

CALIFORNIA STATE UNIVERSITY, EAST BAY

Designation Code: **2005-06 CAPR 14**

Date Submitted: April 21, 2006

TO: The Academic Senate

FROM: Committee on Academic Planning & Review (CAPR)

SUBJECT: Five-Year Program Review for the BS and MS in Statistics

PURPOSE: For Action by the Academic Senate

ACTION

REQUESTED: Acceptance of the Five-Year Program Review of the Statistics Programs and approval of the continuation of the programs without modification

BACKGROUND

INFORMATION: The Statistics Department offers Bachelor's and Master's degrees in Statistics. The MS degree includes five options: (1) Actuarial, (2) Biostatistics, (3) Computational Statistics, (4) Mathematical Statistics for students who want to pursue a PhD degree in Mathematics, and (5) Theory and Methods as a general Option in Statistics. Furthermore, there are two post-baccalaureate certificate programs: Applied Statistics and Mathematical Statistics. A detailed analysis of comparable programs at the graduate level for CSU campuses and similar programs in other universities was presented. The requirements at CSU East Bay are usually more applied than those of other programs.

On 13 November 2005, the Chair of the Statistic Department, Dr. Julia Norton, the Dean of the College of Science, Michael Leung, and two faculty members from the Statistics Department, Drs. Bruce Trumbo and Mitchell Watnik, met with CAPR members. At this meeting the review process, the future plans of the Statistics Department, especially in newly developed professional fields such as bioinformatics and biostatistics, as well as the external review report of the Statistics Department were discussed.

While student enrollment in the undergraduate program is small, the graduate program continues to grow. Since undergraduate Statistics program are generally offered through Mathematics Departments and there are only two other Statistics master's programs in the CSU, the summary data for similar programs is not available to evaluate the trend statewide. The Statistics Department recognized its growth and the need for extending the course offerings in various areas, and two new tenure-track faculty members joined the faculty during the academic year 2005-2006. Two tenure track faculty searches are being conducted in the 2005-06 academic year for hiring during the academic year 2006-2007. There are currently six full-time faculty members in the Statistics Department with an additional faculty member serving under the FERP program.

The Statistics Department has used the results from assessment of outcomes to revise course content and modify curriculum. CAPR commends the Student Learning Outcomes information and data collected for assessment measures by the Department of Statistics. The Department measures and tracks several targeted Student Learning outcome goals in all its programs.

The Statistics Department is continuing to strengthen its ties with alumni and local businesses as presented in their report. It is hoped that needed resources can be supplemented from these sources. CAPR believes that the Statistics program can also further collaborate with the Engineering Department to the betterment of both programs, utilizing newly developed Engineering Management and certificate programs in Engineering.

The degree programs in Statistics do not require more than the minimum requirements for graduation at the university. The number of units required for both the BS and MS degrees in

Statistics is aligned with similar degrees throughout the California State System and other universities, and tends toward the lower end of units required for graduation. The main difference is in the Mathematics requirements, where student minors are not required to take Calculus at CSU East Bay.

CAPR urges swift implementation of the proposed new MS degree program in Biostatistics with the additional recommendation that the University support the Department's needs related to increased student enrollment at the undergraduate level; further, CAPR also recommends the following:

- ❖ Increase course offerings at the introductory level, if necessary utilizing graduate students and hiring part-time lecturers.
- ❖ Utilize the students teaching laboratory sessions, when applicable, in order to enable the graduate students to gain experience in teaching
- ❖ Continue collaboration with other departments, such as Engineering and Economics, for mutual betterment of these programs (especially with the new MS program and certificate programs in Engineering).
- ❖ Approve the proposal for the MS degree program in Biostatistics currently under consideration.

CAPR RECOMMENDATION:

- ❖ CAPR recommends the continuation of the Bachelor's and Master's degrees in Statistics without modification.

The preceding recommendation was unanimously approved 24 February 2006 and the report was finalized at the April 20, 2006 CAPR meeting. The next CAPR review will be in 2009-2010.

Additional Background:

The Statistics department offers general Bachelor's and Master's Degrees in Statistics. The MS degree includes the following five Options:

1. Actuarial,
2. Biostatistics,
3. Computational Statistics,
4. Mathematical Statistics for students who want to pursue a Ph.D. degree in Mathematics; and
5. Theory and Methods as a general option in Statistics.

There are also two post-baccalaureate certificate programs: Applied Statistics and Mathematical Statistics. The certificate programs combine basic work in Statistics with primary course work in another field (for example, an MS in Sociology) in order to prepare those students with specific skills needed for advanced applied statistical work.

The BS program in Statistics is a broad and flexible program that is designed to accommodate students interested in different applied fields and those who are interested in applied and theoretical statistics. The MS Program in Statistics is designed to meet the needs of students with a variety of backgrounds in Statistics and Mathematics with different career objectives.

Overview of the Documents Submitted to CAPR

As required, the report to CAPR included a self study, a plan for the degree programs, a program assessment plan and accompanying data, an outside review prepared for a departmental response, applications submitted for new tenure-track faculty positions since 1999 and the outcome of those searches, and enrollment and graduation data.

Five-Year Program Review/Self-Study (2005-2006)

Summary of specific areas of the Self-Study

Two Options in Biostatistics and Computational Statistics offered through the MS degree in Statistics were added in compliance with the Outside Reviewer's suggestion. Course requirements have been changed in order to clearly meet the needs of the graduate students. There is a continuous growth trend in numbers of Statistics MS students.

The number of Statistics BS majors has remained steady at about 10-20, with more double majors than single majors attempting the program. (See data from Institutional Research.) The number of Statistics Minors and post-baccalaureate students remain steady as well. The Statistics faculty will follow the outsider review's recommendation to launch an effort and collaborate with other departments in order to increase enrollments at the undergraduate level while maintaining a high SFR for all the Department's programs.

At the undergraduate level, Statistics serves the University in the capacity of providing courses to the areas of GE Area B4 (and B6 effective Fall 2005) (Quantitative Reasoning) and non-Statistics majors requiring a solid statistical base. The Outside Reviewer recommended an increased use of SPSS in social science. This recommendation was accomplished by offering the following courses:

1. A graduate Statistics course for Business and Economics, Statistics 6011.
2. A graduate course to target educators and social scientists to be offered during 2005-06, Statistics 6010.
3. Two courses for use in upper-division General Education to be offered during the academic year 2006, Statistics 3040 and 3050. (See attached catalog copy for these new courses. Attachment B of the report was provided by Statistics).

Faculty Trends

The Statistics Department currently has six tenure-track faculty members and 2 nearly full-time lecturers, along with other lecturers. The tenure-track faculty size was increased from four to six during 2005-2006. Since the last CAPR review, the Department of Statistics held three searches and interviewed 69 candidates. The Department is currently conducting searches for two new tenure-track faculty positions for 2006-2007.

The first tenure-track faculty search since the 2000 review was successfully completed in 2003-2004 and resulted in the hiring of Dr. Jaimyoung (Jaimie) Kwon, a PhD Statistician working in biostatistics and transportation. The two most recent faculty searches were successfully completed in Spring 2005. Drs. Mitchell Watnik (an applied statistician) and Shenghua (Kelly) Fan (a biostatistician) joined the Department of Statistics in Fall 2005. Three members of the faculty have retired during this time frame, two outright and one under FERP. (See Attachment C of the report provided by Statistics for search details and hiring proposals put forward.)

Resources

The only available student space is the Statistics Department Computer Lab which is housed next to the College of Science Computer Lab and supervised by their staff. The Computer Lab is equipped with the necessary software and hardware. Faculty office space is currently inadequate, with one faculty member housed in a closet and no office space for incoming faculty. However, the most pressing need is for additional support staff in the graduate area to handle increased enrollments. The large SFR supported by the faculty requires increased additional student teaching assistants to meet this need.

Summary of Supporting Data

- 1) The number of units required to complete the Statistics MS and BS degrees are comparable to those in other Statistics programs in the UC and CSU systems.
- 2) Since most other undergraduate Statistics programs are offered through Mathematics Departments, the comparable data, especially to address the trend for undergraduate evaluation, is not available at this point. The CSU does not track undergraduates in Statistics separately on their website.

Outside Reviewer's Comments & the Department's Response

Dr. Mary Ellen Bock, Department of Statistics, Purdue University, reviewed the Statistics Department in May 2005 and submitted a six-page detailed report. The detailed response by the Department is submitted as follows:

1. **Increase use of Teaching-Assistants (TAs).** We continue to use graduate students as graders in our courses, rewarding faculty who have high enrollments or difficult teaching loads with increased grading assistants or other student support. Students who are qualified to serve as teaching students are usually fully employed and unable to take on additional work. Many of our international students are intellectually qualified, but lack the language skills required. Problem sessions might be a possibility for these students. We will consider options here.
2. **Increase service courses and areas.** We are trying to improve our cooperation with programs around the University that either require or desire statistical knowledge for their majors. We are and will continue building our General Education offerings (as evidenced by STAT 3050 and 3040, new area B6) and courses that serve graduate students in related fields. We are cross listing courses with Economics and Engineering as well as Mathematics at this time. These are developments in the past five years and we expect more in the coming years.

3. Offer release time to faculty consulting for the University. We appreciate the value that this service would have for all concerned. At the present time we are appreciative of opportunities to collaborate and publish with faculty in other areas of the University. We also recognize the service of all faculty at the University. If resources ever reflect the amount of work that we actually do for the California public, we believe that we will be recognized for our contributions, too.

4. Offer release time to faculty building programs for the Department. We do this in a limited way. Eric Suess won a grant that provided service time for a Visiting Scholar in Biostatistics (Wong) last spring to assist in developing a proposed new MS degree in Biostatistics. That proposal is in draft form and will be coming to CAPR this year. The Chair has release time for program development and does accomplish some with the resources available.

5. Recognize the need for computer support staff. When the Dean proposed a pooled set of computing staff for the College and funded jointly by the college departments, Statistics was the only department that supported this idea. We cannot keep one person busy enough to justify a separate position ourselves but this time is coming soon as the masters degree programs (including the proposed new Biostatistics program) expand. We appreciate the support that we do receive from the College but recognize that we do need more assistance. Eric Suess, with no release time or compensation, spends increasing amounts of time keeping our hardware and software as current as possible. It is his dedication to the computational boundaries of statistics (mentioned by Dr. Bock) that keeps us competitive in these rapidly changing areas of statistics. Whenever we are able to fund qualified student assistance for the webpages or other computational areas requested by faculty, we do so promptly.

6. Research directions suggest programmatic developments.

a. Computational and applied statistics. We will review and further develop our computational option in the MS degree program as need and interest warrant. Eric Suess works in this area of statistics. We hired a new faculty member starting 2005-06 in this area (Watnik). One of the new hires 2006-07 is likely to be in this area as well. Some lecturer additions are promising as are continued collaboration with the Mathematics and Computer Science faculty.

b. Biostatistics. We are proposing a new MS degree program in Biostatistics for the master plan of the University. We are in a sound position to do this at the present time with three faculty (two new tenure-track hires past two years (Kwon 04-05 and Fan 05-06 and another on line for next year) working in this field. A named MS degree has higher visibility than a program option. Our growth in the past three years has been largely due to the MS Statistics, Biostatistics option. We expect even more growth with a new MS degree program.

c. Time/spatial statistics. The frontiers of transportation and its relationship to time-spatial statistics are promising. We have one new faculty working in transportation (Kwon) and an associate professor in time series (Suess). Collaborations with Economics are expanding. We do not have well developed plans in this area for an option or other formal program, but we will continue to monitor trends and offer related seminars in addition to our time series course, as we are able.

7. Grow the faculty. We have expanded our PhD lecturer pool this year. We have added three new tenure-track faculty in the face of three retirements last year. We are hiring an additional two faculty this year in the areas most emphasized by the outside reviewer. Certainly we need more. In addition one faculty member is 68 and we can anticipate a retirement in the near future.

Program's Five-Year Strategic Plan (2005-2010)

After reviewing the Self-study materials and the assessment materials, the Department of Statistics proposes the following plan.

- 1) The splitting of some dual-level courses is essential to maintaining quality in both the MS and BS programs. Changes to all 6000-level courses are proposed over the next five years as budgetary and faculty hires permit. Tightening of Option requirements will occur as new faculty assist in developing areas where we currently have shortfalls in topic coverage. These changes are underway in the form of discussion and written drafts circulating among the faculty of Statistics, particularly the Graduate Advisor, Bruce Trumbo.

- 2) The MS program in Statistics grows primarily due to an increased interest from international students and with continued demand from currently employed adults already working in related fields. High level as growth continues in the pharmaceutical, medical, and biotech fields as well as other areas of grow this expected. Many of other majors come from the financial and engineering fields. The sudden spurt that the MS Degree programs have taken in the last five years may well continue as interest grows in the Options we have developed. Retention in the MS program is high with some slippage to the post-baccalaureate Certificate programs as a fallback plan (possibly as few as five students have taken this route in the past five years). The drive for continued enrollment opportunities is spearheaded by the Graduate Advisor, Bruce Trumbo, and the Departmental website, maintained by Eric Suess and more recently by Mitch Watnik.
- 3) Eric Suess won a grant investigating a professional master's program in Statistics. We hope this type of plan will offer new possibilities for attracting students with an even more highly tailored program for working adults. A proposed new Masters degree in Biostatistics is winding its way through the official channels and is now out of the College Curriculum Committee.
- 4) According to the application of our assessment tools--the mid-program Student Learning Outcomes and the culminating two-day MS examination taken near the end of the Master's program--indicate that students are synthesizing materials that we intend to cover in the program. These outcomes are discussed and displayed graphically in the separate Assessment section of the document submitted to CAPR. We have changed the graduate-level first-year course offerings in response to a lower than expected scoring of master's students on the initial imbedded questions. We will continue to monitor changes at this level.
- 5) Although there have been some issues with retention at the MS level, the advising at the time of entry has increased advising. Forms developed by the Graduate Advisor require advising and record keeping for all students who ask a programmatic question or seek a signature.

The continued strong growth of the MS Degree program demands a closer follow up of the needs of the curriculum and a requirement to hire faculty with Doctorates in Statistics whenever possible. Our student body contains a strong female and Asian component. Our most recent new faculty is Asian; one of the new tenure-track faculty members who joined the Department Fall 2005 is an Asian female. The last two senior faculty members Norton and Trumbo, are expected to retire within the next ten years. It is expected that as the Department adds new faculty, the goal is to hire faculty to assist enhancing current offerings while maintaining the quality of our existing programs. Any changes will reflect the quality of the new faculty and the needs of our new students.

CAPR RECOMMENDATION

CAPR recommends the continuation of the Bachelor's and Master's degrees in the Statistics program without modification, with a recommendation that the University support the Department's needs related to increased student enrollment at the undergraduate level. CAPR also recommends the following:

- 1) Increase course offerings at the introductory level, if necessary utilizing graduate students and hiring part-time lecturers.
- 2) Utilize the students teaching laboratory sessions, when applicable, in order to enable graduate students to gain experience in teaching.
- 3) Continue collaboration with other departments, such as Engineering and Economics, for mutual betterment of these programs (especially the new MS program and certificate programs in Engineering).
- 4) Approve the proposal for the MS degree program in Biostatistics currently under consideration.
- 5) Continue with the search for new two tenure-track faculty positions for 2006-2007 due to an increase in FTES resulting from the newly developed Options and programs.