UNIT REPORT

Computer Science BS - Institutional Effectiveness Final Annual Report 2019

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Definition of Unit

CSC Mission Statement

Reporting Year: 2017-2018

Providing Department: Computer Science BS

Department/Unit Contact: Doug Talbert

Mission/Vision/Goal Statement:

The mission of the Computer Science Department is

“Our mission is to be widely recognized for enabling students to have global impact through innovative and quality programs, through research that emphasizes collaborative partnerships, and by enabling the success of a diverse student, faculty, and alumni community.”

This mission is consistent with the University’s mission to “provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation” and with the University’s commitment to the life-long success of students and to enrich the lives of people and communities in the Upper Cumberland region of Tennessee.

It is also consistent with Flight Plan, the University’s strategic plan, and it’s focus on improving student experience, transforming technology, and creating distinctive programs.

Goal/Objective/Outcome

Program Goal 1: Professionalism

Define Goal:

Our graduates will exhibit the clear communication, responsible teamwork, commitment to quality, and professional attitudes and ethics needed to engage in successful careers in industry, academia, and public service.

Intended Outcomes / Objectives:

4. An ability to make informed judgments in computing practice based on legal and ethical principles.

5. An ability to function effectively on teams to establish goals, plan tasks, meet deadlines, manage risk, and produce deliverables.

Program Goal 2: Leadership

Define Goal:

Our graduates will provide technical leadership for their business, profession, and community.

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Intended Outcomes / Objectives:

1. An ability to analyze a problem, and to identify and define the computing requirements appropriate to its solution.

3. An ability to communicate effectively with a range of audiences about technical information.

4. An ability to make informed judgments in computing practice based on legal and ethical principles.

Program Goal 3: Economic impact

Define Goal:

Our graduates will enhance the economic well being of the Upper Cumberland and the state of Tennessee and the nation through their technical expertise and leadership.

Intended Outcomes / Objectives:

1. An ability to analyze a problem, and to identify and define the computing requirements appropriate to its solution.

2. An ability to design, implement, and evaluate a computer-based solution to meet a given set of computing requirements in the context of the discipline.

4. An ability to make informed judgments in computing practice based on legal and ethical principles.

6. An ability to apply theory in the design and implementation of computer-based solutions.

7. An ability to reason about and explain computer-based solutions at multiple levels of abstraction.

Program Goal 4: Life-long learning

Define Goal:

Our graduates will adapt to new technologies, tools and methodologies to maintain their ability to respond to the challenges of a changing environment.

Intended Outcomes / Objectives:

1. An ability to analyze a problem, and to identify and define the computing requirements appropriate to its solution.

4. An ability to make informed judgments in computing practice based on legal and ethical principles.

Assessment Tools

California Critical Thinking Skills Test (CCTST)

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcome 1

Type of Tool: Exit Exam

Frequency of Assessment: Each year

Rationale:

The CCTST is based on the Delphi Expert Consensus Definition of Critical Thinking. It is used to predict strength in critical thinking in authentic problem situations and success on professional licensure examinations. We consider it one measure of students' problem analysis/solving ability.

ETS Computer Science Major Field Test (CS-MFT)

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcome 1 and 6

Type of Tool: Exit Exam

Frequency of Assessment: Each fall and spring semester

Rationale:

This standardized test provides direct assessments of programming/software engineering, discrete structures/algorithms, and architecture/OS/networks/databases. Since this test is given to graduating seniors, it is an appropriate tool to measure of student's abilities at the time of graduation. It is a standardized test based on nationally defined expectations for computer science graduates. The department chairperson summaries the results, and the full faculty and the external advisory board discuss the summary and identify corrective steps (if needed).

In-course Direct Assessments

Goal/ Outcome/ Objective: Goals 1-4/Learning Objectives 1-7

Type of Tool: Rubric

Frequency of Assessment: Annually

Rationale:

As part of redesigning our assessment process, we are replacing our old direct assessments with a more structured assessment process that identifies traits (associated with specific learning outcomes) that students should exhibit in selected courses. Each outcome will (eventually) be assessed in at least two course per year. Each trait is intended to be measured at least twice throughout the course. The performance on each trait in translated into a rubric that reflects the level of attainment.

Since this is new, we are still developing performance targets. For this initial run, the performance target is 70% at the "practicing" level or higher by the end of the semester.

In-course Student Surveys

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 1-7

Type of Tool: Survey

Frequency of Assessment: Annually

Rationale:

As part of redesigning our assessment process, we are performing pre- and post-course surveys to capture students perception of ability on a traits associated with learning outcomes associated with the course. The courses receiving the surveys are the same ones being used for the in-course direct assessments.

Students respond to each question through the following Likert scale:

(1) Extremely well
(2) Very well
(3) Moderately well
(4) Slightly well
(5) Not well at all

Since this is new, we are still developing performance targets. For this initial run, the performance target is a post-survey average for each trait in the upper division class to be 2.5 or lower. We will use the p-value analysis to understand the impact of specific class on the traits, but we don't have performance targets for those.

Student Exit Survey

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 1-7

Type of Tool: Survey

Frequency of Assessment: Each fall and spring semester

Rationale:

These surveys provide an opportunity for graduating seniors to reflect on their experiences at TTU and for us to ask several questions related to student learning outcomes. We must wait until this point to ensure that the student can reflect on all of his or her experiences. The results are summarized, and the full faculty discuss the summary and identify corrective steps (if needed).

Results

California Critical Thinking Skills Test (CCTST)

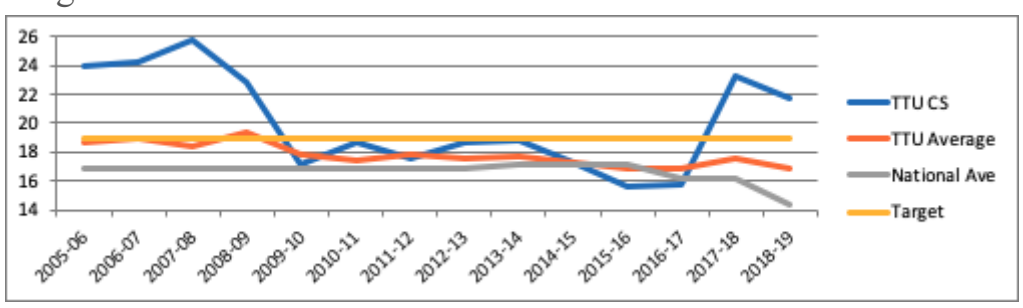
Goal/Objective/Outcome Number: Learning Outcome 1

Results:

The results for the 2017-18 year are not yet available, but the results for the available years is as follows:

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
N											33	49	49	70
TTU CS	24	24.2	25.7	22.8	17.1	18.6	17.6	18.7	18.8	17.3	15.6	15.8	23.2	21.7
TTU Average	18.6	18.9	18.4	19.4	17.8	17.4	17.9	17.6	17.7	17.3	16.9	16.2	17.6	16.8

National Ave	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	17.1	17.1	17.1	17.1	16.2	14.4
Target	19	19	19	19	19	19	19	19	19	19	19	19	19	19



Attachments:

Exit Survey Results

Goal/Objective/Outcome Number: Outcomes 1 - 7

Results:

The desired level of attainment for each assessment is 70%.

Percent rating the program as good or excellent at achieving each CSSC objective

% 'excellent' or 'good'	F12-S14	F13-S15	F14-S16	F15-S17	F16-S18	F17-18
# of graduates	44	57	51	58	99	139
# of responses	33	40	41	50	55	54
outcome 1	89.9%	92.5%	94.3%	94.0%	93.9%	93.8%
outcome 2	97.0%	95.0%	97.6%	96.0%	89.1%	90.7%
outcome 3	**69.7%**	70.0%	**65.9%**	**68.0%**	80.0%	83.3%
outcome 4	80.1%	84.2%	90.2%	88.0%	80.6%	82.7%
outcome 5	81.8%	82.5%	81.4%	80.8%	85.5%	87.0%
outcome 6	90.9%	85.0%	85.4%	82.0%	85.2%	88.7%
outcome 7	97.0%	92.5%	92.7%	94.0%	92.6%	94.3%

Attachments:

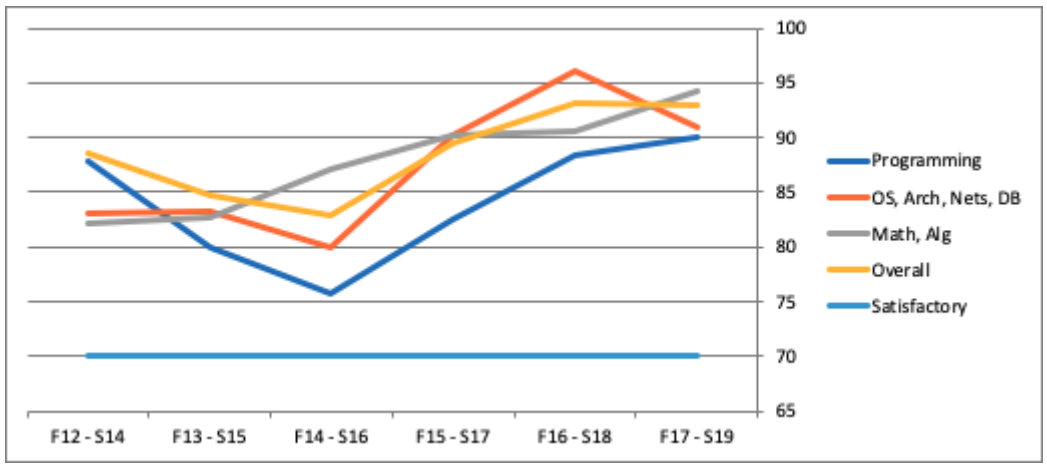
Major Field Test

Goal/Objective/Outcome Number: Learning Outcome 1 and 6

Results:

We consider a score of 80 to be satisfactory.

Cohorts	Programming	OS, Arch, Nets, DB	Math, Alg	Overall
F17 - S19	90	90.9	94.3	93
F16 - S18	88.4	96.1	90.6	93.2
F15 - S17	82.6	90.2	90.2	89.4
F14 - S16	75.8	80	87.1	82.9
F13 - S15	79.9	83.2	82.7	84.7
F12 - S14	87.9	83	82.1	88.5
F11 - S13	93.7	**68.1**	84	85.3
F10 - S12	90.4	73.6	83	83.5



Attachments:

Outcome 1 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 1

Results:

Direct assessment completed in CSC 4610 (Software Engineering I). Results are attached.

In-course surveys were completed in CSC 1300 and CSC 4610. Results are below.

Question 1: How well can you analyze a problem? (Analyzing a problem means determining the elements or essential features of that problem.)

Question 2: How well can you identify and define the computing requirements appropriate for a solution a problem?

Sample sizes: Pre = 161, Post = 114

	Pre	Post	P-value
Q1	2.3 (.75)	2.1 (.76)	.011
Q2	2.7 (.82)	2.4 (.88)	.028

Attachments: Attached Files

Outcome 1 - Fall 2018.pdf

Outcome 2 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 2

Results:

Direct assessment completed in CSC 1310 (Data Structures and Algorithms). Unfortunately, the assessment was performed with respect to the wrong outcome.

In-course surveys were completed in CSC 1310 and CSC 3300. Results are below.

Question 1: How well can you design a computer-based solution to meet a given set of computing requirements?

Question 2: How well can you implement a computer-based solution to meet a given set of computing requirements?

Question 3: How well can you evaluate a computer-based solution to meet a given set of computing requirements?

Sample sizes: Pre = 91, Post = 49

	Pre	Post	P-value
Q1	2.8 (1.04)	2.4 (.89)	.029
Q2	2.7 (1.02)	2.3 (.9)	.049
Q3	2.4 (1.02)	2.4 (.9)	.87

Attachments:

Outcome 3 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 3

Results:

Direct assessments were not completed in time for this report.

In-course surveys were completed in CSC 3040 and CSC 4620. Results are below.

Question 1: How well can you communicate technical information in writing to a technical audience?

Question 2: How well can you communicate technical information in writing to a non-technical audience?

Question 3: How well can you communicate technical information orally to a technical audience?

Question 4: How well can you communicate technical information orally to a non-technical audience?

Sample sizes: Pre = 47, Post = 46

	Pre	Post	P-value
Q1	2.3 (.84)	2.4 (.86)	.594
Q2	2.3 (.72)	2.4 (.98)	.6
Q3	2.6 (.68)	2.6 (.84)	.55
Q4	2.4 (.85)	2.5 (.98)	.62

Attachments:

Outcome 4 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 4

Results:

Direct assessment completed in CSC 3040 (Prof., Comm, and Research in Computing). Results are attached.

In-course surveys were completed in CSC 3040 and CSC 4570. Results are below.

Question 1: How well can you make informed judgements in computing practices based on legal principles?

Question 2: How well can you make informed judgements in computing practices based on ethical principles?

Sample sizes: Pre = 55, Post = 54

	Pre	Post	P-value
Q1	2.6 (1.06)	2.1 (.83)	.003
Q2	2.2 (1.02)	1.7 (.7)	.001

Attachments: Attached Files

Outcome 4 - Fall 2018.pdf

Outcome 5 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 5

Results:

Direct assessments were not completed in time for this report.

In-course surveys were completed in CSC 3040 and CSC 4620. Results are below.

Question 1: How well can you function on a team to establish goals and plan tasks?

Question 2: How well can you function on a team to meet deadlines and produce deliverables?

Question 3: How well can you function on a team to manage risk?

Sample sizes: Pre = 47, Post = 46

	Pre	Post	P-value

Q1	1.9 (.74)	2. (.86)	.525
Q2	2.1 (.93)	2.1 (.9)	.901
Q3	2.5 (1.02)	2.1 (.85)	.18

Attachments:

Outcome 6 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 6

Results:

Direct assessment completed in CSC 4575 (Information Assurance and Cryptography). Results are attached.

In-course surveys were completed in CSC 2310 and CSC 4575. Results are below.

Question 1: How well can apply computer science theory to produce computing-based solutions?

Question 2: How well can apply software development fundamentals to produce computing-based solutions?

Sample sizes: Pre = 25, Post = 0 (wrong survey sent to students)

	Pre
Q1	2.6 (.76)
Q2	2.9 (.86)

Attachments: Attached Files

Outcome 6 - Spring 2019 - CSC 4575.pdf

Outcome 7 In-Course Assessments

Goal/Objective/Outcome Number: Learning Outcome 7

Results:

Direct assessment completed in CSC 4200 (Networks). Results are attached.

In-course surveys were completed in CSC 2400 and CSC 4200. Results are below.

Question 1: How well can you reason about computer-based solution at multiple levels of abstraction?

Question 2: How well can you explain computer-based solution at multiple levels of abstraction?

Sample sizes: Pre = 92, Post = 71

	Pre	Post	P-value
Q1	2.4 (.76)	2.1 (.86)	.015
Q2	2.7 (.87)	2.2 (.96)	.005

Attachments: Attached Files

Outcome 7 - Fall 2018.pdf

Modifications and Continuing Improvement to Goals/Objectives/Outcomes

Address concerns with Learning Outcome 3

Goal/Objective/Outcome Number: Learning Outcome 3

Program Changes and Actions due to Results:

Our two indirect measures for communication resulted in differing assessments. One goal this year is to redesign the way communication skills are integrated through our curriculum. Hopefully, this will address this issue.

Link to Assessment:

In the pre/post-survey for Outcome 3, one of the oral communication traits received a score of 2.6 (1/10th of a point higher than our target level). We will continue to monitor this trait.

Link to 'Tech Tomorrow' Strategic Plan: Research, Scholar, Intellect, and Creativity

Address concerns with Learning Outcome 4

Goal/Objective/Outcome Number: Learning Outcome 4

Program Changes and Actions due to Results:

The two instructors for CSC 3040 (our primary course for teaching ethics) will be asked to include more instruction and examples illustrating the two traits with which students struggled.

Link to Assessment:

The direct assessment for learning outcome 4 showed a lack of attainment for two of the traits. We will continue to monitor this assessment as we work to improve those traits.

Link to 'Tech Tomorrow' Strategic Plan: Research, Scholar, Intellect, and Creativity

Improvement to Assessment Plan

Improving In-Course Assessment Process

Improvements to Assessment Plan:

Several things need to improve about our process, including the following:

- Work to automate the complete survey process more to reduce mistakes
- Improve faculty understand of process
- Improve completion speed of direct assessment
- Improve trait identification and assessment process
- Develop better understand of attainment goals
- Break out the surveys by course