

Unit Plan for Assessing and Improving Student Learning in Degree Programs

Unit: Department of Statistics

Unit Head approval: [signed] Douglas G. Simpson

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SECTION 1: PAST ASSESSMENT RESULTS

Brief description of changes or improvements made in your unit as the result of assessment results since 2000.

The Department of Statistics made significant changes in its undergraduate and graduate programs as the result of assessments since 2000. These were in response to indicators of student demand, exit interviews with graduates, post-degree communications with alumni, feedback from industry on the MS program, and faculty assessment of the training of our students and trends in the field. The major developments are summarized below.

Undergraduate programs:

- 1) A new first course for Statistics majors was developed, Statistics 200, "Statistical Analysis." This was designed to expose students to a range of statistical methods, applications and statistical computing early in their undergraduate careers, and to give them a better understanding of the field before embarking on the required calculus and mathematical statistics foundational coursework.
- 2) The requirements of the B.S. in Statistics were revised to include more exposure to data analysis and computing earlier in the undergraduate experience, and to provide a more standard core of required courses for undergraduate statistics majors prior to the upper level elective courses.
- 3) Electives available to upper level Statistics majors were expanded to incorporate new courses developed in the past several years.
- 4) A new Minor in Statistics was developed in response to interest on the part of students majoring in other subjects who frequently take several of our courses to enhance their research skills.

Graduate programs:

- 1) A number of new courses for MS and PhD students were developed to incorporate newly emerging trends in the field: Statistics 440 (Statistical Data Management), Statistics 448 (Advanced Data Analysis), Statistics 466 (Image and Neuroimage Analysis, cross listed), Stat 530 (Bioinformatics, cross listed), and Statistics 542 (Statistical learning).

2) A new MS degree concentration in Analytics was developed to combine the strengths of the traditional MS in Statistics with enhanced computational and data analytic sophistication for those planning careers in information intensive industries or research.

3) The MS requirements were revised to provide the flexibility to develop further concentrations, and to provide a more focused instruction in theory appropriate to MS level students as compared with PhD students.

4) The PhD qualifying exam structure was revised and streamlined so that students would be eligible to take the qualify exam earlier and move more efficiently through the early core learning phase of the PhD program.

5) Elective course options for the PhD program were expanded by the addition of the new graduate level courses in emerging areas of research.

SECTION 2: REVISED ASSESSMENT PLAN

(a) PROCESS: Brief description of the process followed to develop or revise this assessment plan.

The Department Chair, serving as the outcome assessment coordinator, attended Outcomes Assessment Workshops conducted by the Center for Teaching Excellence. The Chair and Executive committee of the Department developed the revised outcomes assessment plan in consultation with the chairs of the undergraduate and graduate program committees.

(b) STUDENT OUTCOMES: List Unit's student learning outcomes (knowledge, skills, and attitudes).

Desired learning outcomes for undergraduate Statistics majors:

Outcome 1. Have a good working knowledge of the most commonly used statistical methods and be able to use these methods able to draw valid conclusions from data;

Outcome 2. Be able to apply mathematical and statistical reasoning;

Outcome 3. Communicate effectively in writing and orally;

Outcome 4. Be competent in the use of statistical software, in data management, and in the interpretation of computational results;

Outcome 5: Work well as part of a team.

Desired learning outcomes for MS students:

All of the above, plus:

Outcome 6: Be adept at statistical computing and data management, including the use of statistical computing software, data management systems, and networking capabilities;
Outcome 7. Interact productively with clients (e.g., scientific collaborators) who have a need for statistical expertise;
Outcome 8. Be able to apply statistical theory to evaluate statistical procedures;

Desired learning outcomes for PhD students:

All of the above plus

Outcome 9: Function effectively as an independent researcher.

Outcome 10: Function effectively as an instructor.

(c) MEASURES AND METHODS USED TO MEASURE OUTCOMES:

Statistics 427, Statistical Consulting, functions as a capstone course in our curriculum. This course is an elective for undergraduate majors and M.S. students and is required for Ph.D. students. The students work directly with clients from a variety of disciplines on projects where statistical methods and analysis play an important role. Student performance in the course reflects knowledge base (Outcome 1), applying that knowledge base in a real world setting (Outcome 2), interaction with clients (Outcome 7), communication skills (Outcome 3), computer skills (Outcomes 4 and 6) and ability to work well as a member of a team (Outcome 5). These outcomes can be assessed by the Statistics 427 instructor, who has ample opportunity to observe the students as they interact with clients, work individually and in teams on projects, and communicate their findings both orally and in writing to the clients. This effort will be targeted at the M.S. and Ph.D. levels, but it will also provide information on learning outcomes for undergraduate majors who take the course.

We will use alumni surveys to assess outcomes for our graduates. Their opinions about the extent to which our program achieves the desired outcomes, and about the relevance of both the program and the outcomes to their career paths, will be solicited. This information will be supplemented with numerical data providing an employment profile of our graduates. In view of the size of our program it makes sense to carry out the survey once every three years, but we will monitor the numerical data on a yearly basis.

We will use exit interviews with graduating seniors to help assess outcomes for our undergraduate majors.

Outcome 9, which applies only to Ph.D. students, is demonstrated by successful defense of a thesis that reflects high level, independent research by the student. We will assess this outcome by tracking progress in the program, focusing on the percentage of students who complete the degree and on the average time-to-degree. We will also monitor the analogous percentages and times for significant milestones in the program: passing the qualifying examinations and passing the preliminary examination.

Outcome 10 will be assessed by classroom observation of teaching assistants, which is our current practice.

SECTION 3 : PLANS FOR USING RESULTS

(a) PLANS: Brief description of plans to use assessment results for program improvement.

Assessment of outcomes based on performance in Statistics 427, together with the exit interviews and surveys, may suggest further improvements in the syllabi and emphases in the 400-level methodology courses. Such improvements will be directly geared toward fuller achievement of the desired outcomes. Assessment of Outcome 8 will be based on samples of exams from the theory course Statistics 510. Assessment of outcome 9 will be used for Ph.D. program improvement in terms of the pattern of required examinations and the process of choosing an advisor, if a need for change is indicated. Assessment of outcome 10 may lead to further improvements in T.A. preparation and feedback. The Department Chair and Executive Committee will review the assessment results annually to see where program improvements might be made.

(b) TIMELINE FOR IMPLEMENTATION:

We plan to conduct the next alumni survey in Fall 2009. In the meantime we will continue to update and verify the necessary database and revise the items to be used in the survey. We will also revise the outcomes assessment in the capstone course, Statistics 427, with the expectation that it will be fully implemented by Spring 2009. We plan to implement assessment of outcomes 9 and 10, and to conduct exit interviews with graduating seniors beginning in spring 2009. Assessment of outcome 8 will begin Fall 2008.