



**COMMITTEE ON ACADEMIC PLANNING AND REVIEW
ANNUAL PROGRAM REPORT**

College	CoS
Department	Statistics and Biostatistics
Program Unit	
Reporting for Academic Year	2016-2017
Department Chair	Mitchell Watnik
Date Submitted	7/28/2016

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. We listed a new tiered course (6260 / 4960 R Programming) for the upcoming Fall. It was supposed to be offered that way for this Fall (2015), but a glitch in the curriculum processing prevented that. It was listed as a “selected topics” course instead.
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.

Regarding 3.2 (Students):

1. The total number of MS students was approximately the same this year as last year.
2. The total number of BS students was approximately the same this year as last year.
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.
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 Zhou was promoted to (full) professor at the end of the academic year. Professor Chatterjee was retained.
2. The Department received approval to hire during the 2015-6 academic year, but the search was not successful and has been carried over into the coming year. Professor Kerr is going to chair the hiring committee this time.

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. The Department was funded at over \$60,000 for semester conversion and intends to make transformative changes for the new regime. Approximately \$15,000 of that budget is carried over to the next year, as was originally proposed. The Department still needs to complete certificate programs, as well as make some changes to a few of the course proposals.

A request for computing space for students was submitted, in conjunction with the Computer Science Department, but it was not approved by the Dean.

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, and 6.

For MS in Biostatistics we assessed SLO's 1, 2, and 3

No SLO's were assessed for Statistics BS in 2015-2016 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" will be used for assessment. This year the course was formally selected and the rubric developed but not yet 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.

For the Statistics BS program STAT 4601 "Regression" was formally identified as the course to use for end-of-program assessment.

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 in the semester conversion process as we transform the programs.

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. 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 Fall 2015 and Spring 2016 the pass rate for Statistics is 75.8% and for Biostatistics is 100%. Most of the students take the comprehensive examination in the Spring (Fall 2015, n = 15 and Spring 2016, n = 47 for Statistics; Fall 2015, n = 1, and Spring 2016, n = 8 for Biostatistics).

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 2015-2016

	SLO 1	SLO 2	SLO 3	SLO 4	SLO 6
Rubric Score 0	2	1	5	2	4
1	1	2	6	1	3
2	3	7	13	3	16
3	12	18	20	12	18
4	26	18	14	26	13

5	18	16	4	18	8
Total	62	62	62	62	62

Table 2: Summary Statistics of Rubric Scores for Statistics MS 2015-2016

Statistic	SLO 1	SLO 2	SLO3	SLO 4	SLO6
Minimum	0	0	0	0	0
Maximum	5	5	5	5	5
Mean	3.82	3.58	2.71	3.82	2.92
Standard Deviation	1.15	1.18	1.32	1.15	1.33

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

Table 3: Frequencies of Rubric Score for Biostatistics MS 2015-2016

	SLO 1	SLO 2	SLO3
Rubric Score 0	0	0	0
1	1	0	0
2	1	0	1
3	1	2	3
4	4	4	3
5	2	3	2
Total	9	9	9

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

Statistic	SLO 1	SLO 2	SLO3
Minimum	1	3	2
Maximum	5	5	5
Mean	3.56	4.11	3.67
Standard Deviation	1.33	0.78	1.00

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. Last year (2014-2015), two new courses were offered: in Winter, STAT 6610 “Data Visualization” and in Spring, STAT 6620 “Statistical Learning with R.” Professor Eric Sues developed and taught both courses. This year (2015 – 2016), both courses were very well received and in heavy demand (two sections were given for each course and all four sections were well attended). These courses were taken by students in both programs, Statistics MS and Biostatistics MS, as well as students outside the program.

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.

Fall 2015	Biostatistics MS	Statistics BS	Statistics MS
Asian	6	5	20
Black	3	0	4
Hispanic	4	3	7
White	7	5	21
Two or more	0	1	2
Unknown	1	2	9
Non-resident Alien	3	2	44
Total	24	18	107

Fall 2015	Biostatistics MS	Statistics BS	Statistics MS
Female	10	10	48
Male	14	8	59

Degrees conferred by program

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

Student information by level and academic allocations are not available for AY 15-16.