

**ACADEMIC SENATE**

**Committee on Academic Planning and Review**

**ANNUAL PROGRAM REPORT**

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| College | Science |
| Department | Computer Science |
| Program | Master’s in Computer Science |
| Reporting for Academic Year | 2017-2018 |
| Last 5-Year Review | 2010-2011 |
| Next 5-Year Review | 2017-2018 |
| Department Chair | Matt Johnson |
| Date Submitted | 6/27/2018 |

# SUMMARY OF ASSESSMENT *(suggested length of 1-2 pages)*

## Program Learning Outcomes (PLO)

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| Students graduating with an M.S. in Computer Science from CSU East Bay will be able to:   1. Apply knowledge of mathematics and computational theory to analyze problems in computer science, and assess and determine the resources and requirements needed for their solution. (ILO 1,2) 2. Design, develop, and evaluate a computer-based system, process, component, or program to meet desired needs. (ILO 1,4) 3. Classify and explain the mechanisms, components and architecture of computing systems. (ILO 1) 4. Employ current techniques, skills, and tools necessary for computing practice, and justify the need for continuing professional development. (ILO 1) 5. Discuss professional, ethical, legal, and security issues and responsibilities and the impact of computing on individuals, organizations and society. (ILO 1,2) 6. Function successfully on teams to accomplish a common goal, and explain computer science concepts effectively in written and oral form. (ILO 1,5) |

## Program Learning Outcome(s) Assessed

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| Following our assessment plan, the Department is assessing one PLO per year. This is the fourth year that assessment has been done and so we are assessing PLO 5 this year. The department does collect assessment data for all targeted courses each year, however, so as to track trajectories for scores on all PLOs and allow for “closing the loop.”  Evaluation for assessment purposes was completed in three sections of one course this year (addressing PLO 5):  CS 6000 – Research Methodologies, Required, Developing PLOs 2 and 5  Assessed Fall 2017, Winter 2018, Spring 2018 |

## Summary of Assessment Process

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| **Instrument(s) and Sampling Procedure:**  The Department created SLOs and PLOs for the Master in Computer Science program in the academic year 2012-2013. The Department made the decision to use Blackboard as a means to provide students with an assessment exam that addresses the SLOs of each course. The SLOs for each course have been mapped to the program PLOs and the ILOs of the university. The assessment exams were developed for the required courses in the program, as well as a representative set of elective courses. The assessment instruments were then made available to the department faculty via a BlackBoard repository. Instructors teaching courses which were to be assessed in a given year deployed the tests and reported the results back to the Graduate Coordinator. Since PLO 5 actually assesses critical thinking on societal issues, it is assessed based upon a research paper assignment rather than the BlackBoard instruments used to assess the other PLOs.  **Sample Characteristics:**  The Department has been using the above assessment mechanism for three years now and can evaluate its advantages and disadvantages. Unfortunately, evaluating the results of the assessment exams as they stand is challenging, as each assessment contains questions addressing multiple PLOs. Due to a BlackBoard limitation, the results for individual PLOs cannot be automatically aggregated and compared across multiple courses, and instead must be tabulated by hand. To solve this problem, for the semester-based program, the Department agreed to develop assessment instruments that address only one PLO at a time. This will allow assessment to be automated, providing the opportunity to assess more courses, and assess those courses more frequently. The Department has developed all of the new assessment instruments for the semester-based program and is in the process of porting them into BlackBoard for use in Fall 2018. Again, the societal issues PLO will be assessed somewhat differently than the other PLOs. It will be assessed through short writing exercises that are graded via a rubric.  An additional challenge in the current system is assessing PLOs for both the Master’s in Computer Science program and the Master’s in Computer Network program. Since the programs share the great majority of the courses, but have different PLOs, it has been necessary to provide separate mappings of course SLOs to the PLOs of the two different programs, or to include additional questions on the assessment instruments to address the different PLOs. Fortunately, this difficulty will be eliminated under the semester-based program as the Master’s in Computer Science and the Master’s in Computer Networks have been combined into a single program with common PLOs. In addition, the PLOs for the Bachelor’s and Master’s programs have been coordinated so that matching PLOs for the undergraduate and graduate programs will be evaluated on the same timetable.  **Data Collection:**  Assessment data for PLO 5 was collected in three sections of one course, CS 6000 Research Methodologies, in Fall 2017, Winter 2018, and Spring 2018. The data were collected by the instructors of the sections from the research paper assignments that they had assigned as part of the course requirements.  **Data Analysis:**  One major limitation regarding assessment of PLO 5 is that only data regarding Development of the PLO is available. No data regarding Mastery of the PLO could be collected because the courses in which it was to be collected were not scheduled in academic year 2017-2018. The courses in which Mastery of PLO 5 was to be assessed were three electives, CS 6526 - Security in Wireless and Mobile Computing, CS 6592 - Network Management, and CS 6594 - Broadband and Multimedia Networks. All of these courses are being eliminated or subsumed into the semester-based CS 697B – Topics in Computer Networks course, and as such, were not offered this year. The Department has identified the assessment of PLOs in elective courses as a deficiency of our existing assessment plan, and chosen to assess only required courses under our semester-based plan. For the current year, this assessment report will only address Development of PLO 5.  CS 6000 is a required course in Research Methodologies addresses topics in information literacy, critical thinking, and written and verbal communication. It requires advanced understanding of computer science theory and practice in order to evaluate journal and conference articles that form the basis of the content. Course requirements include writing of a research paper and presentation of that paper to the class including discussion of the impact of the results on society which is why it particularly addresses PLO 5.  In evaluating the assessment scores for PLO 5, we find excellent results in two of the sections assessed, Fall 2017 and Winter 2018, with less impressive results in the last section, Spring 2018. PLO 5 is one of the more challenging outcomes for students to achieve in that it requires students to develop and master their critical thinking as well as written communication skills. Developing good critical thinking and written communication skills often takes years of practice and should be begun early in an undergraduate career. Again, most of the graduate students in the Master’s in Computer Science program are international students, and many international Computer Science programs do not stress these skills to the degree that is necessary to become proficient. As a result, many of our Master’s students start at a disadvantage in regards to PLO 5. The Department addresses this disadvantage by advising students to take the WST and often required remediation courses as soon as possible, and by emphasizing the need for written assignments in as many Master’s degree courses as possible.  The wide disparity between the assessment results in Fall and Winter versus Spring could be due to preparation of the individual students in the sections assessed although this would seem unlikely due to the fairly large sample sizes, 30 in Fall 2017, 25 in Winter 2018, and 28 in Spring 2018. More likely, the poor performance in Spring 2018 was due to the choice of research papers that were to be evaluated and presented. Students are given their own choice of research papers to evaluate and present, and sometimes choose papers which are too advanced for them to successfully evaluate without additional preparation. This would lead to a poor assessment score on both their research paper and presentation.  In regards to closing the loop and using the results of the assessment process to improve student learning for PLO 5, it would appear that the students in CS 6000 usually successfully develop the PLO and no further modifications are needed. In some cases though, we see drastically poorer development of the PLO. The Department would prefer that course requirements lead to improved development of the PLO for all students and that less variation be seen between sections. There is wide latitude available in the course for addressing different areas or additional material, so fine-tuning would be aimed towards identifying subject material which most successfully results in student acquisition of the critical thinking and written communication skills. This could be implemented by providing the students with a list of pre-approved journal articles of appropriate complexity, or by requiring instructor approval of journal articles before students began their own evaluation and presentation. In addition, as with most classes, it would be beneficial to provide additional learning opportunities for students who were unsuccessfully served by the current class format. These opportunities might include high impact educational practices such as collaborative projects or swapped classrooms. |

## Summary of Assessment Results

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| **Main Findings:**  At the Development level, most students have attained a high level of proficiency in PLO 5, although some require additional work. Due to course scheduling, assessment data at the Mastery level is not available.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **2017-2018 Assessment Results** | **1** | **2** | **3** | **4** | **5** | | CS 6000 Research Methodologies (Fall 2017) |  |  |  | **93.0%** |  | | CS 6000 Research Methodologies (Winter 2018) |  |  |  | **95.4%** |  | | CS 6000 Research Methodologies (Spring 2018) |  |  |  | **69.8%** |  |   **Recommendations for Program Improvement:**  The Department has proposed a transformed curriculum for the semester-based system which includes a new required course in Cybersecurity which will provide students with the opportunity to improve the critical thinking and written communication skills essential to attaining proficiency in PLO 5. Also, as described above, the assessment tools that the Department is currently using are unwieldy, and there is the potential for selection bias in assessing certain PLOs since they are assessed in elective courses which not all students may take. Under the semester system, the Department plans to assess PLOs in required courses only and has created assessment tools which more clearly assess one PLO at a time.  **Next Step(s) for Closing the Loop:**  An instrument and rubric for assessing PLO 5 under semesters has been developed and is being ported into BlackBoard for use in Fall 2018. Course instructors teaching CS 671 – Cybersecurity, where PLO 5 will be assessed, will be encouraged to include more opportunities for development of critical thinking and written communication skills in the courses. In addition, it would be beneficial to provide additional learning opportunities for students who were unsuccessfully served by the current class format. These opportunities might include high impact educational practices such as collaborative projects or swapped classrooms.  **Other Reflections:** |

## Assessment Plans for Next Year

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| The Department will begin using its new semester-based program assessment plan and will assess PLO 1 next year. Please note that, since the Master’s program PLOs were adapted to match the Bachelor’s program PLOs under the semester-based system, assessment data from the quarter-based PLOs will not provide a meaningful comparison to that gathered under the semester-based system. |