CALIFORNIA STATE UNIVERSITY EAST BAY

ACADEMIC SENATE
Committee on Academic Planning and Review

ANNUAL PROGRAM REPORT

College	Science
Department	Statistics and Biostatistics
Program	MS Statistics
Reporting for Academic Year	2020-2021
Last 5-Year Review	2018-2019
Next 5-Year Review	2023-2024
Department Chair	Ayona Chatterjee
Author of Review	Ayona Chatterjee
Date Submitted	01 October 2021

I. SELF-STUDY

A. Five-Year Review Planning Goals

The five-year review includes planning goals for curriculum (3.1), students (3.3), faculty (3.4), and resources (3.5).

To summarize, the curriculum plans (3.1) include:
1. Adjust our Statistics MS program curriculums in response to semester conversion
2. Continue offering two sections of core graduate courses and grow our graduate program
3. Develop online courses at the graduate level
4. Continue to develop curriculum that addresses cloud computing and big data, beyond what we already have.

The student plans (3.3) include:
1. Grow our Statistics MS program with better advertisement
2. Increase the use and diversity of computation in courses (at all levels)
3. Continue teaching schedules that accommodate working students including online classes
4. Raise funds to increase our scholarship and leadership funds by improving alumni engagement

Faculty plans (3.4) include:
1. Anticipation of our junior faculty receiving retention or promotion so that they can devote more time to program development and enhancement
2. Hire tenure-track faculty to replace recent attrition due to retirement
3. Hire faculty with expertise reflecting industry demands in Biostatistics. Statistical Computation, Large Data Analysis, and Data Analytics
4. Increase our number of long-term lecturers

Resource plans (3.5) include:

1. Upgrade office furniture for tenured/tenure-track faculty
2. Increasing our current 1.0 staff support to our former level of 1.75 staff support. This is critical to help sustain our MS program as we feel that a lot of time and effort is required in managing the admissions process and a large chunk of that work is done by our staff support.

B. Progress Toward Five-Year Review Planning Goals

Regarding 3.1 (Curriculum):
1. We continue to have discussions on what electives to offer for the MS Statistics students.
2. Since our conversion to semesters, all graduate courses are now standalone classes. We had a lot of issues related to graduate admissions this past Spring exacerbated by the sudden onset of the current pandemic. This resulted in many applications not being processed until summer and many applicants deferring admission to Spring, culminating in a slightly smaller incoming class than usual. We hope this to be a one-time issue and expect to be back to "normal" next year.
3. Development was done to create online versions of all courses, considering mandatory distance learning due to the pandemic.
4. The Statistics MS program now has a Data Science Concentration (effective Fall, 2018), which is more reflective of current demands. Curriculum development for this concentration has resulted in faculty pursuit of cloud-based and modern computation methods to best serve our students.

Regarding 3.3 (Students):
1 Even though we continue to live through the pandemic and have lost a considerable population of international students in our program our incoming Fall 2021 class is typical of most years and we have had much interest in Spring admissions which will likely create growth over last year.
2. At the graduate level, Python and Tableau were recently introduced to add to the existing software used, R and SAS, among others.
3. We are in the process of modifying some of our elective offerings, so that students will have the option of taking them on-ground or online. This added flexibility will be really helpful not just to make our program more competitive but also help our working students.
4. Now under semesters, we have continued to make it possible to complete our graduate programs by taking classes after 5:30pm.
5. Fundraising did not increase this year.

Regarding 3.4 (Faculty):
1. Assistant Professor Wendy Rummerfield was hired and started this Fall of 2021.
2. Assistant Professor Jiyoun Myung started in Fall 2020 and is successfully retained and entering her second year. Assistant Professors Li Zou and Eric Fox were both granted retention, now entering their fourth year. Professor Eudey begins her fourth year of FERP in Fall, 2020. Professor Watnik continues to work as Associate Dean, Academic Programs and Services.
3. The Department received approval to hire for one position during the 2021-2022

academic year. This search has a focus for finding faculty with expertise in Biostatistics. The position is open currently and review pf candidates will begin October 2021.
4. We currently have three lecturers on 3-year contracts and three lecturers on a 1-year contract.

Regarding 3.5 (Resources):
1 We have been able to support the use of RStudio Cloud for all our upper division data science classes in the undergraduate program.
2. Lectures teaching on ground have access to microphones to use during class.
3. Our new ASC, Jamane Joseph, is continuing in her position to support the department. Our staffing level has remained the same.

C. Program Changes and Needs

Overview: Semester conversion and EO 1110 has had an incredible impact on our department. This has resulted in a significant increase in work for our staff, hiring TAs from our graduate student pool, and substantial revision of our curriculum at all levels to meet the needs of students. This has been exacerbated by the current pandemic, requiring us to teach at a distance.
Curriculum: In Spring 2021 we offered an extra elective for our Data Science program STAT 654 – Intro to Deep Learning. This was very well received. Otherwise the curriculum for the MS Statistics program remained unchanged.
Students: Nothing to add, though there is an increase demand for online classes.
Faculty: Nothing to add.
Staff: With the implementation of EO 1110, an already strained staff has had a significant increase in workload. Additional support is needed specially handing graduate admissions as our program does have a separate department application process.
Resources: Our Department's programs would greatly benefit from a dedicated computer lab and/or funds so that every graduate student has his/her own laptop computer or accounts on cloud sites that would enable running and utilizing statistical software and solutions.
Assessment: The department continues to carefully monitor the assessment of its programs, proposing curricular and advising changes, as necessary.
Other: No significant program modifications were made last year.

II. SUMMARY OF ASSESSMENT

A. Program Learning Outcomes (PLO)

PROGRAM LEARNING OUTCOMES (PLOs)	
Students graduating with a MS in Statistics will be able to:	
PLO 1	Apply statistical methodologies, including a) descriptive statistics and graphical displays, b) probability models for uncertainty, stochastic processes, and distribution theory, c) hypothesis testing and confidence intervals, d) ANOVA and regression models (including linear, and multiple linear) and analysis of residuals from models and trends at the Master's level.

PLO 2	Derive basic theory underlying these methodologies.
PLO 3	Model practical problems for solutions using these methodologies.
PLO 4	Produce relevant computer output using standard statistical software and interpret the results appropriately.
PLO 5	Communicate statistical concepts and analytical results clearly and appropriately to others; and,
PLO 6	Employ theory, concepts, and terminology at a level that supports lifelong learning of related methodologies.

Program Learning Outcome(S) Assessed

Year 3: 2020-2021	
1. Which PLO(s) to assess	PLO 1
1. Is it aligned to an ILO?	Yes
1. If yes, list ILO.	Thinking and Reasoning
1. Course name and number	STAT 692 – Comprehensive Exam
1. SLO from course	Apply statistical methodologies, including a) descriptive statistics and graphical displays, b) probability models for uncertainty, stochastic processes, and distribution theory, c) hypothesis testing and confidence intervals, d) ANOVA and regression models (including linear, and multiple linear) and analysis of residuals from models and trends
1. Assessment activity	Written Comprehensive Exam
1. Assessment Instrument	Grades from exam
1. How data will be reported	Quantitative, proportions of students in each category from 1-5 (5 mastered)
1. Responsible person(s)	STAT 692 instructor, Assessment Rep
1. Time (which semester(s))	Fall and Spring
1. Ways of closing the loop	Included in end-of year report and internal assessment of PLOs.

B. Summary of Assessment Process

. **Instrument(s):**

We implemented quantitative assessment of the results of our Comprehensive Examination by mapping all but one of the PLO's (#5) to specific course problems on the MS comprehensive exam. Rubrics were established for the outcomes and implemented.

It was decided that PLO #5 is better addressed by term projects that involve communication (either a written project or presentation that is worth considerable

weight in the grading scheme of the course). STAT 632 "Theory and Application of Regression" will be used for assessment of PLO #5. It should be noted that the assessment of PLO #5 is at the end of the first year of the program, while the other assessments are at the end of the program.

Sampling Procedure: We sample by gathering data from all students attempting to complete our capstone experience, both STAT 632 and the comprehensive exam.

Sample Characteristics: All MS Statistics students at, or near, to the end of their program were identified.

Data Collection: The comprehensive exam is given twice a year, Fall and Spring. All tenure/tenure track faculty participate in the evaluation of student performances on this exam that are then used to evaluate the PLO's. STAT 632 is given every Spring for which the PLO #5 is identified and assessed by the instructor on record.

Data Analysis: We currently utilize Google Sheets to incorporate the rubrics that were established for the outcomes, to analyze the data.

Summary of Assessment Results

Main Findings: **Main Findings:**

Frequencies of Rubric-Scores for Statistics MS 2020-2021

Rubric Score	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5*	PLO 6
1	0	4 (10%)	3 (7%)	2 (5%)	1 (2%)	4 (10%)
2	0	6 (15%)	3 (7%)	2 (5%)	1 (2%)	6(15%)
3	2 (5%)	3 (7%)	7 (17%)	5 (12%)	10 (24%)	3 (7%)
4	14 (34%)	14 (34%)	6 (15%)	6 (15%)	8 (38%)	14 (34%)
5	25(61%)	14 (34%)	22 (54%)	26 (63%)	21 (51%)	14 (34%)
Total	41	41	41	41	41	41

Summary Statistics of Rubric Scores for Statistics MS 2020-2021

Statistic	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5*	PLO 6
Minimum	3	1	1	1	1	1
Maximum	5	5	5	5	5	5
Median	5	4	5	5	5	4
Mean	4.6	3.7	4.0	4.3	4.0	3.7
Std. Deviation	0.1	0.2	0.2	0.2	0.2	0.2

* PLO5 was from a course rubric and not all in the course took the Comprehensive Examination.

Recommendations for Program Improvement:

Due to semester conversion, much of existing course content and course sequences have been altered. This has resulted in a drastic increase of student advising.

Next Step(s) for Closing the Loop:
We will continue to monitor the evaluation of our PLO's to determine if additional advising or curricular changes need to be addressed.

Other Reflections: We have no additional reflections on assessment at this time.

C. Assessment Plans for Next Year
Most PLOs are the same and assessment will be for comparable courses.

Year 4: 2021-2022	
1. Which PLO(s) to assess	PLO 2 & PLO 3 & 4
1. Is it aligned to an ILO?	No
1. If yes, list ILO.	
1. Course name and number	STAT 692 – Comprehensive Exam
1. SLO from course	Derive and understand basic theory underlying these methodologies Formulate and model practical problems for solutions using these methodologies Produce relevant computer output using standard statistical software and interpret the results appropriately
1. Assessment activity	Written Comprehensive Exam
1. Assessment Instrument	Grades from exam
1. How data will be reported	Quantitative, proportions of students in each category from 1-5 (5 mastered)
1. Responsible person(s)	STAT 692 instructor, Assessment Rep
1. Time (which semester(s))	Fall and Spring
1. Ways of closing the loop	Included in end-of year report and internal assessment of PLOs.

III. DISCUSSION OF PROGRAM DATA & RESOURCE REQUESTS

A. Discussion of Trends & Reflections Notable Trends;
Please see Appendix A for graphs and tables supporting the following information.
The MS Statistics program enrollment is down after a spike in 2018, but otherwise

consistent with recent years.
We have maintained a balanced gender ratio in our program. Our international student representation has decreased by almost 50% in the last 3 years which has overall effected our enrollments.

Reflections on Trends and Program Statistics:
The Department of Statistics and Biostatistics is a huge service department for the College and University with a high SFR. We have always had a large graduate program, but now that our undergraduate program is taking off, primarily due to the concentration in Data Science, our tenure track faculty are being spread even thinner throughout our three programs.

Also not reflected in this data is the huge impact of EO 1110 on our department. Our commitment to providing service courses for the university is larger than ever. All this while we continue to keep our MS program offer8ings up to date with our Data Science classes and use of statistical programming.

B. Request for Resources

1. Request for Tenure-Track Hires: Increase our tenure-track faculty to sustain offering for our graduate courses in Biostatistics. We foresee growing our Biostatistics program and also the fact that's some of our Biostatistics faculty may retire in the near future and would like to be prepared for. Prof Eudey is in her 4th year of her FERP and it will be prudent for the department to plan ahead.

2. Request for Other Resources
   We would like to have continued support for our MS Statistics advisor with providing assigned time to not just advise students but also help in the promotion of the program and in the admission process.

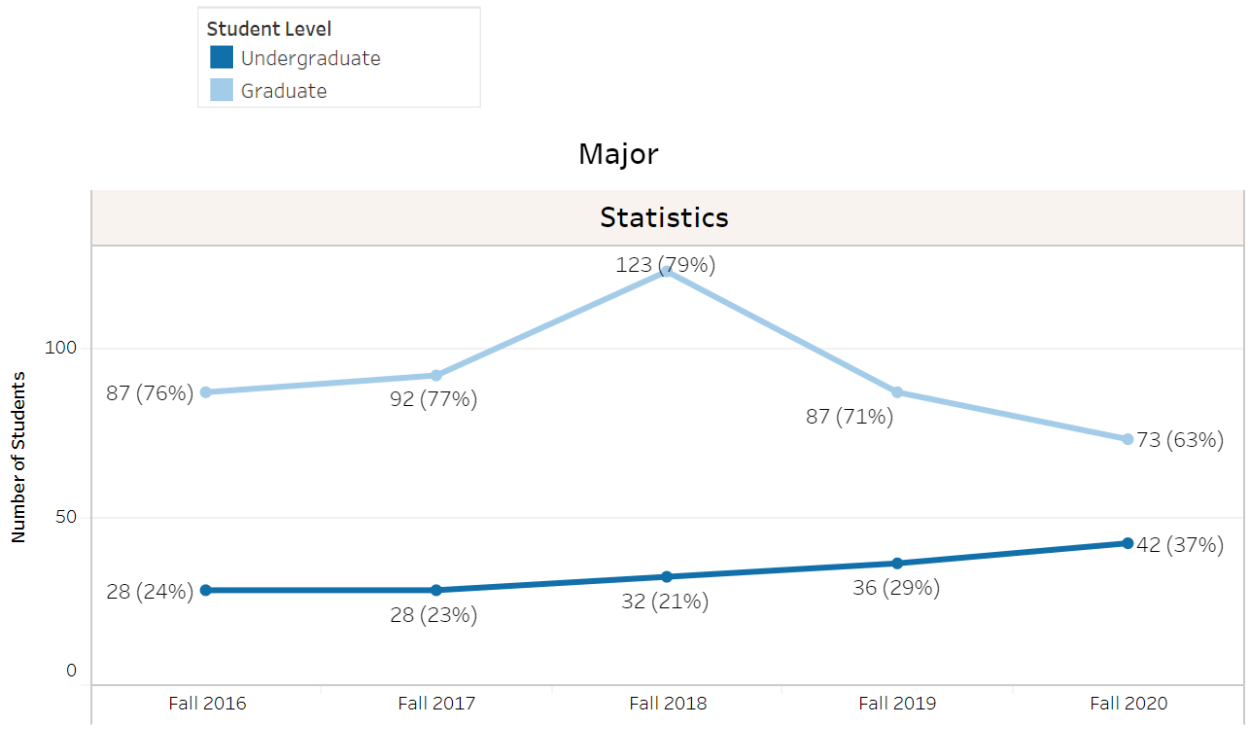
Appendix A

III A. Discussion of Trends & Reflections

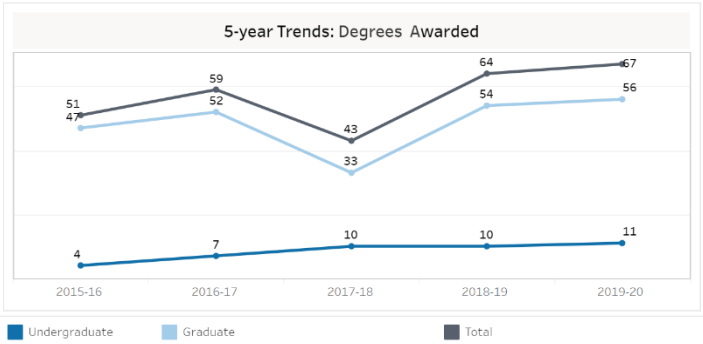
Notable Trends:

Tables of enrollment for Fall 2020 are broken down by race/ethnicity and sex.

Fall 2020	**Statistics MS (%)**
Asian	20 (27%)
Black/African American	4 (5%)
International	22 (30%)
Latinx	10 (14%)
Multiple Races	1 (1%)
Unknown	4 (5%)
White	12 (16%)
Total	73
Fall 2020	**Statistics MS (%)**
Female	36 (49)
Male	37 (51)



Degrees Conferred



Time to Degree (Yrs) (and Headcount)

	First-time Freshmen	Transfer	Masters & Ed.D
Grand Total	3.7 (2)	2.0 (9)	2.2 (56)
CSCI Statistics	3.7 (2)	2.0 (9)	2.2 (56)

Make a selection in the table above to filter charts further