciences that require the best visual and teaching aids, field experiences, and innovative approaches in science learning. The Geology program supports College Goals 2 and 3 in utilizing methods and technologies that hold the most promise for improving student course and program completion success rates, as well as offering enhanced facilities and improved course availability. The recent developments in the Geology

program that have had (or are expected to have) an effect on the student success rate in view of these college goals are provided below:

1. Major improvements have been made since last program review in turning Geology lab and lecture room (Rm. 8109) into a “smart” classroom with an LCD projector and Internet connections. This has opened up students’ and instructors to the web resources during lectures and presentations and allowed for a great expansion in versatility of the teaching methods and their effectiveness in keeping student interest and improving course success rate.
2. The Geology program has recently acquired a seismograph with a digital interface that will record local and regional seismic activity and display that information for students and the community at large. The seismograph is currently being assembled by Prof. Paul Belasky and a student majoring in geology, and will be set up in the Ohlone Museum of Paleontology (Rm 8109B), right next to the geology lecture room. Given a strong interest exhibited by students in earthquakes, the seismograph will go a long way towards educating students and community about earthquake hazards, making lab exercise on earthquakes hands-on, realistic, and really exciting, and keeping students engaged and interested in the geology courses they take.
3. A digital geological-image database of several thousand images was assembled by Prof. Paul Belasky during his sabbatical (Spring 2006) and is currently being added to. The purpose is to find the best images from around the world illustrating all major concepts and phenomena in geological sciences and make them available to students by incorporating them into multi-media lectures which incorporate both traditional and innovative teaching methods.
4. The collection of fossils at the Ohlone Museum of Paleontology has been refurbished and relabeled to reflect recent advances in knowledge about our local Irvingtonian Ice-Age fossils. The new display is more informative and accessible to students who study it as part of their lab experience. Only a handful of community colleges have earth science museums, which gives Ohlone students a unique learning opportunity.

5. A number of field trips, including a San Francisco bay cruise on a ship with Marine Science Institute and visits to Point Lobos State Preserve and Capitola are offered by the Geology program. At the time when a number of colleges have dispensed with their field trip programs, ours is going strong and has recently expanded. Ohlone earth science students go to more field trips than ever before.
6. Two new courses (GEOL 105 The Changing Earth and GEOL 104 California Paleontology) are being developed. Both of these courses will utilize the innovative, web-enhanced teaching techniques, and one of them (GEOL 105) is going to be developed under the Title III. The latter will eventually incorporate learning communities (earth science classes in conjunction with Marine Biology and Human Ecology classes).

3. Program Student Learning Outcomes

SLO1. Demonstrate scientific literacy by defining and explaining the major steps in the scientific method of investigation, specifically, the difference between empirical data, interpretation, hypothesis, theory, speculation, and pseudo-science.

SLO2. Apply general math skills such as unit conversion, ratios, and percentages to solving simple rate problems; evaluate data, produce and interpret tables and graphs; apply the metric system of measurement.

SLO3. Demonstrate geographic literacy by identifying major geographical features on the map, estimate elevations and depths, calculate distances on maps using scale, and determining compass directions on the map.

SLO4. Identify and classify the common earth materials, such as most common minerals, rocks, and fossils in the lab and in the field.

SLO5. Describe and use the geologic time scale, explain the concept of “deep time” and major events in earth history.

SLO6. Explain the basic concepts in the theory of plate tectonics and give examples of major geological phenomena associated with it.

SLO7. List, explain and evaluate local geological hazards in the Fremont area such as earthquakes, volcanoes, landslides, seismic sea waves, etc.

SLO8. List and categorize common natural resources and explain their origin, spatial distribution, and the resulting products, wastes, and contaminants.

SLO9. List and explain the most important environmental problems associated with human activity and assess the potential for further human-caused global environmental change (climate change, mass extinction).

4. Assessment of Student Success in Reaching Program Outcomes

The assessment will be conducted in several ways:

A. A questionnaire will be developed and passed around to all students within the first 2 weeks of the semester. It will be attached to(but not be counted as part of the first quiz they have to take). The questionnaire will assess the student knowledge of the topics as pertaining to each student learning outcome (see above). It will contain objective questions that will ask them to rate their knowledge of that general topic on the scale of 1 to 10, then answer specific questions (matching, lists, multiple choice) on that general topic or pertaining to the short text provided .To insure objectivity, the students will be able to use Scantron sheets for most of the questions.

The same questionnaire will be given to students at the end of class (attached to the final exam, but not be counted as part of it). The results will then be compared. The specific assessment strategies for each student learning outcome are provided below:

SLO1: The students will be given two paragraphs of text – one from a popular science journal and another from a newspaper or a tabloid journal (they would not be told which is which) – on a similar topic (examples: global warming, earthquake hazards, fossil evidence, life on other planets). The students would then be asked to find statements referring or pertaining to data, data sources, speculation, hypothesis, and theory in these articles. They would also be asked list speculation, hypothesis, theory, and paradigm in order of increasing amount of supporting data. The students would then be asked to differentiate between the two articles on the basis of their relative scientific validity.

SLO2: The students will be given questions asking them to do each of the following: simple conversions, metric conversions, simple graph interpretation questions, and a simple rate problem.

SLO3: The students will be asked to rate their geographic knowledge on the scale of 1 to 10. The students will then be given a copy of a large-scale map of the world and a topographic map the Fremont area. They will be asked questions locating some continents, major physical features, oceans and seas on the map of the world. They will also be asked to determine latitude and longitude of a few features on the map. The students will also be asked to determine the location and elevation of the Mission Peak.

SLO4: A simple set containing common and important minerals, rocks, and fossils will be passed around in class. The students will identify these specimens by matching them with the list provided.

SLO5: The students will be given a simplified version of the geologic time scale and asked to use it in order to answer several questions referring to the age of the earth and timing of some of the major events in earth history.

SLO6: The students will be given a plate tectonic map of the world and asked multiple choice questions testing students' familiarity with concepts of plate tectonics, continental drift, seafloor spreading, Pangea, and types of geological phenomena (e.g., earthquakes, volcanoes, mountain ranges) associated with different plate boundaries. They will also determine locations of several geographical localities on particular tectonic plates.

SLO7: The students will be asked to choose from the list of geological hazards that can affect the Fremont area and rate the relative likelihood and destructive power of these hazards on a scale of 1-10. They will also be asked about the relationship between these hazards and Hayward fault as well as the nearby boundary between two tectonic plates (St. Andreas fault).

SLO8: The students will be asked to match several common natural resources with their general origin, geographic distribution, uses (products), and environmental contaminants.

SLO9: The students will be provided the list of global environmental problems and asked to rate their relative significance on a scale of 1-10. The students will then be asked to match these environmental problems with their general causes and likely effects by the end of this century.

B. The questionnaire given at the end of the semester will also ask students to rate the course and (if they have taken more than one course) the Geology program as a whole. They will also be asked if their interest in the subject has increased through the course and by how much (expressed on a scale from 1 to 10).

C. The retention rates and grades represent additional criteria for the assessment of the program and student success pertaining to SLO's described above.

5. Assessment of Program Through Review of the Teaching Learning Process

In the past eight years, the Geology programs stressed the traditional methods of teaching the earth sciences, such as formal, structured lectures, more informal, specimen-based hands-on labs, emphasis on classroom instruction, attendance, note-taking, etc. These techniques are still being used and are quite effective. At the same time, new technologies such as the computer-based learning, electronic student response devices, in-class links to the Web, on-line instruction, and other innovative methods of teaching have been introduced. Due to the shorter 16-week semester, the lectures have become longer, and more challenging for the students to absorb in one sitting. Thus, the current goal of the Geology program is to incorporate both of the approaches (traditional and the one utilizing web resources) into the teaching. To that end, the digital image data base has been (and is being assembled), new media were added (new videos, animation sequences, DVD's, PowerPoint presentations with web links) were added to aid student learning and better utilize the "smart" classroom in 8109. In addition, two new courses (GEOL 105 The Changing Earth and GEOL 104 California Paleontology) are being developed. Both of these courses will utilize the innovative, web-enhanced teaching techniques, and one of them (GEOL 105) is going to be developed under the Title III. In the future, on-line classes in oceanography, geology (and possibly paleontology), as well as learning communities (earth science classes in conjunction with Marine Biology and Human Ecology classes) will be seriously considered, and a coordinating department website developed.

The resources of the Ohlone Museum of Paleontology and the recently-acquired seismograph with a digital interface should further enhance the hands-on, interactive aspect of the teaching within the program. It is the combination of the traditional and innovative teaching methods that is believed to be the key to student success in the program.