Name of the Program/Department: BS in Computer Science

Year: 2015/2016

Name of the Preparer: M. Padmaja Rao

Mission

The Computer Science Department aims to instill in our students a sound knowledge of all key domains of the computing sciences while encouraging critical thinking, teamwork, innovation, and a lifelong love for learning. We have a vision of graduating engineers, who are ethical, creative in problem solving, effective communicators, respectful of their peers, and have a desire to serve their community. Our internship program and placement efforts actively assist students in finding computing jobs.

Program Learning Outcomes

1. Our students will have critical thinking skills along with creativity to analyze and solve software engineering and computational problems.
2. Our students will be able to effectively communicate.
3. Our students will have an understanding of ethical perspectives and be guided by high ethical standards.
4. Our students will know the core concepts within each computer science discipline: programming, computer architecture, software engineering, algorithms, operating systems, compiler theory, theory of computation, and database management.

Executive Summary

The Bachelor of Computer Science (BS) program has five program learning outcomes (PLO) which include teaching students to think critically and logically, communicate effectively, understand the ethical issues during the process of software development and deployment, be creative in their approach to building information systems, and have functional knowledge of areas in computer science. These five PLO's translate into five student learning outcomes (SLO) where students will be able to analyze problems critically and logically, will exhibit good oral communications skills, will exhibit good written communication skills, will be aware of ethical issues that are arising during the software engineering life cycle, will demonstrate creativity in their approach to building information systems, and will demonstrate functional knowledge of each areas of computer science

We measured two of the five SLOs by presenting juniors with an ethics module that consists of a series of readings, case studies, and discussion questions that engage the student in ethical reflection. Since current computer science classes are small in size, writings from all the eight students were evaluated by two faculty members. The other three SLOs were measured in the Capstone projects of graduating seniors who presented their projects at the annual Computer Science Symposium. Again due to the smaller graduating class, all five graduating seniors were evaluated by three faculty members. The median score is used to evaluate the students. The benchmark is that 80% of the students will meet or exceed expectations.

We conclude that the benchmark was met in all five SLOs. We would like to aim higher and have 90% of our students exceed expectations in 2016-2017.

Student Learning Outcomes

The students in the Computer Science Program in the School of Business

1. Will be aware OF ethical issues that are created while making business decisions by
   a. Identifying the multiple elements of the issues and identifying the dilemma of the decision maker
   b. Identifying the relationship among direct and indirect stakeholders
   c. Identifying the positive and negative consequences of the issues
   d. Able to recommend a response that balances the positive and negative consequences for the stakeholders

   The benchmark was that 80% or more students would meet or exceed the above expectations

2. Will exhibit good written communication skills by
   a. Proper use of vocabulary
   b. Presenting the information in an organized manner
   c. Writing free of grammatical and spelling errors
   d. Ensuring all issues, recommendations are well integrated and supported

   The benchmark was that 80% or more students would meet or exceed the above expectations

3. Will exhibit good oral communications skills by
   a. Presenting the information in an organized manner
   b. Proper use of vocabulary
   c. Makes and maintains eye contact with the audience
   d. Making the speech in a voice that is understood
   e. Using effective body language
   f. Speaking with minimal reference to notes

   The benchmark was that 80% or more students would meet or exceed the above expectations

4. Will demonstrate critical thinking by
   a. Identifying and understanding the information systems problem,
   b. Gathering and managing functional and non-functional requirements
   c. Implementing risk management
   d. Implementing project management (project planning and estimation)
   e. Implementing a viable solution that meets functional and non-functional requirements

   The benchmark was that 80% or more students would meet or exceed the above expectations

5. Will demonstrate creativity in their approach to solving business problems by
   a. Identifying multiple elements of the problem and elaborate on the problem in ways to show insights beyond the stated situation
   b. Identifying components of the situation that are beyond the given information and identifying unanswered questions that are of consequence to the solution
   c. Developing a solution that transforms the assumptions of the situation and is easily visualized as being implemented as a solution to the problem

   The benchmark was that 80% or more students would meet or exceed the above expectations

Assessment Methods

1. Computer Science students will be aware of ethical issues they might encounter in the context of software engineering practice.

Students in CS 340, Software Engineering, were introduced to the SOFTWARE ENGINEERING CODE OF ETHICS AND PROFESSIONAL PRACTICE (Version 5.2), which was adopted by the ACM/IEEE-CS Joint Task Force on Software Engineering Ethics and Professional Practices. This was followed by engaging students in interactive discussions about ethical issues that the students might face as practicing software engineers. The students were than given an ethics module, "An Introduction to Software Engineering Ethics" by Shannon Vallor and Arvind Narayanan from the Markkula Center for Applied Ethics at Santa Clara University. The module consists of a series of readings, case studies and discussion questions that engage the student in ethical reflection.

The majority of the students in CS 340 are juniors. Since our class sizes are small, responses from all our eight students were reviewed by two faculty members according to the rubric. The rubric for each learning outcome contained multiple criteria and the median score for each was taken as the score for a student. The median scores were summarized, and depending on the score, the student was classified into three categories: Below Expectations, Meets Expectations, and Above Expectations.

The benchmark was that 80% or more of students would meet or exceed expectations

2. Computer Science students will be able to demonstrate superior written communication skills

An ethics module was given the juniors in CS 340, Software Engineering. The module consists of a series of readings, case studies and discussion questions that engage the student in ethical reflection. Answers from all eight students were selected to be reviewed by two faculty members according to rubric. The rubric for each learning outcome contained multiple criteria and the median score for each was taken as the score for a student. The median scores were summarized, and depending on the score, the student was classified into three categories: Below Expectations, Meets Expectations, and Above Expectations.

The benchmark was that 80% or more of students would meet or exceed expectations

3. Computer Science students will be able to demonstrate superior oral communications skills

The graduating students in CS 480 presented their capstone projects at the annual Computer Science Symposium, on April 4th 2016. The attendees were from Francis Marion University and the local community. Because of small sizes of the computer science upper level classes, all five graduating student were reviewed by three faculty members, according to rubric. The rubric for each learning outcome contained multiple criteria and the median score for each was taken as the score for a student. The median scores were summarized, and depending on the score, the student was classified into three categories: Below Expectations, Meets Expectations, and Above Expectations.

The benchmark was that 80% or more of students would meet or exceed expectations

4. Computer Science graduates will to analyze information system problems critically and logically.

Computer Science seniors were asked to identify and understand an information systems problem, gather requirements, implement risk management and project management, and provide a viable solution for this problem for their capstone projects in CS 480. The capstone projects of all five graduating students were selected to be reviewed by three faculty members according to rubric. The rubric for each learning outcome contained multiple criteria and the median score for each was taken as the score for a student. The median scores were summarized, and depending on the score, the student was classified into three categories: Below Expectations, Meets Expectations, and Above Expectations.

The benchmark was that 80% or more of students would meet or exceed expectations

5. Computer Science graduates will demonstrate creativity in their approach to solving information systems problems.

All five graduating students' capstone projects were selected to be reviewed by three faculty members according to rubric. The rubric for each learning outcome contained multiple criteria and the median score for each was taken as the score for a student. The median scores were summarized, and depending on the score, the student was classified into three categories: Below Expectations, Meets Expectations, and Above Expectations.

The benchmark was that 80% or more of students would meet or exceed expectations

Assessment Results

The assessment results are from Spring 2016

Table 4: Assessment results

	Benchmark	CS 340	CS 480
Ethics	80%	100%	
Written Communication	80%	93.75%	
Oral Communication	80%		100%
Critical Thinking	80%		100%
Creativity	80%		100%

1. Computer Science students will be aware of ethical issues that they might encounter in the context of practicing software engineering. 100% of juniors in CS 340 met or exceeded expectations in ethics. **We concluded that the benchmark was achieved** since over 80% of the student met or exceeded expectations in the Spring of 2016.

2. Computer Science students will be able to demonstrate superior written communication skills Written communication skills have been assessed at the junior level. 93.75% of the students met or exceeded expectations in the Spring 2016. **We concluded that the benchmark was achieved.** Over 80% of the student met or exceeded expectations in Spring 2016.

3. Computer Science students will be able to demonstrate superior oral communications skills Graduating seniors were tested in CS 480 for oral communication skills. 80% of the seniors met or exceeded expectations in oral communication in their capstone projects in Spring 2016. **We concluded that the benchmark was achieved**. Over 80% of the student met or exceeded expectations in Spring 2016.

4. Computer Science graduates will analyze information system problems critically and logically. 100% of graduating seniors tested met or exceeded expectations using critical thinking in their capstone projects in Spring   2016. **We concluded that the benchmark was achieved**. Over 80% of the student met or exceeded expectations in Spring 2016.

5. Computer Science graduates will demonstrate creativity in their approach to solving information systems problems. 100% of the graduating seniors met or exceeded expectations giving creative solutions in their capstone projects in Spring 2016. **We concluded that the benchmark was achieved**. Over 80% of the student met or exceeded expectations in Spring 2016.

Action Items

Based on data collected during the 2015-2016 academic year using a presentation rubric, it was determined that the 80% target was achieved for each student learning outcome. The rubric for each learning outcome contained multiple criteria and the median score for each was taken as the score for a student. The median scores were summarized, and depending on the score, the student was classified into three categories: Below Expectations, Meets Expectations, and Above Expectations. On average, 98.8% of students met or exceeded expectations on the following five student learning outcomes:

SLO 1.0. Computer Science students would be aware of ethical issues they might encounter in the context of software engineering practice.

SLO 2.0. Computer Science students would be able to demonstrate superior written Communication skills

SLO 3.0. Computer Science students would be able to demonstrate superior oral communications skills

SLO 4.0. Computer Science graduates would be able to analyze information system problems Critically and logically.

SLO 5.0. Computer Science graduates would demonstrate creativity in their approach to solving information systems problems.

The Computer Science faculty set as a goal for 2016-2017 that 100% of students would exceed expectations, especially in the areas of oral and written communications and ethics. The Department of Computer Science developed the following action plan to be implemented during the 2016-2017 academic year:

1. Oral Communication
Modify the junior year presentation in CS 340 such that the review and evaluation of the presentation is done by a panel reviewing a video-taped presentation. This experience and analysis will definitely provide more diverse feedback and consequently affect a positive change on the student's senior capstone presentations at the Computer Science Symposium.

2. Written Communications
In collaboration with professors in the English Department, modify English 318, Technical Writing, so that the course includes an emphasis of content organization and depth of discussion.

3. Ethics
Modify the junior-year CS 340 course by providing students with multiple examples of how to approach the discussions in the ACM/IEEE Software Engineering Code of Ethics module before beginning the assignment. Based on data from 2015-2016 (the presentation rubric) the CS faculty concluded that this pre-exposure will result in broader and deeper discussions.