COMMITTEE ON ACADEMIC PLANNING AND REVIEW
ANNUAL PROGRAM REPORT

College	CoS
Department	Statistics and Biostatistics
Program Unit	
Reporting for Academic Year	2016-2017
Last 5-Year Review	
Next 5-Year Review	2018-2019
Department Chair	Lynn Eudey (Interim-Chair)
Date Submitted	10/19/2017

1. SELF-STUDY (about 1 page)

A. Five-year Review Planning Goals

The five year review includes planning goals for curriculum (3.1), students (3.2), faculty (3.3), and resources (3.4).
To summarize, the curriculum plans include:
1. Updating our MS programs' curriculums
2. Offer required MS courses as graduate-only courses
3. Continue offering two sections of core graduate courses and grow our graduate program
4. Update our MS options to reflect demand
5. Enhance our BS program to reflect our SLO's and industry demands

The student plans include:
1. Grow our MS programs
2. Enhance and grow our BS program
3. Recruit community college students into our BS program
4. Increase the use of computation in courses (at all levels)
5. Continue teaching schedules that accommodate working students
6. Raise funds to increase our scholarship and leadership funds

Faculty plans include:
1. Anticipation of our junior faculty receiving tenure/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 and resignation
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 include:

1. Upgrade computers for tenured/tenure-track faculty and lecturers
2. Explore the use of "clickers" in introductory statistics courses
3. Increasing our current 1.0 staff support to our former level of 1.75 staff support.

B. Five-year Review Planning Goals Progress

Regarding 3.1 (Curriculum):
1. Our tiered course (6260/4960 R Programming) was presented in Fall 2016 and was well attended
2. The required courses were all offered as MS-only during the recommended quarters. 6204 and 6304 were offered as tiered courses outside of the Fall Quarter. 6250 was offered as tiered in the Fall Quarter (MS Biostatistics students are required to take the course in the Spring Quarter).
3. Core courses required for both MS Biostatistics and MS Statistics (6204, 6205, 6304, 6305, 6509, 6501, 6502) were offered in two sections in the corresponding quarters.
4. The MS Statistics option changes have been deferred to semester conversion, but the name change for the "Statistical Computing" Option to "Data Science" Concentration was accepted and will be effective Fall, 2018.
5. All three degree programs were successfully transformed to the semester system.
6. As part of the semester conversion we have added additional graduate level courses: STAT 641 Bootstrapping Methods (which is a preferred alternate for required course), STAT 653 Statistical Natural Language Processing, STAT 671, Advance JMP, and STAT 673 Nonparametric Statistical Methods. All of these courses are computationally intensive.
7. As part of the semester conversion we have dedicated undergraduate courses that were formerly presented in tiered courses with the corresponding graduate courses.
8. STAT 6250 SAS Programming was offered as an online-only course. A lecturer, Dr. Isaiah Lankham, was successful in obtaining a grant from Online & Hybrid Course Quality Transformation Cohort 5 to develop this course for online presentation.

Regarding 3.2 (Students):
1. The total number of MS students was about 20% less 2016-2017 as compared to 2015-2016.
2. The total number of BS students increased by about 50% (10 students) in 2016-2017 as compared to 2015-2016.
3. We did have transfer students enter our program, but not enough to offset graduating students.
4. On top of previously-existing courses using computing (e.g., 6304, 6305, 6509), 6610 and 6620 brought a marked increase in the use of computation. We note that both 6610 and 6620 had such high demand that there were 2 sections offered in the Winter and Spring Quarters, respectively. In addition, these two courses were in high demand from students of different majors. This increases the visibility of our MS program in Statistics.
5. Core courses and most electives in our graduate program were offered after 6. Many undergraduate required courses were also offered after 4.
6. Fundraising did not increase this year.

Regarding 3.3 (Faculty):
1. Professor Kerr applied for promotion to Full Professor but was denied. Professor Kerr will apply again in 2018. Professor Chatterjee was retained and will apply for tenure and promotion AY 2017-2018.
2. The Department received approval to hire during the 2016-7 academic year, but the search was not successful and has been carried over into the coming year. The Department was also

granted another tenure-track search. Professor Zhou is chairing the hiring committee this time for the two open positions in AY 2017-2018.

3. Our long-term lecturer, Clyde Sugahara, retired at the end of Spring 2017. We currently have three lecturers on 3-year contracts and one lecturer on a 1-year contract. Our lecturer pool is healthy and we anticipate having at least one more lecturer on a 1-year contract by Fall 2018.

Regarding 3.4 (Resources):

1. Some professors received upgraded computers this year.

2. Our staffing level has remained the same.

C. Program Changes and Needs

Pursuant to the new policy, there will be no further curricular changes until semesters begin. Approximately $15,000 of the Semester Conversion budget was used in 2016-2017. The Department completed the two certificate programs for the semester conversion and made some changes to a few of the course proposals.

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.

2. **SUMMARY OF ASSESSMENT** (about 1 page)

A. Program Student Learning Outcomes

Student learning outcomes for MS in Statistics are:

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.

2. Derive and understand basic theory underlying these methodologies

3. Formulate and model practical problems for solutions using these methodologies

4. Produce relevant computer output using standard statistical software and interpret the results appropriately

5. Communicate statistical concepts and analytical results clearly and appropriately to others; and

6. Understand theory, concepts, and terminology at a level that supports lifelong learning of related methodologies.

Student learning outcomes for MS in Biostatistics are:

1. Apply biostatistical methods to data, including (a) descriptive statistics, probability and graphical displays, (b) distributions, hypothesis testing and confidence intervals, and (c) uncertainty, likelihood, modeling and error analysis;

2. Derive basic theory and communicate to others results involving biostatistical data analysis;

3. Formulate problem solutions, produce appropriate computer code and to interpret results.

Student learning outcomes for BS in Statistics are:

1. Apply basic computational skill in descriptive statistics and graphical displays; hypothesis testing and

confidence intervals; modeling and error analysis
2. Communicate to others results involving descriptive statistics and graphical displays; hypothesis testing and confidence intervals; modeling and error analysis
3. Analyze data using appropriate statistical computer software and to interpret the results covering descriptive statistics and graphical displays; hypothesis testing and confidence intervals; modeling and error analysis.

B. Program Student Learning Outcome(s) Assessed

For MS in Statistics we assessed SLO's 1, 2, 3, 4, 5, and 6.
For MS in Biostatistics we assessed SLO's 1, 2, and 3
No SLO's were assessed for Statistics BS in 2016-2017 academic year.

C. Summary of Assessment Process

We have long used the culminating experience of the Comprehensive Examination along with feedback from alumni and community industry leaders in assessing our programs. Student learning outcomes and institutional learning outcomes were previously identified and mapped to specific courses for all three programs (in Spring 2014, refer to program curriculum maps).

This year we implemented quantitative assessment of the results of our Comprehensive Examination by mapping all but one of the SLO's for each of the MS programs to specific course problems on the MS exam. The comprehensive examination has a common (to both programs) 4-hour closed book examination and, four days later, program-specific 4-hour open book examinations. Questions on the examinations are identified with the required graduate courses. Rubrics were established for the outcomes and implemented.

The SLO's that were not evaluated by the Comprehensive Examination involve communication skills (SLO #5 for Statistics MS and SLO #2 for Biostatistics MS). It was decided that these SLO's are 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). For the Statistics MS SLO #5, STAT 6509 "Theory and Application of Regression" was be used for assessment. This year the course was formally selected and the rubric developed and implemented. For Biostatistics MS SLO #2, BSTA 6653 "Clinical Trials in the Pharmaceutical and Biomedical Industries" is used for assessment. This year the course was formally selected, the rubric was developed and implemented. It should be noted that the assessment of MS SLO #5 is at the end of the first year of the program, while the other assessments are at the end of the program

For the Statistics BS program STAT 4601 "Regression" was formally identified as the course to use for end-of-program assessment. A rubric has yet to be developed and this may be done within the semester system.

All implementations of academic assessment took place after the last faculty meeting of the academic year, hence faculty review and any changes to the curriculum will be done in the future. We anticipate that any changes we decide upon will be implemented within the semester system.

D. Summary of Assessment Results

Our comprehensive examination is our primary method of assessing both master's degree programs. The tests are written to test knowledge from the required core courses for each program. Typically our pass rate is 75% or higher. As of Spring 2016, combined over the past few years, the average pass rate for Statistics MS is 79% (SD = 16%) and for Biostatistics MS is 75% (SD = 24%). For Spring 2017 the pass rate for Statistics MS was 79% (n = 53) and the pass rate for Biostatistics was 100% (n = 5).

Last year we initiated the use of a rubric to assess the individual ILO's as described above. Rubrics used were on a 5-point scale with 5 denoting exemplary demonstration of the SLO involved and 1 denoting no or very poor demonstration of the SLO involved. The results for Statistics MS program for 2015-2016 are shown in Tables 1 and 2 below.

Table 1: Frequencies of Rubric-Scores for Statistics MS 2016-2017

Rubric Score	SLO 1	SLO 2	SLO3	SLO 4	SLO6
0	1	0	16	1	3
1	0	2	5	0	5
2	2	6	2	2	13
3	4	10	4	4	15
4	17	18	9	17	5
5	29	17	17	29	12
Total	53	53	53	53	53

Table 2: Summary Statistics of Rubric Scores for Statistics MS 2016-2017

Statistic	SLO 1	SLO 2	SLO3	SLO 4	SLO6
Minimum	1	0	0	1	0
Maximum	5	5	5	5	5
Mean	4.32	3.79	2.68	4.32	2.94
Standard Deviation	1.00	1.13	2.14	1.00	1.47

Table 3: Frequencies of Rubric-Scores for Statistics MS 2016-2017 SLO5

Rubric Score	
0	0
1	0
2	3
3	12
4	16
5	11
Total	42

The results for Biostatistics MS program for 2015-2016 are shown in Tables 3 and 4 below.

Table 4: Frequencies of Rubric Score for Biostatistics MS 2015-2016

Rubric Score	SLO 1	SLO 2*	SLO3
0	0	0	0
1	0	0	0
2	0	1	0
3	0	0	0
4	0	7	4
5	5	2	1
Total	5	10	5

*SLO2 was from a course rubric and not all in the course took the Comprehensive Examination.

Table 4: Summary Statistics of Rubric Scores for Biostatistics MS 2015-2016

Statistic	SLO 1	SLO 2	SLO3

Minimum	5	2	4
Maximum	5	5	5
Mean	5	4.00	4.2
Stand. Deviation	0	0.82	0.45

The Statistics and Biostatistics Department evaluates the results of the comprehensive examination twice per year. This information, along with student feedback, alumni feedback, and information about current industry demands for specific statistical skills has led to our recent modernizing of our curriculum.

This year we incorporated the information learned from the assessment of the individual rubrics from the tools used last year in our transformation of both programs for semester conversion.

3. STATISTICAL DATA (about 1 page)

Institutional Research, Analysis and Decision Support (IRAD) produces program statistics annually in standard format. These statistics (available on their page here) will be attached to the Annual Report of the Program Unit. This statistical document is expected to be approximately one page long and will contain the same data as required for the five-year review including student demographics of majors, student level of majors (e.g. Juniors, Seniors), faculty and academic allocation, and course data.

The Annual Report may include one or two pages of supplemental information, as appendices, in the form of graphical presentation (e.g., line graphs), tables, and pertinent discussion which summarize the data of the last several (3-5) years to make changes and trends more apparent. This year the data were not broken down by degree, so we include the statistics from Fall 2015 as well as from Fall 2016

	Biostatistics MS Fall 2015	Statistics BS Fall 2015	Statistics MS Fall 2015	Fall 2016 – All Programs
Asian	6	5	20	27.8%
Black	3	0	4	1.7%
Hispanic	4	3	7	8.7%
White	7	5	21	14.8%
Two or more	0	1	2	1.7%
Unknown	1	2	9	7.8%
Non-resident Alien	3	2	44	37.4%
Total	24	18	107	

	Biostatistics MS Fall 2015	Statistics BS Fall 2015	Statistics MS Fall 2015	Fall 2016 – All Programs
Female	10	10	48	47.8%
Male	14	8	59	52.2%

Degrees conferred by program This table remains the same as last year since the data were not provided in the 20171005-APR-Statistics-2012-2016.xlsx spreadsheet.

Major	Baccalaureate					Master's					Total				
	AY 10-11	AY 11-12	AY 12-13	AY 13-14	AY 14-15	AY 10-11	AY 11-12	AY 12-13	AY 13-14	AY 13-14	AY 10-11	AY 11-12	AY 12-13	AY 13-14	AY 13-14
Bio-statistics						11	12	20	10	17	11	12	20	10	17
Statistics	3	8	4	3	7	49	43	55	37	38	52	51	59	40	45