UNIVERSITY OF SAN FRANCISCO | College of Arts and Sciences

BACHELOR OF SCIENCE IN DATA SCIENCE

ASSESSMENT REPORT
ACADEMIC YEAR 2017 – 2018

I. LOGISTICS & PROGRAM LEARNING OUTCOMES

1. **Please indicate the name and email of the program contact person to whom feedback should be sent (usually Chair, Program Director, or Faculty Assessment Coordinator).**

   Outgoing Director (F18): Nathaniel Stevens (ntstevens@usfca.edu)

   Incoming Director (S19): James Wilson (jdwilson4@usfca.edu)

2. **Were any changes made to the program mission statement since the last assessment cycle in October 2017? Kindly state "Yes" or "No." Please provide the current mission statement below. If you are submitting an aggregate report, please provide the current mission statements of both the major and the minor program.**

   No

   To deliver a high-quality data science program that instructs students in the theory and practice of mathematical and computation analysis of applied data driven problems, and to graduate students with appropriate experience in industry-standard data science tools.

3. **Were any changes made to the program learning outcomes (PLOs) since the last assessment cycle in October 2017? Kindly state "Yes" or "No." Please provide the current PLOs below. If you are submitting an aggregate report, please provide the current PLOs for both the major and the minor programs.**

   Yes, we slightly adapted the language of PLO1 as was suggested in the feedback for our 2016-2017 assessment report.

   - [PLO1] Analyze information critically and logically in a mathematical setting.
   - [PLO2] Reformulate and solve problems in an abstract framework.
   - [PLO3] Express mathematical results verbally, working individually and in collaborative groups.
   - [PLO4] Apply mathematical techniques to specific problem domains
   - [PLO5] Demonstrate competence with programming concepts, including software development techniques and data structures
   - [PLO6] Apply mathematical and computational techniques to real-world problems involving large, complex data sets.
   - [PLO7] Visualize, present and communicate analytical results.

4. **Which particular Program Learning Outcome(s) did you assess for the academic year 2017-2018?**

   PLO1, PLO4, PLO5

II. METHODOLOGY

5. **Describe the methodology that you used to assess the PLO(s).**

   For example, "the department used questions that were inputted in the final examination pertaining directly to the <said PLO>. An independent group of faculty (not teaching the course) then evaluated the responses to the questions and gave the students a grade for responses to those questions."

   We directly assessed all graduating seniors with and end-of-degree exam given in the Spring 2018 semester. This exam consisted of 14 multiple choice questions spanning topics from the required curriculum. This exact exam, with the same 14 questions, was also given (for the first time) to the previous cohort of graduating seniors in the Spring 2017 semester. It is our intention to continually assess our students and, by extension, the program by annually giving the graduating seniors the same exam. This will provide objective and comparable year-over-year data with which we can evaluate the effectiveness of the program. We presently have two years of data whose results and findings I will discuss in the next section. Note that the exit exam is attached as a separate document.

III. RESULTS & MAJOR FINDINGS

6. What are the major takeaways from your assessment exercise?

This section is for you to highlight the results of the exercise. Pertinent information here would include:

Having only used this exit exam as a direct assessment tool for two years it is difficult to draw strong year-over-year conclusions, especially with such small sample sizes. That said, strictly speaking, graduating seniors performed slightly better (on average) on the exam in 2018 than the ones in 2017, as is evidenced by the data presented in Figure 1. However, a two-sample *t*-test does not find these averages (8.83 vs. 9.00) to be statistically significantly different (*p*-value = 0.8870).

Because there is no significant difference in exam scores between the two years we pool both years together, increasing our effective sample size to $n = 16$. In Figure 1 we see that the scores range from a minimum of 6 to a maximum of 12. We distinguish among different levels of student mastery based on these scores. In Table 1 we define four levels of mastery, map those to ranges of test scores and identify the percentage of students achieving each level. This information is also depicted in Figure 2.

Level of Mastery	Exam Scores	No. Students	% Students
Poor	0-6	4	25%
Satisfactory	7-9	4	25%
Good	10-11	7	44%
Excellent	12-14	1	6%

Table 1: BSDS Levels of Mastery (2017 and 2018 aggregate)

Overall, we were pleased with the performance of our graduating seniors though we recognize there is still room for improvement. For instance, we would prefer to have a smaller percentage of students scoring in the "Poor" category – though this distribution should be interpreted cautiously as there are so few data points. Nonetheless, we intend to provide additional emphasis on problem areas identified by the exam in our degree-required classes. This is elaborated upon in the next section.

As mentioned previously, we also plan to give this exam to every graduating student on an annual basis allowing us to evaluate year-over-year improvements.

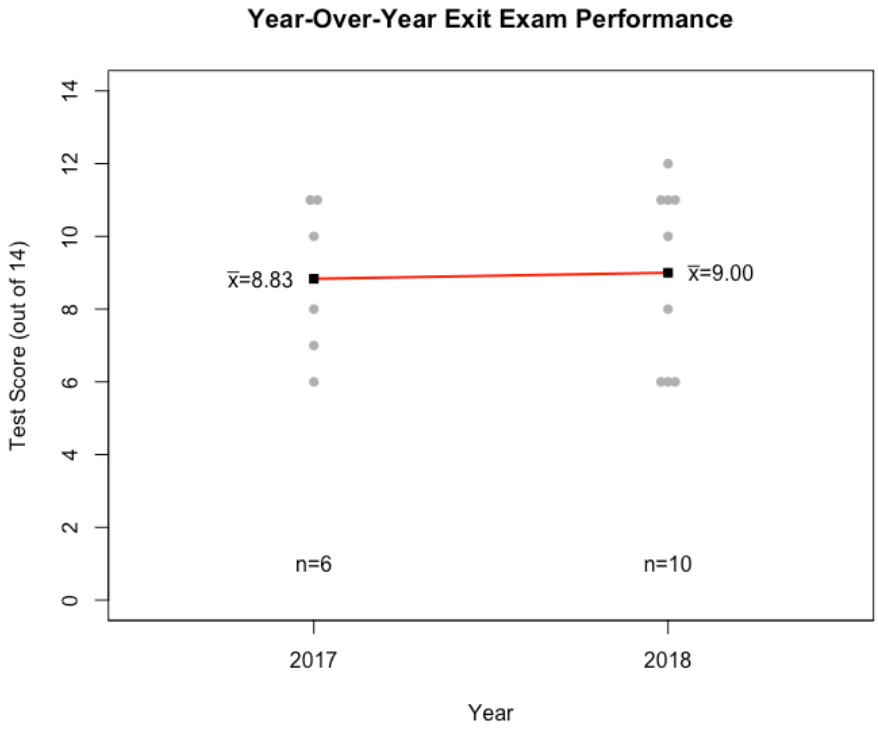

Figure 1: BSDS Exit Exam Scores (2017 vs. 2018)

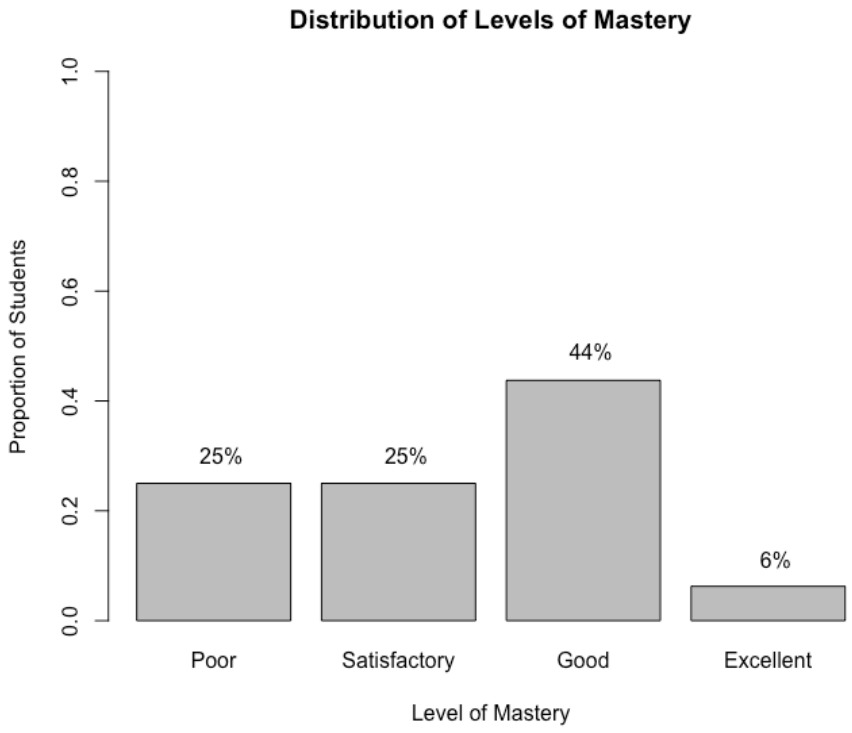

Figure 2: BSDS Levels of Mastery (2017 and 2018 aggregate)

IV. CLOSING THE LOOP

7. **Based on your results, what changes/modifications are you planning in order to achieve the desired level of mastery in the assessed learning outcome? This section could also address more long-term planning that your department/program is considering and does not require that any changes need to be implemented in the next academic year itself.**

   By carefully scrutinizing the exam results it has become apparent that Questions 1, 3, 8, 11 and 13 are the ones that students most often struggle with. The students' difficulty with these questions indicates a struggle specifically with PLO4. The topics being tested by these questions are:

   - Conditional probability
   - Eigenvalue calculation
   - *p*-value interpretation
   - Likelihood estimation

   All of these topics are tied to specific classes (MATH 230, MATH 370, MATH 371). Based on these findings we plan to ensure these topics (in these classes) are clearly emphasized and that their importance beyond the classroom is highlighted. This should help to improve student performance on these questions and the level of mastery associated with this learning outcome.

8. **What were the most important suggestions/feedback from the FDCD on your last assessment report (for academic year 2016-2017, submitted in October 2017)? How did you incorporate or address the suggestion(s) in this report?**

   1. I changed the wording of PLO1 and used the language suggested in the feedback from our previous report.

   2. It was mentioned that the results from last year's exit exam were neither thoroughly nor clearly communicated, and we did not provide a clear description of the way in which we plan to continually assess the program on an ongoing basis. I hope that my analysis and discussion this year are to the FDCD's satisfaction.

   3. It was mentioned that our previous discussion surrounding "closing the loop" was not detailed enough. I hope that my analysis and discussion in this year's report is sufficient.