GEOLOGIC TECHNIQUES AND PROBLEM SOLVING: A COURSE FOR NEW MAJORS

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ACTIVITY DESCRIPTION

Geologic Techniques and Problem Solving is an introductory level, lower division, course for geology majors that teaches basic skills in the context of a field-based problem, which provides the central integrating theme for the entire 15-week semester. The course prepares students to complete investigations and write reports, so that they can more rapidly achieve an advanced skill level in their upper-division courses.

CONTEXT: Course is taken after Physical Geology (introduction to geology) and is used to provide a context for students' upper division geology coursework. The course was added to the curriculum five years ago.

Students making observations of sedimentary rocks in the Miocene Monterey Formation.

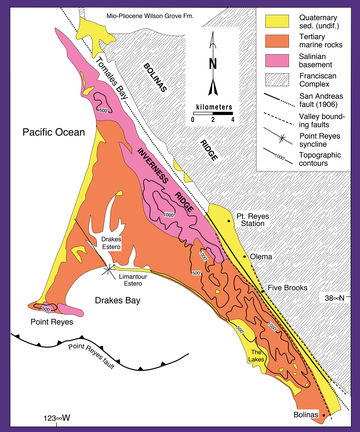
COURSE SEQUENCE

Learn skills to prepare for field trip (Brunton, rock ID, maps, notes) → Weekend trip to collect basic field data → Learn to write a report / prepare illustrations → Aerial photos of field area; Report 1st draft → Peer review of 2nd draft; concurrent group investigation → Final report due to instructor

Group Activity: Each group chooses a specific problem related to the field area to investigate in greater depth. They learn to use online database tools to find articles related to their topic and work together as a team to develop an oral presentation.

Final Class: Symposium modeled after professional conference. Each group prepares an abstract and annotated bibliography that is provided to all class members. Each group presents the results of their investigations to the class in an oral format.

Students collecting strike and dip measurements—Miocene Monterey Formation.



FIELD PROJECT SUMMARY

Point Reyes Peninsula is a large-scale syncline, with plutonic basement rock exposed at the surface on the limbs along Inverness Ridge and at Point Reyes (see map above, adapted from Galloway, 1979). Five Tertiary formations are exposed in the center of the syncline. Students complete basic descriptions of the plutonic and Tertiary units, and collect strike and dip measurements from the units on both fold limbs. They construct two small geologic maps, a SW-NE profile across the peninsula, and write a report that includes the following sections: abstract, introduction, rock unit descriptions, structural features, and conclusions. The conclusions section is a geologic summary that integrates stratigraphic and structural observations.

LEARNING GOALS

Content/Context: acquire knowledge about local (San Francisco Bay area) geology

Geologic Skills: be able to collect basic field data, use topographic maps and aerial photographs, create geologic maps and cross sections

Higher Order Thinking Skills: be able to read basic geologic journal articles and consider societal implications of geoscience investigations

Other Skills: be able to write a clear, accurate report about observations; be able to use online database search tools (e.g., Georef); be able to work with a group to investigate a problem and present results in an oral format

MATERIALS, DATA, TOOLS, LOGISTICS

Specialized Tools:
(1) Brunton campass—students require much practice to become skilled users;
(2) Web browser software—students quickly learn to use search tools for online databases;
(3) Topographic maps and aerial photos—students quickly learn basic skills

Logistical Challenges:
finding a field site with interesting stratigraphy and structure that is not too challenging

EVALUATION

What Students Should Achieve:
(1) Ability to collect basic field data
(2) Ability to write a clear, concise geologic report
(3) Ability to articulate geologic information

Assessment:
I have the same students in my Sed/Strat class one year later. I have observed that, since adding the techniques course to the curriculum, students in Sed/Strat are more comfortable in the field and can more rapidly achieve an advanced writing level. I now require the students in Sed/Strat to write a field report that involves high-level interpretations and that integrates information from the geologic literature with their own observations. Before, I had to start at a more basic level.

Field site at Point Reyes, located about an hour north of San Francisco. Landsat image draped over Digital Elevation Model. (USGS/PG&E)