

**California State University East Bay**

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DATE SUBMITTED: May 1, 2006

TO: The Academic Senate

FROM: Committee on Academic Planning & Review (CAPR)

SUBJECT: Five-year Program Review of the Geological Sciences Programs

PURPOSE: For Action by the Academic Senate

**ACTION**

**REQUESTED:** Acceptance of the Five-Year Program Review of the Degree Programs in Geological Sciences and approval of the Continuation of the Degree Programs in Geological Sciences, with annual monitoring by CAPR and the Dean, of issues identified in the program review, particularly of the MS degree program, until the next review in 2009-10 and that the Program faculty response, signed by the Dean, correcting inaccuracies of the Review document, be sent to the Senate Office before the end of the academic year and be attached as part of the permanent records of the Five Year Program Review.

**BACKGROUND:**

The Department of Geological Sciences offers both MS and BS degrees in Geological Sciences along with a minor and certificate program. The department and the outside reviewer believe that these programs are strong but little student learning outcome data was offered to back this statement up. Effort must be put into attracting students for this vibrant field. Institutionalized assessment and a sound growth strategy must be put into place. There are a fair number of majors, averaging about thirty annually over the past five years with about six graduates per year. Unfortunately, these numbers combine both the undergraduate and graduate programs. The current shortages in mineral and other resources should generate a need for qualified graduates. A number of possible strategies are identified in the additional background given below and in the materials supplied by the Department of Geological Sciences. The Student Faculty Ratio (SFR) data presented clearly show, for example, that the Department needs to use some of its full-time faculty in non-major courses to balance the cost of its programs and to attract more majors. The Department has begun to go in the direction of more tenure-track faculty in lower division service courses.

The Department of Geological Sciences has made progress in enrollment management in the past two years, but more and continued work is needed. The self study and the strategic plan documents clearly identify the directions in which the department wants to move. We believe these proposals may lead to growth while maintaining program quality. The department should work with outcome assessment colleagues to develop an assessment process that is not time consuming and yet provides meaningful data at the program level so that both enrollment and quality can be monitored effectively.

**RECOMMENDATIONS:**

CAPR recommends the continuation of Degree Programs in Geological Sciences with annual monitoring by CAPR as the department addresses enrollment issues, particularly in the MS degree program. The next review period for Geological Sciences is 2009-2010.

## Additional Background

### Overview description of the program:

Since its establishment in 1965, the Department of Geological Sciences has been producing undergraduate and graduate degree-holders in geology that are well-prepared, versatile and successful in securing employment as well as in obtaining scholarships/assistantships while pursuing advanced degrees. In addition to their traditional Geology programs, the department is contributing to the college/University through the following:

- The department has developed a BS program in Environmental Science, jointly with Biology, Chemistry and Geography. This program has grown to about 29 majors in the last few years.
- The department has developed the Single Subject Teacher Credential Program in General Science Breadth, and the Concentration in Geology (Earth Sciences). State approval for the new program is in process.
- The department is also contributing to the general science and GE curriculum.

### Overview of the documents submitted to CAPR:

As required, the report to CAPR included:

- A self study
- A plan for the degree programs
- Program assessment plan
- Outside review and a departmental response.
- Departmental statistics
- Department Mission Statement

## OUTSIDE REVIEWER'S COMMENTS & THE DEPARTMENT'S RESPONSE

### Outside Reviewer's Comment

C. John Suen, Professor of Earth and Environmental Sciences, California Water Institute, CSU Fresno submitted a report in April 2005. The following are the some of the key points listed in his summary of findings and recommendations:

- The number of TT faculty is below the "critical mass" for a comprehensive department with multiple undergraduate and graduate degree programs. Working with the dean, the department should have a definite plan of action to strengthen its programs.
- The department needs to increase participation in the G.E. program, liberal studies, and Environmental services programs. In particular, Geology should offer at least two, or possibly three, sections of the new G.E. upper division courses per quarter, and should use surplus FTES to fund additional faculty positions.
- Teaching productivity as measured in terms of sections per FTEF is near the national norm, but in terms of student credit hours per FTEF, or FTES per FTEF (SFR), it is about the national 25% -quartile value. Class sizes of non-lab general courses should be maximized to increase teaching productivity.
- Expenditure per FTES is about normal as compared to the national norms. The same level of funding should be sustained with special augmentations to counter the effect of the loss of the vehicle pool and to hire part-time lectures to help teach the new G.E. courses.
- The number of students in the graduate program is too small. The reviewer recommends supporting the project-based MS degree option for at least two to three years. An assessment of the new program should be conducted. If it fails to increase significantly the number of students in the program, a more drastic step, including the temporary suspension of the graduate program should then be considered.
- Students are dissatisfied with the availability of courses. They are also concerned about the future accessibility of field education.

- The department should hire a TT faculty member to cover the area of hydrology ASAP, and should use a qualified and competent part-time lecturer in the mean time.
- A lower-division introductory Environmental Sciences course should be introduced and taught by the Geology faculty for the Environmental Science program.
- Student recruitment efforts should be increased by working with the university's recruitment and outreach office which could publicize the program through local public media.
- Alumni and employer surveys should be conducted to obtain long-term assessment data
- The mission statement of the department is adequate and appropriate, and it is consistent with the university's mission. To achieve its goals, the department needs continuing support and long-term commitment by the administration.

The department responded to the outside reviewer's comments by stating:

- We certainly see the need to increase FTES through increased participation in both the lower division and upper division GE offerings, and increased participation in the multiple subject and single subject teacher preparation program.
- We plan to seek at least one new TT position as soon as FTES increases.
- It was necessary to cancel more classes due to the budget cuts. The department has become more conservative in the number of course offerings and did not have to cancel any major classes.
- Since the departure of Dr. Fagan, hydrology has been taught on a yearly basis, twice by a current TT faculty member and once by a part-time lecturer.
- This department since the late 1970's has offered MS in Geological Sciences. The project-based approach has been implemented since Fall 2005. We need at least five years to fully evaluate this new approach.
- The Geology department currently teaches a lower division Environmental Sciences (ENSC 2800) and already gets the FTES for it.
- Employment history of alumni would be useful data. On previous alumni surveys, we have asked respondents to list which courses or topics are most important in their work. Similar questions could be asked of employers and we will develop such a questionnaire during the next months.
- With oil prices at record levels, the worldwide demand for geologists is expected to increase. Although most oil and gas companies in the US are based in Texas, the national demand should create vacancies in other geosciences-related firms, including geotechnical firms and research labs in California and San Francisco Bay area.

#### SUMMARY OF FIVE-YEAR PROGRAM REVIEW/SELF-STUDY

What has been accomplished since the last review

- Developed the BS program in Environmental Science, jointly with Biology, Chemistry and Geography. This program has grown to about 29 majors in the last few years.
- Developed the Single Subject Teacher Credential Program in General Science Breadth, and the Concentration in Geology (Earth Sciences). State approval for the new program is underway.
- Created an alumni database in preparation for funding initiatives.
- Established a biannual schedule for classes with previously low enrollments. This has increased FTES in those classes.
- Offered General Education Clusters in science, working with other science departments. One of these clusters has 2 geology classes.
- Offered one interdisciplinary General Education Cluster in Social Sciences, with faculty from Sociology and Philosophy.
- Obtained new instrumentation and equipment from CI-CORE and NEHERP grants and university funds, including ground penetrating radar (GPR) accessories, and new computers for numerical modeling and estuarine research. Many of these items have been used in courses, and for student research.
- Developed a framework for outcome assessment for the BS/BA/MS program.

- Developed a new approach to the MS (using the Project format), tailored for the adult, working population. The proposal for this new approach was approved, and will be implemented in 2005-2006. We expect greater "efficiency", i.e., larger class enrollments through this new approach, and a speedier "throughput" of students to obtain the M.S. degree.

Additional details provided by the Geology department on the FTES issue

- Historically FTES data have not always included all the courses that the Geology department has taught. We teach classes with the SCI, ENSC, and GEOL prefixes. Unfortunately these are not always accounted for in a simple analysis of departmental FTES.
- Geology has 4 full time faculty members in the department.
- The FTES for the Geology department for Fall 2005 are up approximately 20%. This is significant considering that FTES for the University and College are down for Fall 2005. We recognize the need to recruit and generate interest in our program and more fully participate in General Education and service courses.
- The number of graduate and undergraduate degrees granted in the current year will significantly increase from last year.

PROGRAM'S FIVE-YEAR STRATEGIC PLAN (2005 – 2010)

Our main goal for the near and long term future is to maintain a high degree of educational quality in our undergraduate and graduate programs. In light of the current status and needs, the department has developed the following specific goals, which are ordered in terms of priority:

1. *Increase overall department FTES:* This will be accomplished in the next five years through the introduction of GEOL 1000 (Earth Systems Science) in Liberal Studies and the Science Subject Matter Teacher Preparation Programs. As more and more students will have to follow the new requirements, enrollment in this class will increase, necessitating the use of large lecture rooms and numerous lab sections. This new course will be offered as soon as feasible.
2. *Establish course fees for all classes with field trip requirements* so that field study is not eliminated because of the disappearance of the motor pool.
3. *Increase number of majors and retention in the BS program:*
  - Update the B.S. curriculum as required,
  - Outreach to attract new majors,
  - Reach out to **undeclared** students in General Education courses and freshmen clusters
  - Offer events for new and current students, such as field trips and get-togethers.
4. *Establish more active ties with graduate students to ensure success:*
  - Improve students' rate of progress toward degree
  - Establish and promote the new approach to the M.S. degree. Many of our graduate students have already expressed great interest in this new approach.
  - Develop new courses in fields in demand in the workplace (contaminant transport, applied geophysics).
5. *Implement Assessment Plan:*
  - Finalize undergraduate assessment process and implement assessment plan for graduate program.
6. *Build network with local employers:*
  - Work with Career Development Center to establish working relationships with potential employers.
  - Involve local companies in department events and research.
  - Hold meetings of Bay Area sections of geological societies on campus.

7. *Support faculty/student development:*

- Develop connections between students seeking research experiences and faculty members.
- Engage all faculties in the graduate program as instructors and thesis/project advisors.
- Attract experienced lecturers to teach specialized courses, such as Micropaleontology.
- Encourage students to give presentations at major scientific meetings.

8. *Facilities enhancement:*

- Continue to update instructional and research equipment, including modernizing all computer workstations, and purchasing new software.
- Acquire new particle-size analyzer with grant monies. Continue department 'beautification' activities, focusing on display cases.

#### CAPR ANALYSIS OF THE PROGRAM'S FIVE-YEAR REVIEW

The Geology department has correctly identified the issues that need to be addressed. CAPR stresses these points with the following analysis.

#### Achieve Sustainable FTES

The department has hired two tenure track faculty to fill in the vacancies created by the retirement of 2 faculty members. The self-study shows that the TT faculty count has been reduced from 7 to 4 over the past 10 years. As stated in the external reviewer's analysis, low FTES per FTEF is the big issue. It is very important for the department to work towards achieving better FTES in order to stop/reverse this downward spiral. The department has to work with the college dean to identify the sustainable FTES and work out a plan to achieve that. Failure to achieve the FTES target would make it difficult for the department to get replacements for future retirements. The following are some of CAPR's observations on this front:

- Introduction of new GE classes is expected to increase the FTES. Also, the GE courses would leverage to attract undeclared students towards BS program. Hence, teaching the GE courses effectively by TT faculty is very important. This is contrary to the outside reviewer's idea to hire part-time faculty to teach GE courses in order to support the degree programs.
- Very low enrollment in the graduate program is one of the contributing factors to low FTES (since SFR is at a reasonable level). The department has introduced the project-based masters program and also introduced a biannual schedule for graduate classes. The department has to evaluate whether this change mitigates the impact of graduate program on the FTES.
- Development of inter-disciplinary and teacher programs is commendable. This allows the department to cross list the courses and increase the class enrollment. Development of inter-disciplinary courses and cross listing of the courses would be very helpful. The department has to explore this possibility further with programs such as geophysics and contaminant transport (which are stated in the self study document), especially in the graduate program area.
- More needed work is needed with the Dean's office to correct the FTES measurement problems associated with the interdisciplinary courses and also the summer field trip related courses.
- The Department should explore the idea of teaching some of the graduate and undergraduate elective classes together but with different requirements such as term project. Many programs for which the enrollment is very low have used this approach.

#### Graduate Program

The graduate programs can be valuable for the faculty/department in terms of research. It would be beneficial for the Department to increase the enrollment in the graduate program. The MS degree program in Geological Sciences graduates an average of 2 students a year over the past five years. Unfortunately the trend is decreasing from 5 in 1999-2000 to 1 in 2003-2004. This trend must be reversed or the program should be terminated. The following are some of the observations made by CAPR:

The successful graduate programs in sciences and engineering areas fall in to two categories:

- The first category caters to working people who want to pursue a graduate degree while working. The Biostatistics program is an example of that.
- The second category is the one that attracts new students through good internship and placement activities. The environmental science program is a good example of this. We have learned that the ability to get internships and placement in state and local agencies, especially water related areas, attracts students.

The two markets require different orientations to the graduate program. The department needs to analyze the potential market and revise the curriculum and the reach-out activities accordingly. Offering a project-based curriculum itself may not revive the program.

- Clear direction and increase in overall FTES are essential to save the graduate program. Supporting this program with low enrollment will take resources out of undergraduate, GE and other programs. Hence this could be counterproductive to the department.
- The department should work out a concrete/strategic plan and show results in order to continue the program beyond the next review.

#### Maintaining the quality of the program with diminished resources

Maintenance of quality programs becomes a challenge once the department loses critical mass of TT faculty. The following are the some of the points that came out of CAPR discussions:

- It is difficult to offer too many electives due to the smaller student population and small number of TT faculty. The department has to revise the curriculum to package all the required skills/topics into a fewer number of courses. As the self study document says, understanding the employer's requirement is one of the options to do that.
- Typical of any science and engineering curriculum, laboratory and field trips are important to the quality of the curriculum. On the other hand, they are also a drain on the resources. Once again, the department has to balance the two needs of FTES and lab/field trip requirements. Suggested fees for the courses with field trip requirements may address the issue to some extent. Increase in the overall FTES is very important to compensate for the small class sizes in lab/field trip type classes.
- Outcome assessment is becoming a WASC and state requirement. The self-study document has clearly identified the directions in which the department wants to move. The department should work with outcome assessment consultants to develop an assessment process that is not time consuming and yet provides meaningful data at the program level. The department can explore innovative ways to collect the assessment data from the course/curriculum requirements itself such as term projects, project-based courses, capstone courses and thesis/research projects.

#### Build networks with local employers

Close ties with the local and state level employers are essential to the success of the program in a number of ways. This is a typical situation in all the departments and colleges.

- The department should network with alumni and local industries. Identifying internship opportunities is important to lure undecided GE students.
- Start a student organization, organize company visits, invite industry professionals to social events, etc. These student organization activities increase the awareness about our programs and also give networking opportunities for students.
- As stated in the self assessment, the alumni and industry network is helpful to evolve the curriculum.

#### RECOMMENDATIONS:

CAPR recommends the continuation of Degree Programs in Geological Sciences with annual monitoring by CAPR as the department addresses enrollment issues, particularly in the MS degree program. The next review period for Geological Sciences is 2009-2010.