

UNIVERSITY OF SAN FRANCISCO
College of Arts and Sciences

BS in Computer Science—Program Assessment Plan

Program Goals

This document outlines a comprehensive plan for obtaining quantitative and qualitative data that can be used to determine how well our BSCS program is achieving our stated student learning outcomes. Our goal is to establish effective, but low overhead strategies for acquiring assessment data and computing assessment metrics based on this data. We believe such an approach will help in securing broad faculty participation and ensuring long-term data collection that will help us shape our curriculum in the future. We are developing a consistent framework that can be used for the BSCS program as well as our graduate programs: MSCS (Masters of Science in Computer Science) and MSIE (Masters of Science in Internet Engineering).

Program Learning Outcomes

We start with our current learning outcomes. Students who complete the Bachelors of Science in Computer Science will be able to demonstrate:

- An understanding of fundamental topics in computer science including programming, data structures, algorithms, and computer systems implementation;
 - The first outcome gives a broad overview of the sub-disciplines that our students are exposed to in the core degree program. Knowledge and mastery of these sub-disciplines is essential to becoming a successful computer scientist.
- The ability to design, implement, and debug software applications;
 - The second outcome describes cross-cutting skills (design, programming, and debugging) that are acquired through most of our required courses.
- Effective communication and team participation skills with respect to software development.
 - Finally, the third outcome regarding effective communication and team participation is not covered as intensely in the curriculum as the others, but it is an important goal.

One of our goals in this assessment plan is to better track our effectiveness in student success in these areas.

Part of this plan includes the deployment of web-based software to assist in the collection and reporting of our assessment data. The idea is to make it as easy as possible to obtain information, either in the form of grades or instructor evaluation. The web-based assessment application will allow for easy reporting and visualization of our data. We want to ensure that the data is and resulting metrics are easily understood by our faculty.

Note that we are currently undergoing a full redevelopment of our undergraduate curriculum, so some of the specifics discussed in this plan will be subject to change. However, this plan is developed in a way to be easily adapted to curriculum changes.

Assessment Plan

Our assessment plan consists of utilizing grade data to track student learning in core computer science areas. In addition, we plan to better track student learning over time. We will supplement the raw grade data with instructor feedback on student potential and communication skills. Using a new web-based tracking system, instructors will submit supplemental assessment data in addition to grades.

2.1 Assessment Clusters

In the Department of Computer Science, we put a high degree of confidence in using grades as a metric for assessing student performance and comprehension. However, a single GPA number does not give insight into how a student is meeting our specific learning outcomes. As such, we propose to define core clusters for which we will compute independent GPA values. Such values will give us insight into how students are performing in each of our learning outcome areas. The clusters consist of the following areas: foundational, mathematics and theory, software development, and systems. Some courses reside in more than one cluster, representing the fact that such courses have mixed content.

2.1.1 Foundational

The foundation course cluster consists of the introductory CS courses and one sophomore-level course. This cluster will help us track overall performance of our students when they first begin the program. The foundational cluster consists of the following courses:

- CS 110 Introduction to Computer Science I (4 units)
- CS 112 Introduction to Computer Science II (4 units)
- CS 245 Data Structures and Algorithms (4 units)

2.1.2 Mathematics and Theory

The mathematics and theory cluster consists of the required math courses as well as CS 245. This cluster represents will reveal how well our students are performing in math and abstract concepts. This cluster consists of the following courses:

- Math 109 Introduction to Calculus and Analytic Geometry I (4 units)
- Math 201 Discrete Mathematics (4 units)
- Math 202 Linear Algebra and Probability
- CS 245 Data Structures and Algorithms (4 units)

2.1.3 Software Development

The software development cluster includes CS courses that stress designing, building, and debugging software applications. This cluster consists of the following courses:

- CS 220 Introduction to Parallel Computing (4 units)
- CS 342 Introduction to Software Engineering (4 units)
- CS 490 Senior Team Project (4 units)

2.1.4 Systems

The systems cluster includes courses that focus on low-level program and the design and implementation of computer systems. This cluster consists of the following courses:

- CS 210 Assembly Language and System Programming (4 units)
- CS 220 Introduction to Parallel Computing (4 units)
- CS 315 Computer Architecture (4 units)
- CS 326 Operating Systems (4 units)
- CS 414 Compilers (4 units)

2.2 Communication Skills

Many of our courses have some degree of graded written, verbal, and presentation requirements. However, we currently have no mechanism to assess how well students are doing in this area. One of the goals of this assessment plan is to give our faculty a simple way to record communication skill performance independent of the technical requirements for each course. For each course, we will provide a separate web-based grading application that can be used to record communication skills grades for each course.

The CS faculty will have to come to an agreement on how to best evaluation and score the communication skills component for each course. Initially will not require all courses to included a graded communication skills component. We will focus on the courses that already have a formal requirement.

2.3 Student Potential

Often, grades do not accurately reflect the real potential of student ability. Faculty often talk about students who are really sharp, but who do not do well on tests or lack the motivation to meet all the project requirements. We want to track the more subjective notion of student potential to help better understand their performance. We believe that more explicit tracking of student potential will better help us with advising.

2.4 Student Progress

Once thing we currently do not look at is how well students do over the course of their time in the program. Do students improve over time? Do they do more poorly over time? Our proposed assessment web application will help answer these questions. We can compute the derivative of CS grades over time to summarize progress. We can do this for each cohort to see how cohorts compare over time.

Proposed Data and Metric Usage

The first part of this assessment plan is setting up a system for acquiring performance data and computing metrics on this data. We believe that having such data will enable us to better identify what we are doing well and where we need to improve.

Here are some of the initial components that we believe we can evaluate with our new metrics.

- Cluster Performance By simply looking at GPAs for each cluster will indicate how student respond to each sub area.
- Communication Skills Our new system will allow us to gauge how well students are performing in terms of communication.
- Progress We will better understand how students perform throughout the program. Where are the trouble spots?