Assessment Rubrics
for Statistics Student Learning Outcomes

Department of Mathematics and Statistics
College of Arts and Sciences

The University of New Mexico

Erik Erhardt

September 27, 2016

Contents

Contact Persons for the Assessment Plan
Matthew Blair, Chair of the Undergraduate Committee, `blair@math.unm.edu`
Erik Erhardt, Statistics representative, `erike@math.unm.edu`

1

How to use this document

In discussion with the faculty, the 2015-16 Undergraduate Committee created the student learning outcomes for all department majors.

The SLOs listed in Section E.1 (from the "Academic Program Plan for Assessment of Student Learning Outcomes") will be assessed in the courses listed in Table 1 using the rubrics provided in Section E.2.

E B.S. Statistics

E.1 Broad Program Goals & Measurable Student Learning Outcomes

E.1.1 Broad Program Learning Goals for this Degree/Certificate Program

Upon graduation the students of the Statistics concentration will have the following competencies:

A. Proficiency in probability and statistical theory and methods.

B. Ability to manipulate and visualize data and to compute standard statistical summaries.

C. Skill in applying fundamental mathematical techniques.

E.1.2 List of Student Learning Outcomes (SLOs) for this Degree/Certificate Program

A.1 Correctly analyze and interpret the results from standard designed experiments, sample surveys, and observational studies, understand the limitations of the procedures and the appropriate scope of conclusions.

B.1 Implement basic computer science skills needed for statistics, including a) data management tools, and b) use of a statistical software package for standard analyses.

B.2 Demonstrate competence in data management, summarizing, and plotting using a high-level statistical programming language (such as R, SAS, or Stata).

C.1 Demonstrate knowledge of basic mathematical skills needed for statistics, including a) probability and statistical theory, b) calculus foundations, c) symbolic and abstract thinking, and d) linear algebra.

C.2 Solve probability problems, with discrete and continuous univariate random variables, and apply the Central Limit Theorem.

E.2   Rubrics

Every instructor will be asked to complete a "Semester Report", which provides data on the performance of these students in achieving these outcomes. In addition, we need the *major and concentration of each student* which can be obtained by a small class survey as part of an assignment or separately. Near the end of the semester, instructors will ask students to self-assess their performance on these SLOs through an online survey. Finally, the instructor "Semester Report" data will be merged with the student self-assessment and summaries the SLO assessments will be generated.

Table 1 indicates which SLOs are assessed by which Stat courses. Table 2 provides an example for mapping a quiz/assignment score to a rubric rating.

There are several strategies that an instructor can use to assess whether each student has mastered each SLO.

1. Create a set of exam question throughout the semester that directly address an SLO, record evaluations of those questions.

   This will require some advanced planning, and tracking of these individual scores throughout the semester. It may require scanning a page of student solutions to review and aggregate later.

2. Design quizzes and small assignments that each assess an SLO, use the scores as evaluation. This is easier to track directly from the gradebook.

Table 1: SLOs assessed by Courses

	Stat Courses				
SLO	345	427	428	440	445
A.1		X	X	X	X
B.1		X	X	X	X
B.2		X	X	X	X
C.1	X				
C.2	X				

Table 2: Rubric Likert scale example

Likert	Score
5 Excellent	$96 - 100\%$
4 Very good	$90 - 95\%$
3 Satisfactory	$80 - 89\%$
2 Questionable	$60 - 80\%$
1 Unacceptable	$0 - 59\%$

E.2.1   Rubric for Stat 345

E.2.1.1   Stat SLO C.1   Demonstrate knowledge of basic mathematical skills needed for statistics, including a) probability and statistical theory, b) calculus foundations, c) symbolic and abstract thinking, and d) linear algebra.

Rating	Description
Excellent	- Exemplary solution which demonstrates full comprehension of the skill. - The strategy follows directly from theoretical results. - No errors. - Student has clearly interpreted solution in highly articulate Statistical and English language.
Very Good	- Cogent solution which demonstrates good comprehension of the skill. - The strategy was apparent and effective. - Errors are insignificant. - Student has interpreted solution in understandable Statistical and English language.
Satisfactory	- Understandable solution which demonstrates reasonable comprehension of the skill. - The strategy was recognizable and mostly effective. - Errors are minor. - Student has interpreted solution in decipherable Statistical and English language.
Questionable	- Incomplete solution which demonstrates partial comprehension of the skill. - The strategy was potential effective. - Errors are significant. - Student has interpreted solution incompletely or misused in Statistical and English language.
Unacceptable	- Poor solution which demonstrates little to no comprehension of the skill. - The strategy was unclear or ineffective. - Errors are striking. - Student has misinterpreted solution completely or used unclear Statistical and English language.

E.2.1.2 Stat SLO C.2 Solve probability problems, with discrete and continuous univariate random variables, and apply the Central Limit Theorem.

Rating	Description
Excellent	• Exemplary solution which demonstrates full comprehension of the skill. • The strategy follows directly from theoretical results. • No errors. • Student has clearly interpreted solution in highly articulate Statistical and English language.
Very Good	• Cogent solution which demonstrates good comprehension of the skill. • The strategy was apparent and effective. • Errors are insignificant. • Student has interpreted solution in understandable Statistical and English language.
Satisfactory	• Understandable solution which demonstrates reasonable comprehension of the skill. • The strategy was recognizable and mostly effective. • Errors are minor. • Student has interpreted solution in decipherable Statistical and English language.
Questionable	• Incomplete solution which demonstrates partial comprehension of the skill. • The strategy was potential effective. • Errors are significant. • Student has interpreted solution incompletely or misused in Statistical and English language.
Unacceptable	• Poor solution which demonstrates little to no comprehension of the skill. • The strategy was unclear or ineffective. • Errors are striking. • Student has misinterpreted solution completely or used unclear Statistical and English language.

E.2.2 Rubric for Stat 427, 428, 440, 445

E.2.2.1 Stat SLO A.1 Correctly analyze and interpret the results from standard designed experiments, sample surveys, and observational studies, understand the limitations of the procedures and the appropriate scope of conclusions.

Rating	Description
Excellent	• Exemplary solution which demonstrates full comprehension of the skill. • The strategy follows directly from theoretical results. • No errors. • Student has clearly interpreted solution in highly articulate Statistical and English language.
Very Good	• Cogent solution which demonstrates good comprehension of the skill. • The strategy was apparent and effective. • Errors are insignificant. • Student has interpreted solution in understandable Statistical and English language.
Satisfactory	• Understandable solution which demonstrates reasonable comprehension of the skill. • The strategy was recognizable and mostly effective. • Errors are minor. • Student has interpreted solution in decipherable Statistical and English language.
Questionable	• Incomplete solution which demonstrates partial comprehension of the skill. • The strategy was potential effective. • Errors are significant. • Student has interpreted solution incompletely or misused in Statistical and English language.
Unacceptable	• Poor solution which demonstrates little to no comprehension of the skill. • The strategy was unclear or ineffective. • Errors are striking. • Student has misinterpreted solution completely or used unclear Statistical and English language.

E.2.2.2   Stat SLO B.1   Implement basic computer science skills needed for statistics, including a) data management tools, and b) use of a statistical software package for standard analyses.

Rating	Description
Excellent	• Exemplary solution which demonstrates full comprehension of the skill. • The strategy follows directly from theoretical results. • No errors. • Student has clearly interpreted solution in highly articulate Statistical and English language.
Very Good	• Cogent solution which demonstrates good comprehension of the skill. • The strategy was apparent and effective. • Errors are insignificant. • Student has interpreted solution in understandable Statistical and English language.
Satisfactory	• Understandable solution which demonstrates reasonable comprehension of the skill. • The strategy was recognizable and mostly effective. • Errors are minor. • Student has interpreted solution in decipherable Statistical and English language.
Questionable	• Incomplete solution which demonstrates partial comprehension of the skill. • The strategy was potential effective. • Errors are significant. • Student has interpreted solution incompletely or misused in Statistical and English language.
Unacceptable	• Poor solution which demonstrates little to no comprehension of the skill. • The strategy was unclear or ineffective. • Errors are striking. • Student has misinterpreted solution completely or used unclear Statistical and English language.

E.2.2.3 Stat SLO B.2 Demonstrate competence in data management, summarizing, and plotting using a high-level statistical programming language (such as R, SAS, or Stata).

Rating	Description
Excellent	- Exemplary solution which demonstrates full comprehension of the skill. - The strategy follows directly from theoretical results. - No errors. - Student has clearly interpreted solution in highly articulate Statistical and English language.
Very Good	- Cogent solution which demonstrates good comprehension of the skill. - The strategy was apparent and effective. - Errors are insignificant. - Student has interpreted solution in understandable Statistical and English language.
Satisfactory	- Understandable solution which demonstrates reasonable comprehension of the skill. - The strategy was recognizable and mostly effective. - Errors are minor. - Student has interpreted solution in decipherable Statistical and English language.
Questionable	- Incomplete solution which demonstrates partial comprehension of the skill. - The strategy was potential effective. - Errors are significant. - Student has interpreted solution incompletely or misused in Statistical and English language.
Unacceptable	- Poor solution which demonstrates little to no comprehension of the skill. - The strategy was unclear or ineffective. - Errors are striking. - Student has misinterpreted solution completely or used unclear Statistical and English language.