ACADEMIC SENATE
Committee on Academic Planning and Review

ANNUAL PROGRAM REPORT

College	Science
Department	Statistics and Biostatistics
Program	MS Statistics
Reporting for Academic Year	2019-2020
Last 5-Year Review	2018-2019
Next 5-Year Review	2023-2024
Department Chair	Joshua Kerr
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Date Submitted	01 October 2020

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
2. Increase the use and diversity of computation in courses (at all levels)
3. Continue teaching schedules that accommodate working students
4. Raise funds to increase our scholarship and leadership funds

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 Statistical Computation, Large Data Analysis, and Data Analytics
4. Increase our number of long-term lecturers

Resource plans (3.5) include:
1. Upgrade computers for tenured/tenure-track faculty and lecturers
2. Upgrade office furniture for tenured/tenure-track faculty
3. Increasing our current 1.0 staff support to our former level of 1.75 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. From Fall 2018 to Fall 2019, our graduate program shrunk by 24%. Surprisingly, despite the pandemic, we are on track to grow this year. The incoming Fall 2020 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. Now under semesters, we have continued to make it possible to complete our graduate programs by taking classes after 5:30pm.
4. Fundraising did not increase this year.

Regarding 3.4 (Faculty):
1. Assistant Professor Jiyoun Myung was hired and started Fall 2020. Assistant Professors Li Zou and Eric Fox were both granted retention, now entering their third year. Professor Eudey begins her third year of FERP in Fall, 2020. Professor Watnik continues to work as Associate Dean, Academic Programs and Services.
2. The Department received approval to hire two positions during the 2020-2021 academic year, one of which is a carry-over from a failed search last year. At this time, it is unclear if we will retain one or both of the searches due to the current budgetary climate.
3. The searches mentioned above are intended to help continue to develop and bolster our Data Science and Biostatistics curriculums, create more diversity in our graduate courses instructors, have a heavier presence on our undergraduate curriculum, and help continue to develop and improve all of our programs.
4. We currently have three lecturers on 3-year contracts and three lecturers on a 1-year contract.

Regarding 3.5 (Resources):
1. All tenure-track professors and lecturers received headsets and microphones to support distance learning.
2. Some tenure-track professors have received writeable mousepads with a stylus to support distance learning.
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: With the implementation of EO 1110, the department now hires graduate students as TAs to teach newly developed support courses, beginning Fall 2018. With semester conversion, the department now offers a concentration in Data Science at both the undergraduate and graduate levels. Due to semester conversion, substantial changes are in place to all levels of the curriculum.

Students: Nothing to add.

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.

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 : 2019-2020	
Which PLO(s) to assess	PLO 6
Is it aligned to an ILO?	No
History	STAT 692 offered Fall and Spring semesters

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 2019-2020

Rubric Score	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5***	**PLO 6**
1	0	0	1	0	1	0
2	1	0	1	1	3	0
3	6	5	2	6	8	5
4	3	2	9	3	22	2
5	27	30	24	27	20	30

Total	37	37	37	37	54	37

Summary Statistics of Rubric Scores for Statistics MS 2019-2020

Statistic	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5*	PLO 6
Minimum	2	3	1	2	1	3
Maximum	5	5	5	5	5	5
Mean	4.5	4.7	4.46	4.5	4.1	4.7
Std. Deviation	0.9	0.71	0.93	0.9	1.0	0.71

* 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 3: 2020-2021	
1. *Which PLO(s) to assess*	PLO 1
2. *Is it aligned to an ILO?*	Yes
3. *If yes, list ILO.*	Thinking and Reasoning
4. *Course name and number*	STAT 692 – Comprehensive Exam
5. *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
6. *Assessment activity*	Written Comprehensive Exam

7. Assessment Instrument	Grades from exam
8. How data will be reported	Quantitative, proportions of students in each category from 1-5 (5 mastered)
9. Responsible person(s)	STAT 692 instructor, Assessment Rep
10. Time (which semester(s))	Fall and Spring
11. 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.
The Department of Statistics and Biostatistics continues to have one of the highest SFR in the College of Science. The department's FTEF % grew slightly for tenured / tenure track while decreasing slightly for non-tenure / tenure track.

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. There has been considerable investment by the faculty in development of the new support-course model to accommodate the new freshmen who are no longer able to take remedial math and are going straight into a B4 course. This requires a whole new pedagogy for those courses that did not exist before. This means that a different population with a deeper level of needs is populating these service courses.

B. Request for Resources

1. Request for Tenure-Track Hires: provide evidence from trends provided.
   The Department of Statistics and Biostatistics is only requesting to get back any searches that may be taken away this year. They were initially granted because of our obvious need to increase tenure-density in our department. With a growing undergraduate program, this is more important than ever.

2. Request for Other Resources
   Currently, we are leveraging EO 1110 efforts to support many curricular innovations and support structures such as Teaching Assistants, Supplemental Instruction, and Learning Assistants. We hope to continue getting assigned time for coordination of

the B4 curriculum.

Appendix A

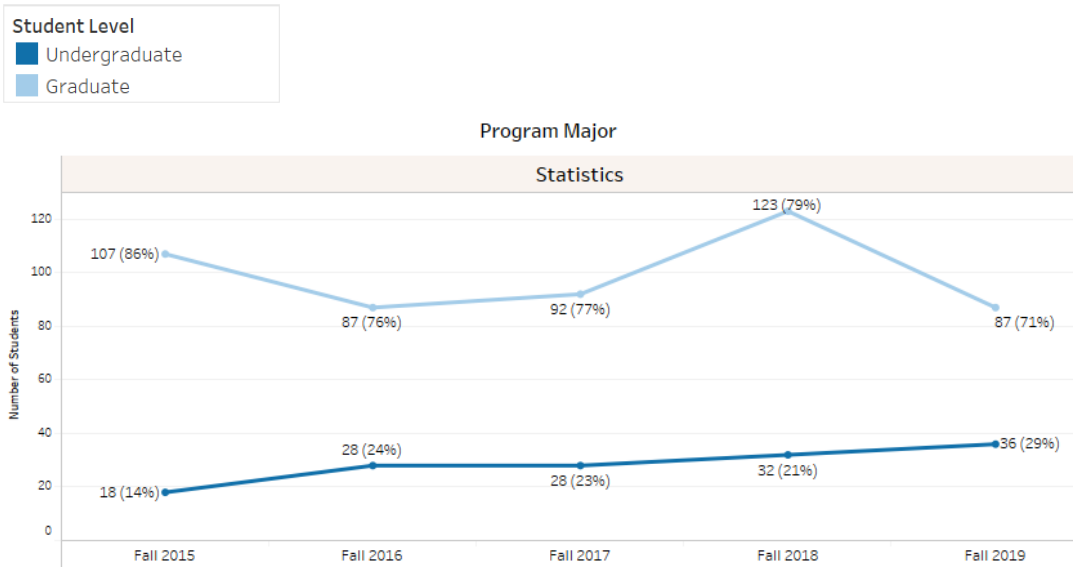
III A. Discussion of Trends & Reflections

Notable Trends:

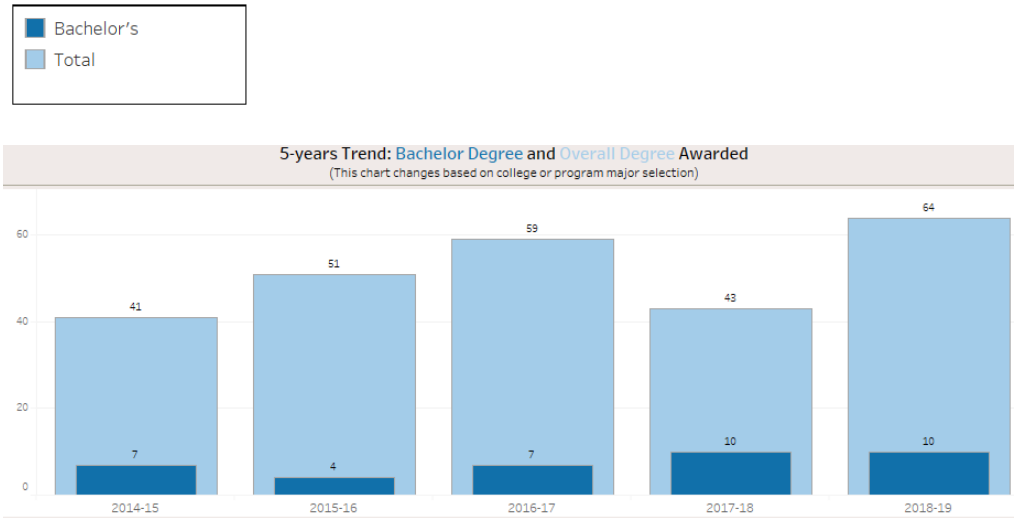
Tables of enrollment for Fall 2019 are broken down by race/ethnicity and sex.

Fall 2019	Statistics MS (%)
Asian	23 (26)
Black/African American	2 (2)
International	35 (40)
Latinx	12 (14)
Multiple Races	2 (2)
Unknown	7 (8)
White	6 (7)

Fall 2019	Statistics MS (%)
Female	42 (48)
Male	45 (52)



Degrees Conferred



APR Coursework Data: Summary: Fall Term as of Census

FTES, FTEF (instruction), and SFR of all state-side coursework

		Term & Year								
		Fall 2017			Fall 2018			Fall 2019		
College	Department	FTES	FTEF	SFR	FTES	FTEF	SFR	FTES	FTEF	SFR
CSCI	BIOL	588.3	19.5	30.2	472.2	18.6	25.4	499.5	17.3	28.8
	CHEM	359.9	14.9	24.2	290.3	14.6	19.9	303.8	14.9	20.4
	CS	394.8	13.4	29.4	361.5	13.6	26.6	426.9	14.5	29.4
	EESC	192.9	7.5	25.7	269.7	7.8	34.4	281.4	8.0	35.1
	ENGR	184.0	7.9	23.3	163.1	7.3	22.2	184.3	8.6	21.3
	HSC				425.0	13.4	31.7	594.0	16.0	37.1
	MATH	629.6	23.2	27.1	449.0	17.0	26.5	461.3	17.0	27.2
	NURS	1,038.3	44.0	23.6	261.9	22.3	11.8	255.3	21.8	11.7
	PHYS	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3
	PSYC	572.2	17.8	32.2	534.2	16.7	31.9	629.7	18.0	35.0
	SCI				0.6	0.1	4.5	0.5	0.1	3.5
	STAT	366.9	10.0	36.6	352.0	10.9	32.3	379.1	11.8	32.1

Make a selection in the table above to filter charts further