

Program-Level Assessment: Annual Report

Program Name (no acronyms): BS in Biostatistics	Department: Undergraduate Public Health Programs
Degree or Certificate Level: BS	College/School: CPHSJ
Date (Month/Year): Oct 2021	Assessment Contact: Lauren Arnold
In what year was the data upon which this report is based collected? 2020-2021 Academic Year	
In what year was the program's assessment plan most recently reviewed/updated? 2020	

1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

This assessment cycle focused on LOs 1-2:

LO1: Perform computations, derivations and calculations as they relate to calculus and linear algebra.

LO2: Use standard statistical software to create and manage datasets and perform basic statistical tests

2. Assessment Methods: Artifacts of Student Learning

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe and identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

LO1 and LO2 were assessed using data from the Capstone project in BST4400.

Due to COVID-19, BST4400 was taught using an "in-person flex" model by which class was held in person with students unable to attend in person simultaneously joining class by zoom. Students could have opted for simultaneous Zoom attendance all semester, while in quarantine/isolation, or per individual classes as needed.

3. Assessment Methods: Evaluation Process

What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (do not just refer to the assessment plan).

BST4400 data: Consistent with the evaluation protocol used in past years, the rubric developed by the BST4400 instructor mapped LOs 1-2 to Capstone project elements, which in turn mapped to specific biostatistical skills. The following rubric is used:

- 1.5 = Student demonstrated understanding of LO at advanced level (>100% of skills demonstrated)
- 1 = Student demonstrated understanding of LO at a basic level (70-100% of skills demonstrated)
- 0 = Student did not demonstrate understanding of LO (<70% of skills demonstrated)

As LO2 mapped to multiple skills, a "coverage" score and "coverage %" were calculated; the percentage mapped back to the LO achievement scale outlined above. (Coverage score of 100% = "1"; < 100% = "0"; >100% = "1.5".) e.g.:

- $LO2_{coverage} = \text{plan for outliers} + \text{power score} + \text{simple methods for missing data} + \text{multiple imputation}$
- $LO2_{percentage} = (LO2_{coverage} / 4) * 100$

It is noted that this year, there was no oral presentation, so LO assessment was based on the written project; the oral presentation was eliminated due to the hybrid nature of class (i.e. not every student attended in person).

4. Data/Results

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

Evaluation of the Capstone project found that 100% of students (n=4) achieved LO1 and LO2.

	Average	% achieving outcome
LO1	1.1	100%
LO2	1	100%

5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

This is only the third year for which we have data on the graduating class of Biostatistics majors (2020 had one graduate, so the data were not reported due to being an identifier). Data from the Capstone course continue to show a positive trend with all students achieving both LO1 and LO2. This indicates that the curriculum has been designed in a way that enables students to develop and practice skills to a point which they achieve PLO 1 and 2 by graduation. As the major continues to have a small number of graduates (~20 students in 4 years), upcoming years will continue to add to the “n” for assessment and help make estimates more precise. As more data are gathered, we look forward to making program level changes (e.g. revisions to the Capstone project or lower-level course content) in future years.

It is noted that data from this year are not directly comparable to prior years. This year, there was no oral presentation component to the project due to the hybrid nature of class (i.e. not every student attended in person). As such, LO assessment was based solely on the written project vs. written and oral project components in the past.

6. Closing the Loop: Dissemination and Use of Current Assessment Findings

A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

Per assessment protocols, assessment reports are shared with the Undergraduate Public Health Steering Committee at a fall semester meeting. The report is also posted on the Program’s googlesite. Lastly, the University Assessment Office posts the report on their webpage as well.

B. How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you’ve initiated one or more of the following:

Changes to the Curriculum or Pedagogies

- Course content
- Teaching techniques
- Improvements in technology
- Prerequisites
- Course sequence
- New courses
- Deletion of courses
- Changes in frequency or scheduling of course offerings

Changes to the Assessment Plan

- Student learning outcomes
- Artifacts of student learning
- Evaluation process
- Evaluation tools (e.g., rubrics)
- Data collection methods
- Frequency of data collection

Please describe the actions you are taking as a result of these findings.

No changes are being taken as a result of these findings (see below).

Other changes: The biostatistics major requires four mathematics courses (e.g., Calculus I, Calculus II, Calculus III, Linear Algebra) as pre-requisites to several BST courses. The major was originally designed for these math courses to provide a foundation for theoretical work in BST4100 (Theory of Biostatistics I), BST4200 (Theory of Biostatistics II) and BST3200 (Applied Biostatistics II). As the major has a small number of students; because the University has a minimum enrollment for a course to run; and to address teaching capacity limitations, BST4100 and BST4200 are now cross-listed with the graduate equivalents. As such, undergraduate, masters, and doctoral students are in class together; each training level has a syllabus that reflects the PLOs and needs of those students. Because the masters and doctoral are not required to have Calculus III and Linear Algebra as pre-requisites, the theory covered in BST4100 and BST4200 is taught without using these higher-level math skills. Similarly, when BST3200 was developed, the intention was for linear algebra to be used to teach regression. However, due to challenges with faculty teaching capacity, a doctoral student who did not have the linear algebra background taught the course this year (it was not taught last year); as such, linear algebra was not used to teach regression. Because students are demonstrating achievement of LO1 without the need for these higher-level math classes, the decision was made in August 2021 to remove them as pre-requisites from the major courses beginning in fall 2022. To assess impact of this decision, achievement of LO1 will be monitored after that change is implemented to see if trends remain steady or fall.

If no changes are being made, please explain why.

Due to the tumultuous academic year of in-person hybrid classes and the need to modify class delivery and content as the year progressed in response to student needs (e.g. due to quarantine/isolation), data collected this year are not comparable to prior years. Thus, no curricular changes will be made based on this year's data.

7. Closing the Loop: Review of Previous Assessment Findings and Changes

A. What is at least one change your program has implemented in recent years as a result of assessment data?

This is only the 4th graduating class (with only 1 graduate in the prior academic year and about 20 graduate total). Additionally, because we've only had 2 years of usable program assessment data (<15 graduates) due to only 1 graduate in 2020, and because of the impact of the pandemic on class structure and overall student learning and mental health (second half of AY2019-2020 and AY2020-202), no program changes were implemented based on assessment reports.

One curricular change made in the past was to cross-list BST4100, BST4200, and BST4400 with the graduate equivalent courses and to offer each only once a year. The decision was made because:

- There are ~20 students total (all four years) in the BST major in a given academic year, with an even smaller number (~1-4) who enroll in these upper-level courses. Courses need minimum enrollment to run ($n \geq 10$ students), a number that isn't possible with undergrads alone in the classes.
- BST is facing teaching capacity challenges, with more course sections taught than faculty availability due to research and administrative buy-out.

Thus, these three 4000-level courses have undergraduate, masters, and doctoral students in class together; each level has a syllabus that reflects the PLOs and needs of those students.

B. How has this change/have these changes been assessed?

These changes were assessed by monitoring LO achievement via the capstone project in BST4400.

C. What were the findings of the assessment?

Despite the cross-listing of courses, and despite no other curricular changes, Capstone data continue to indicate a positive trend, that the curriculum is designed in a way that enables students to achieve or exceed achievement of LO 1 and LO2 by graduation.

Because LO achievement as assessed via the capstone project (completed in BST4400) has remained high, this indicates that the changes to cross-listing the UG sections with the graduate sections has not had a negative impact on student learning.

D. How do you plan to (continue to) use this information moving forward?

We will continue to cross-list BST4100, BST4200, and BST4400 with the graduate equivalents in future academic years.

IMPORTANT: Please submit any assessment tools (e.g., rubrics) with this report as separate attachments or copied and pasted into this Word document. Please do not just refer to the assessment plan; the report should serve as a stand-alone document.

Appendix A: BST4400 Capstone Project Rubric for Assessment of Program Learning Outcomes

BS-BST LO1: Perform computations, derivations and calculations as they relate to calculus and linear algebra.

BS-BST LO2: Use standard statistical software to create and manage datasets and perform basic statistical tests.

Evaluation of performance		
0	Failed to achieve	Student did not demonstrate understanding of learning objective (<70% of skills demonstrated)
1	Achieved	Student demonstrated understanding of learning objective at a basic level (70-100% of skills demonstrated)
1.5	Exceeded expectations	Student demonstrated understanding of learning objective at an advanced level (>100% of skills demonstrated)

Program Learning Objectives (LO) mapped to elements of and specific skills required in the Capstone Project

Category	Specific Skill	Program Learning Objective	Oral Presentation ^a	Written Paper ^a	Coverage ^b
Models	Create process model (show clarity, comprehensiveness, and explanation)	BST-LO4			
Data cleaning	The plan should address identifying and rectifying outliers	BST-LO2			
	Assessing validity of responses (only one or two examples needed)	BST-LO4			
	Any other check for cleanliness that you can derive...be creative	BST-LO4			
Sample Size	Sample Size	BST-LO1			
	Power	BST-LO2			
	Presentation of sample size	BST-LO3			
Missing data	Simple methods	BST-LO2			
	Multiple imputation	BST-LO2			
	Comparison	BST-LO3			
Methods Section	Research questions	BST-LO4			
	Information about data	BST-LO3			
	Planned statistical methods	BST-LO3			
Results Section	Written results	BST-LO3			
	Results tables	BST-LO3			

Program Learning Objective	Coverage Sum	Percent Coverage	Performance on LO
LO1	Sum of coverage scores for corresponding skills above	$(\text{Coverage Sum} / \# \text{ of skills}) * 100$	0 = < 100% 1 = 100% 1.5 = >100%
LO2	Same as above	Same as above	Same as above
LO3	Same as above	Same as above	Same as above
LO4	Same as above	Same as above	Same as above