2015 Computer Science Program Review

Pepperdine University Program Review Guidebook: Academic 2015

Computer Science Program

OVERVIEW

PROGRAM REVIEW: INTRODUCTION

A program review is a systematic process for evaluating and improving academic programs. It is conducted through self-evaluation and peer evaluation by external reviewers, with an emphasis on assessing the quality and degree of student learning within the program. The comprehensive analysis which the review provides and the resulting Memorandum of Understanding are used to stimulate curriculum and programmatic changes and to inform planning and budgeting processes at various levels. The program review cycle occurs every five years.

Program review is a required element in WASC Senior College and University Commission (WSCUC) accreditation and has been a part of Pepperdine's assessment cycle since 2003. While data provides the foundation for effective program review, assessment of student learning, and other quality improvement strategies, the data must be turned into evidence and communicated in useful formats. The program review does this.

When implemented effectively and followed up deliberately, program review is a powerful means for engaging faculty, staff, and administrators in evaluating and improving programs to enhance student learning. The review process is an opportunity to refine a program to meet the changing needs of student learning, retention, curriculum in various disciplines, and student support services. It is also a purposeful opportunity to link decision-making, planning, and budgeting with evidence.

This guidebook provides a framework and resources to help with the review.

GUIDING PRINCIPLES

The process is intended to be meaningful, foremost, for the department and its enhancement of student learning. As a result, the process is flexible in order to serve the needs of both small and large programs as well as academic, co-curricular, and student support programs. The review should be a collaborative process involving faculty, staff, administrators, and students in order to align more effectively the college or department with institutional goals and objectives.

Two guiding principles are embedded in this Guidebook and are consistent with WASC Senior College and University Commission (WSCUC) standards:

*** Ongoing Evaluation of What Students Learn:**

Evidence-based program review includes: a review of program learning outcomes; evaluation of the methods employed to assess achievement of the outcomes; and analysis and reflection on learning results, retention/graduation rates, core competencies, and other outcomes data over a multi-year period.

*** Quality Assurance, Planning, and Budgeting Decisions Based on Evidence:**

The results of the program review are to be used for follow-up planning and budgeting at various decision-making levels.

PREPARATION FOR PROGRAM REVIEW
The program chair is responsible for the planning of the review. An internal committee or working group should be developed to allocate responsibilities for writing the program review including data collection, writing, and use of resources. It is recommended that a meeting occur between the committee and the Office of Institutional Effectiveness (OIE) to review data needs.

PROGRAM ALIGNMENT WITH THE UNIVERSITY, MISSION, AND INSTITUTIONAL OUTCOMES
Program reviews focus on the meaning, quality, and integrity of a program as it relates to student learning and the mission of Pepperdine:
Pepperdine University is a Christian university committed to the highest standards of academic excellence and Christian values, where students are strengthened for lives of purpose, service, and leadership.

Each department carries out the University mission and institutional learning outcomes (ILOs). The ILOs are formed by two components:
*** Core commitments: knowledge and scholarship, faith and heritage, and community and global understanding**
*** Institutional values: purpose, service, and leadership**

Each basic commitment is seen through the lens of three essential institutional values drawn from the University mission statement: purpose, service, and leadership. These basic commitments should link to measurable objectives as stated in the student learning outcomes (SLOs).

OVERVIEW OF PROGRAM REVIEW COMPONENTS
Program review at Pepperdine University is conducted on a five-year review cycle that involves three main components and six steps (see diagram below):

SELF STUDY:
- An in-depth, internal analysis written by program faculty/staff
- Department faculty or program staff (for co-curricular and student support services) conduct a departmental self-study within guidelines provided in the Guidebook. This portion of the review identifies program strengths and limitations, and suggests solutions to identified problems.

EXTERNAL & INTERNAL REVIEWS:
- An external review conducted by an outside expert in the field or discipline. The Guidebook describes how to secure qualified, objective external reviewers, including those with understanding and experience in addressing student learning outcomes assessment. Once the self-study is completed, the external review is organized.
- An internal review by the Advancement of Student Learning Council (ASLC)

CLOSING THE LOOP:
- A Quality Improvement Plan (QIP) developed by the department
- A Memorandum of Understanding (MOU) developed by the dean

Closing the Loop is used to describe the act of making decisions based on evidence. The most important product of a program review is the advancement of student learning. Therefore, the program review cycle ends by identifying evidence-based changes in the

QIP, and then the MOU explains how the plan will be supported and carried out over the next five years.

GLOSSARY OF TERMS
Please download the GLOSSARY OF TERMS.
GLOSSARY_OF_TERMS.pdf
GLOSSARY_OF_TERMS.pdf

Evidence
Please attach evidence

INTRODUCTION

INTRODUCTION

Reviews begin with an introduction that provides a context for the review. In contrast to the rest of the self-study report, this portion is primarily descriptive and should include:

1. INTERNAL CONTEXT
This begins with an overview of the program describing (as appropriate).
a. where the program is situated (school/division),
b. degrees granted, concentrations available, programs offered
c. where is the program located (campus location)

The Computer Science major at Pepperdine is a joint major with Mathematics leading to a B.S. degree. It is situated in the Natural Science Division of Seaver College and is a residential program at the Malibu campus.

d. Provide a brief history of the program.

In 1978, the decision was made to institute the computer science major. The only feasible way with only one person to staff the program was to make it a joint Computer Science/Mathematics degree, so that the computer science course offerings could be minimal in number. One person (the current head of the program) designed the curriculum, wrote all the course descriptions, and taught all the classes.

Through the years, it has been a struggle to secure adequate staffing support for the major. The Seaver Dean when the major was established instigated the program. He saw that a computer science major was necessary to have a credible science division. The next dean was hostile to the major and questioned whether it should exist in a liberal arts college. But regardless of which particular dean is in office, the biggest problem has been to get the academic administration to commit to a more realistic staffing level for the major. There is only one tenure-track full-time computer science professor for the major and there has been only one since its inception. Over the years, second teaching colleagues have included

(1) for many years a retired IBM staffer without an advanced degree,

(2) for one year a church of Christ new Ph.D. who was not successful in the classroom, and
(3) for four years an experienced Ph.D. colleague who was recruited from Cal Lutheran in a visiting position.

The third person helped to designed the current curriculum, which received positive endorsement from outside reviewers. But there was no support from the administration to offer him a tenure-track position because of his perceived weak support of the institution's mission statement.

Currently, the second teaching colleague has a Master's degree and is "all but dissertation" for his Ph.D. He has maintained his "visiting" position for 15 years.

e. Describe the changes made to the program since the last review.

There have been no changes in staffing. This year there have been two changes to the curriculum.

1. For many years, the program taught a service course in business computing for the Business Administration Division. We were recently relieved of that duty, which gave us some teaching hours to devote to our own program. We revised the introductory sequence and added sections of existing courses to give more flexibility to the incoming students, especially transfer students. We relaxed some of the previous prerequisites so students will not be as constrained when planning for their first two years in the major.

2. The University Academic Council has just approved a new joint major in Computer Science/Philosophy. It is modeled after the joint major in Computer Science/Mathematics and was motivated in part to increase student demand for computer science.

2. THE EXTERNAL CONTEXT
This should explain how the program responds to the needs of the area in which it serves: this can include the community, region, field, or discipline.

The program educates students for two areas, academia and industry. Most students obtain computing jobs in industry but some go to graduate school, usually in computer science.

PROGRAM OUTCOMES

Institutional Learning Outcomes

Identifier	Description
CA-PEP-ILO-15.L-1-KS	Think critically and creatively, communicate clearly, and act with integrity.
CA-PEP-ILO-15.L-2-FH	Practice responsible conduct and allow decisions and directions to be informed by a value-centered life.
CA-PEP-ILO-15.L-3-CGU	Use global and local leadership opportunities in pursuit of justice.
CA-PEP-ILO-	Demonstrate expertise in an academic or professional discipline, display

15.P-1-KS	proficiency in the discipline, and engage in the process of academic discovery
CA-PEP-ILO-15.P-2-FH	Appreciate the complex relationship between faith, learning, and practice.
CA-PEP-ILO-15.P-3-CGU	Develop and enact a compelling personal and professional vision that values diversity
CA-PEP-ILO-15.S-1-KS	Apply knowledge to real-world challenges.
CA-PEP-ILO-15.S-2-FH	Respond to the call to serve others.
CA-PEP-ILO-15.S-3-CGU	Demonstrate commitment to service and civic engagement.

Additional Standards/Outcomes

Identifier	Description
CA-PEP-SVR-15.BSCMPSMATH-1	Implement algorithms
CA-PEP-SVR-15.BSCMPSMATH-2	Prove computational theorems
CA-PEP-SVR-15.BSCMPSMATH-3	Analyze computational systems
CA-PEP-SVR-15.BSCMPSMATH-4	Communicate technical results

CURRICULUM MAP

MISSION, PURPOSES, GOALS, AND OUTCOMES

3. MISSION, PURPOSES, GOALS, AND OUTCOMES
A key component in providing the context for the review is a description of the program's mission, purpose, goals, and outcomes.
a. Mission - This should be a general explanation of why the program exists, what it hopes to achieve in the future, and the program's essential nature, its values, and its work.
b. Goals are general statements of what the program wants to achieve.
c. Outcomes are the specific results that should be observed if the goals are being met.

The program's purpose, goals, and outcomes should relate to and align with the mission and goals of the college and of the University.

The mission of the Computer Science/Mathematics joint major is to educate students for service in academia and industry. Its essential nature is the offering of traditional courses and internships, concluding with a senior capstone experience.

The goal of the program is to provide students with the specific software and mathematics skills necessary to provide service to others in academia and industry.

Because the mission of the program is to educate students for service in academia and industry, the outcome is the set of graduates of the program and their success in obtaining admission to graduate school and in obtaining employment in their chosen field of computing.

The major has four Program Learning Outcomes (PLOs):

1. A student who graduates with a major in Computer Science / Mathematics should be able to implement algorithms.

2. A student who graduates with a major in Computer Science / Mathematics should be able to prove computational theorems.

3. A student who graduates with a major in Computer Science / Mathematics should be able to analyze computational systems.

4. A student who graduates with a major in Computer Science / Mathematics should be able to communicate technical results.

See the advising document, "Computer Science at Seaver College" for a detailed description of the curriculum and its philosophy.

I - Introduced
D - Developed
M - Mastered

Computer Science/Mathematics

	MATH 220	**MATH 221**	**COSC 220**
CA-PEP-SVR-15.BSCMPSMATH-1 Implement algorithms			I
CA-PEP-SVR-15.BSCMPSMATH-2 Prove computational theorems	I, D	M	
CA-PEP-SVR-15.BSCMPSMATH-3 Analyze computational systems		I	I
CA-PEP-SVR-15.BSCMPSMATH-4 Communicate technical results			

	COSC 221	**COSC 320**	**COSC 330**
CA-PEP-SVR-15.BSCMPSMATH-1 Implement algorithms	I	D	D
CA-PEP-SVR-15.BSCMPSMATH-2 Prove computational theorems	I		
CA-PEP-SVR-15.BSCMPSMATH-3 Analyze computational systems	D	D	D
CA-PEP-SVR-15.BSCMPSMATH-4 Communicate technical results		I	

	COSC 425	COSC 450	COSC 465
CA-PEP-SVR-15.BSCMPSMATH-1 Implement algorithms	M	M	M
CA-PEP-SVR-15.BSCMPSMATH-2 Prove computational theorems		M	
CA-PEP-SVR-15.BSCMPSMATH-3 Analyze computational systems	M		D
CA-PEP-SVR-15.BSCMPSMATH-4 Communicate technical results			D

	COSC 475	COSC 490	MATH 365
CA-PEP-SVR-15.BSCMPSMATH-1 Implement algorithms	M	M	
CA-PEP-SVR-15.BSCMPSMATH-2 Prove computational theorems			M
CA-PEP-SVR-15.BSCMPSMATH-3 Analyze computational systems	M		M
CA-PEP-SVR-15.BSCMPSMATH-4 Communicate technical results	D	M	

Aligment of PLOs with ILOs
Please upload the evidence.
CoSc_at_Seaver.pdf

ANALYSIS OF EVIDENCE: Meaning

Meaning

Analysis of Direct Student Learning: Meaning Quality and Integrity

The university is required to define and ensure a distinctive and coherent educational experience for each of its degree programs. The findings from the program assessment and analysis process should explain how effectively courses, curricula, the co-curriculum, and other experiences are structured, sequenced, and delivered so that students achieve learning outcomes at the expected levels of performance in core competencies in their majors or fields of specialization, in general education, and in areas distinctive to the institution. It means ensuring alignment among all these elements, and maintaining an assessment infrastructure that enables the institution to diagnose problems and make

improvements when needed. Direct student learning, an examination of how well students are meeting the program learning outcomes, should come from the past four years of annual assessments.

(2013 WSCUC Accreditation Handbook.)

Meaning of the Degree: Describe how the program ensures a holistic experience by answering the following questions about the coherence and alignment within the program:

4. What are the learning outcomes and how does the degree support the institutional mission and institutional learning outcomes?

A student who graduates with a major in Computer Science / Mathematics should be able to:
PLO #1 Implement algorithms
PLO #2 Prove computational theorems
PLO #3 Analyze computational systems
PLO #4 Communicate technical results

5. How does the degree embody the distinct values, basic commitment, and traditions of the institution?

In one word: service. The computer science program at Seaver, and by extension its students, are here to serve other disciplines. The evidence is that all the computer science programs are joint programs with other disciplines: Computer Science/Mathematics, Computer Science/Philosophy, the proposed major in Computer Science/Digital Arts, and the proposed minor in Digital Humanities.

Evidence
Please attach evidence.

6. Is there a coherent, aligned sequence of learning opportunities?

Yes. The evidence is (1) the standard course sequence requiring individual student performance, (2) the senior capstone course requiring student group performance, and (3) the annual internship program with Pepperdine's App Development Group.

Evidence
Please attach evidence.

7. Does the degree offer sufficient breadth and depth of learning for this particular major or program? Please explain.

It does not contain the depth or breadth of a full computer science major. For evidence, see the external reviewer's report, "Course offerings in computer science are quite limited, covering only a fraction of the topics recommended in national curricular guidelines for undergraduate computer

science."

8. Please present a curriculum comparison with at least three peer institutions and with national disciplinary or professional standards if available.

Curriculum comparison table
Please attach the curriculum comparison table.
Math_Comp_Sci_Curriculum_Comparison_vs3.pdf
Math_Comp_Sci_Curriculum_Comparison_vs3.pdf
Math_Comp_Sci_Curriculum_Comparison_vs3.pdf

See the attached comparison of the Seaver college Computer Science/Math major with the joint Computer Science/Math majors at Emory University, Harvey Mudd College, and New York University. Courses for the major denoted by "y(e)" are elective courses. The comparison shows that the largest disparity between Pepperdine's program and other programs is the large number of elective courses available to students at other institutions. This disparity is due to the fact that the Pepperdine program is staffed by only one full-time tenure track professor and one long-term "visiting" professor.

9. How current is the program curriculum?

It is current in its core offerings. The evidence is the use of the JavaScript language in one of the introductory programming course sections and the R programming language in another section, the inclusion of recently-developed left-leaning read-black trees as the balanced tree data structure in the Data Structures course, and the use of the latest mobile device development application tools in the senior capstone course. It is not current because of the electives it cannot offer, such as cryptography, security, and databases due to limited faculty staffing.

10. How has the curriculum changed (if at all) over the last five years including the reasons for the change (e.g., the result of a learning outcome assessment) and evidence used as a basis for change?

The course curriculum was unchanged for many years, although topics within individual courses have evolved. For example, queueing theory was dropped from the Networks course and replaced by greater depth in the other topics of the course. These types of decisions are made by the two professors keeping abreast of the field and conferring in weekly meetings.

Evidence
Please attach evidence.

11. Pedagogy: Please present measures of teaching effectiveness (e.g., course evaluations, peer evaluations of teaching or implementing, scholarship on issues of teaching and learning, formative discussions of pedagogy among faculty, survey measures, participation rates, and student satisfaction surveys).

Teaching
Please attach evidence.

The most significant method of teaching effectiveness is the publishing of six computer science/math courses on iTunes University. See the attached 2013 Innovation in Technology and Learning Grant Case Study, "Pepperdine Computer Science Courses on iTunes U", particularly the Reflections section on pages 5 - 7.

ANALYSIS OF EVIDENCE: Quality

Quality

Quality of the Degree: In meaning of the degree student learning outcomes and curriculum matrixes were used to
define the degree. Now please describe the processes used to ensure the quality of the program.

12. Describe the high impact practices which enrich the learning experiences (How are they integrated in the curriculum? Are they assessed?)
a. Service learning
b. Research opportunities
c. Internships
d. High-impact practices

Due to limited faculty staffing, there is no formal service learning component or high-impact practices. There are sporadic research projects for no more than one student at a time, usually in the area of software development. There is an new internship with Pepperdine's Information Technology Application Development Group that accepts two to three students per year.

13. Co-Curricular : How intentional are the co-curricular experiences which are provided and how are they integrated into the curricular plan?
a. Academic and career advising programs and resources
b. Tutoring, supplemental instruction, and teaching assistants
c. Orientation and transition programs
d. Financial support for obtaining scholarships, fellowships, teaching assistantships, etc.
e. Support for engagement in the campus community
f. Support for emotional and psychological variables of success
g. Spiritual development programs and opportunities
h. Multicultural opportunities which support diversity
i. Plays, musicals, art exhibits, and lectures
j. the Sophomore Experience
k. Study Abroad

Two of the items from the above list are intentional:
(d) There are two financial scholarships, the Darnell and the Northrop Grumman, as described in

the financial resources section.
(k) The study abroad program is made possible by the iTunes U courses, which students can take remotely while overseas.

14. What is the profile of students in the program and how does the profile relate to or enhance the purpose and goals of the program?

Please explain your student success data (enrollment and retention data). Evidence should include student retention and graduation rate trends (disaggregated by different demographic categories such as race, gender, first-generation students, etc.).

OIE provides this data annually and houses the reports on the OIE website and LiveText site.

Student Success Data
Please download student success data.
Enrollment_Data_Computer_Science_Fall2010_14.xlsx
Enrollment_Data_Computer_Science_Fall2010_14.xlsx
Enrollment_Data_Computer_Science_Fall2010_14.xlsx
Enrollment_Data_Computer_Science_Fall2010_14.xlsx
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Enrollment_Data_Computer_Science_Fall2010_14.xlsx
Enrollment_Data_Computer_Science_Fall2010_14.xlsx
Enrollment_Data_Computer_Science_Fall2010_14.xlsx
Enrollment_Data_Computer_Science_Fall2010_14.xlsx

As of fall 2014, 11 out of 30, or 37%, of computer science students were female. While this number is low, it is slightly higher than the industry average, which is generally regarded as 30%. The academic performance of the female students is generally higher than that of male students. In four of the previous five years, the Outstanding Computer Science Graduate was female.

As of fall 2014, 11 out of 30, or 37%, of computer science students were "white non-Hispanic".

We do not have the staffing resources to formally monitor student success or diversity, which is done informally in our weekly (two-person) staff meeting. The program graduates about five majors each fall. Within the last five years, some high-profile achievements of our graduates include admission to the Computer Science graduate program at the University of Pennsylvania and to the graduate program at USC, employment as a software engineer at Amazon's corporate headquarters, and employment at Disney. Over 90% of our graduates find employment in the computing industry or enter graduate school.

15. Please present your student and alumni survey data examining student attitudes, satisfaction levels and dispositions. OIE will provide the data in tables and graphs in their Educational Effectiveness Report. Programs are responsible for explaining the survey results. Survey data includes: UCLA/CIRP satisfaction survey data, alumni data.

Student Survey Data
Please download student survey data.

Data_Report___OIE_Alumni_Survey_2015__NASC_Full_Report__08_28_15.pdf
Data_Report___OIE_Alumni_Survey_2015__NASC_Full_Report__08_28_15.pdf
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Data_Report___OIE_Alumni_Survey_2015__NASC_Full_Report__08_28_15.pdf

The following results are from the OIE Alumni Survey of 2015, to which 23 former computer science students responded.

ANALYSIS

The following statistics compare the Computer Science (CS) discipline with the Natural Science Division (NSD) as a whole. Following is a summary of the first 10 items.

1. Full-time employment: CS 78%, NSD 68%

2. Preparation for primary activity
Not at all or poorly: CS 9%, NSD 6%
Reasonably well or extremely well: CS 91%, NSD 94%

3. Lab course taught critical thinking as it pertains to the scientific method
Strongly disagree or disagree: CS 12%, NSD 4%
Agree or strongly agree: CS 88%, NSD 96%

4. Training in mathematics increased quantitative skills
Strongly disagree or disagree: CS 3%, NSD 9%
Agree or strongly agree: CS 97%, NSD 91%

5. Well-balanced introduction to Natural Science
Strongly disagree or disagree: CS 3%, NSD 4%
Agree or strongly agree: CS 97%, NSD 96%

6. Senior capstone course rating
Very poor or poor: CS 7%, NSD 5%
Good or very good: CS 93%, NSD 95%

7. Think critically to solve problems
Not at all or poorly: CS 0%, NSD 1%
Reasonably well or extremely well: CS 100%, NSD 99%

8. Think creatively in the workplace
Not at all or poorly: CS 15%, NSD 10%
Reasonably well or extremely well: CS 85%, NSD 90%

9. Express ideas clearly
Not at all or poorly: CS 4%, NSD 5%
Reasonably well or extremely well: CS 96%, NSD 95%

10. Work in a team environment
Not at all or poorly: CS 4%, NSD 4%
Reasonably well or extremely well: 96%, NSD 96%

There are 24 other comparative categories assessing discipline-specific programs plus general university-specific categories such as general education. Of the 24 categories, the most positive categories for CS, each of which received 100% agree or strongly agree, were that faculty spent time out of class, provided prompt feedback, presented challenging issues in ways that were respectful of student views, and supported academic endeavors. These categories rank the highest of all other disciplines within the Natural Science Division.

The most negative categories, with the percentages of those who agree or strongly agree were personal development working with faculty on research, 50%, professional development working with faculty on research, 40%, personal development working with faculty on independent study, 25%, and professional development working with faculty on independent study, 37%.

CONCLUSIONS

The data show that in the area of teaching, the computer science part of the computer science/math major delivers an educational experience at or above the experience provided by the division. In the area of research with undergraduates it provides an educational experience far below the division. The reason is clear. There is only _one_ tenure-track faculty member who is responsible for the computer science part of the computer science/math program. Faculty staffing is not adequate to provide meaningful research with undergraduates.

16. Please describe evidence of students' research and publications, awards and recognition, professional accomplishments.

Evidence
Please attach evidence.

In the last five years, three students presented posters at the Southern California Undergraduate Research conference, one student participated in a Harvey Mudd College Computer Science Summer Research project, one student was admitted to a PhD program at the University of Pennsylvania, and an alumnus completed his PhD in software engineering at the USC Viterbi School of Engineering.

ANALYSIS OF EVIDENCE:Integrity

Integrity

In meaning of the degree (section four) student learning outcomes and curriculum matrixes were used to define the

degree. Now please describe the processes used to ensure the rigor of the program.

17. Are the graduates achieving the student learning outcomes at the expected level? How was the threshold determined? How do you know your expectations are appropriate? Do you use comparisons based on national standards or benchmarking? How have your assessment findings supported this?

Are the graduates achieving the student learning outcomes at the expected level? yes

How was the threshold determined? There is no threshold.

How do you know your expectations are appropriate? They are based on the jobs our students get when they graduate.

Do you use comparisons based on national standards or benchmarking? no

How have your assessment findings supported this? See the alumni survey.

18. Is there assurance that students consistently meet the standards of performance that the major has established? What happens to students that don't meet the standards?

Is there assurance that students consistently meet the standards of performance that the major has established? Yes

What happens to students that don't meet the standards? They do not pass their courses.

19. Please present an integrated analysis of the data collected from the assessment of direct learning and indirect learning (survey data, focus group, alumni data, and authentic evidence). Please report on the findings from the last comprehensive program review. In summary please explain how the program has achieved a holistic evaluation of the students' educational experience.

Evidence
Please attach evidence.

I do not mean to be flippant in my answers to the above questions. However, please take these comments in the context that there is only _one_ tenure-track professor who runs the entire program including curriculum development, class scheduling, advising all students, and teaching a full load with no duplicate class preparations. There are simply not enough hours in the day to perform this assessment according to its specifications.

The single most valuable component of this assessment is the external review by Professor Henry Walker from Grinnell. He applied his vast experience in the field of computer science education in his evaluation of our program and provided many actionable recommendations. His report is the basis of the QIP.

WASC 5 CORE COMPETENCIES

WASC 5 CORE COMPETENCIES

20. How does the program ensure that graduates meet the WASC FIVE CORE COMPETENCIES? Present your findings of measurements you have done of the core competencies (may be less than 5).

The five WASC core competencies (CC) are:
1. Critical Thinking
2. Information Literacy
3. Oral Communication
4. Written Communication
5. Quantitative Skills

These align with the Program Learning Objectives as follows:
1. A student who graduates with a major in Computer Science/Mathematics should be able to implement algorithms. Aligns with WASC CC 1, 4, 5.

2. A student who graduates with a major in Computer Science/Mathematics should be able to prove computational theorems. Aligns with WASC CC 1, 4, 5

3. A student who graduates with a major in Computer Science/Mathematics should be able to analyze computational systems. Aligns with WASC CC 2, 4

4. A student who graduates with a major in Computer Science/Mathematics should be able to communicate technical results. Aligns with WASC CC 2, 3, 5

Evidence
Please attach evidence.

SUSTAINABILITY: RESOURCES

Sustainability

21. With the rapid changes in the higher education environment, the University needs to demonstrate how financial viability and planning of their long-term stability are ensured.

In order to demonstrate this each program should address
a. questions about the level of student demand for the program and
b. the degree to which resources are allocated appropriately so they are sufficient to maintain program quality.
c. What is happening within the profession, local community, or society that identifies an anticipated need
for this program in the future? (If appropriate include market research.)

Questions about student demand, resource allocation, and what is happening within the profession are addressed in the attached report "Computer Science at Seaver College: A

Proposal", which was presented to the administration in April, 2015. The proposal documents (a) how the current program is not sustainable, (b) how the science programs at Seaver College are limited compared to our peer institutions, (c) how Computer Science fits the Seaver College Mission, (d) the success of the current program as measured by the accomplishments of our students, (e) student demand for the program, both internal and external, and (f) Natural Science Division support for the program. It concludes with a proposal to strengthen the program, which was rejected by the administration.

Evidence
Please attach evidence if applicable.
Computer_Science_Major_Proposal.pdf

22. FACILITIES
Please describe the adequacy of
a. Classroom space
b. Laboratories
c. Office space
d. Programming venues
e. Student study spaces

Classroom space, office space, programming venues, and student study spaces are all adequate, and are provided in the general context of the Natural Science Division. The program does maintain its own computer lab with 12 work stations. All computer science majors have access to the lab 24/7 via programmable keys.

FACULTY AND STAFF
23. What are the qualifications and achievements of the faculty/staff in the program in relation to the program purpose and goals? How do faculty/staff members' backgrounds, expertise, research, and other professional work contribute to the quality of the program?

Evidence in this category should include(this could be collected through faculty CVs) :
a. Proportion of faculty with terminal degrees
b. List of faculty/staff specialties within discipline (and how those specialties align with the program curriculum)
c. Record of scholarship for each faculty member, professional presentations for staff members
d. Faculty/staff participation in development opportunities related to teaching, learning, and/or assessment
e. External funding awarded to faculty/staff

a. 50% of the faculty have terminal degrees (one out of two)
b. The one tenured faculty member specializes in computer science curriculum issues. The visiting faculty member has a background in computational linguistics.
c. See attached CV.
d. See attached CV. In particular, note textbooks published and iTunes University courses published in support of teaching/learning.
e. No external funding requested.

Evidence
Please attach evidence.
WarfordCV.pdf

24. FACULTY/STAFF
Are there sufficient numbers of faculty/staff to maintain program quality? Do program faculty/staff have the support they need to do their work?
a. Distribution of faculty across ranks (or staff years at institution)
b. Diversity of faculty/staff
c. Number of full-time faculty (ratio of full-time faculty to part-time faculty)
d. Student-faculty ratio
e. Faculty workload
f. Faculty review and evaluation processes
g. Mentoring processes
h. Professional development opportunities and resources (including travel and research funds)
i. Sufficient time for research, program development

a. Distribution of faculty across ranks (or staff years at institution)
The Computer Science/Mathematics program has one Full Professor and one "Visiting" Professor (with 15 years of service).

b. Diversity of faculty/staff
Both professors are male caucasian.

c. Number of full-time faculty (ratio of full-time faculty to part-time faculty)
Two full-time / no part-time.

d. Student-faculty ratio
First year classes student/faculty ratio: approximately 20/1. Second year classes: approximately 15/1. Third and fourth year classes: approximately 8/1. Decreased ratios primarily because of the number of computer science minor students who do not take upper-level courses.

e. Faculty workload
Two individuals teach all the computer science courses and two of the math courses. The other math courses and the physics course are taught by faculty in those areas. The program director regularly teaches seven of the courses in the major. He currently teaches three courses per semester with no duplicate sections, which equates to six different class preparations per year. Writing, research, advising, and program coordinator duties are in addition to his teaching load. The visiting professor regularly teaches seven of the courses in the major. Computer lab manager duties maintaining software and hardware are in addition to his teaching load. See attached document for teaching assignments.

f. Faculty review and evaluation process
All full-time and visiting faculty in the Natural Science Division are asked to complete an Annual Faculty Activity Form. This form asks each member of the faculty to outline his or her activities in the areas of scholarship, teaching, and service. The Divisional Dean of the Natural Science Division reviews each of these annual reports and assesses student teaching evaluations of

courses taught by each member of the faculty. After evaluating each report, the Divisional Dean provides written feedback of the faculty member's teaching and achievement, and the faculty member is asked to provide any written comments related to the evaluation. In addition, the Divisional Dean has one on one conversations with any faculty member needing further follow-up to the evaluation.

For full-time members of the faculty, each rank (e.g. Assistant, Associate, and Full Professor) has three steps. Based on information related to a faculty member's scholarship, teaching, and service, the Divisional Dean can recommend a step increase within a particular rank to the Dean of Seaver College, who makes the final decision regarding the step increase. Promotion to a higher rank, such as Assistant Professor to Associate Professor or Associate Professor to Full Professor, requires an evaluation by the Rank, Tenure, and Promotion (RTP) Committee, which consists of voting tenured representatives from each division in Seaver College as well as a non-tenured professor. For promotion in rank, the faculty member must provide information on Teaching Effectiveness, Scholarly Activity, and Service (professional, university, division, community). With the approval of the Divisional Dean, the candidate for promotion is asked to designate five peer reviewers, who will be asked to evaluate the information provided by the candidate. Each of these designated reviewers will provide a formally written response to each of the major categories, and the Divisional Dean will provide an independent response that includes details of the faculty member's teaching evaluations submitted by students. The RTP committee evaluates the evidence and makes a recommendation to the Dean of Seaver College, who has independently evaluated all of the evidence submitted on behalf of the candidate. The Dean's recommendation is then sent to the Provost and President.

The above outlined procedure is basically the same used for an individual submitting for tenure and promotion. All members of the faculty considered tenure-track receive a pre-tenure review that uses the same criteria as those outlined for tenure and promotion. This review occurs mid-tenure and is designed to provide constructive feedback concerning teaching, scholarship, and service. It also allows for the college to determine whether or not the faculty member should continue. If the evaluation suggests no reappointment, the faculty member is allowed to stay the following year prior to termination. If the reappointment is approved, the Divisional Dean and faculty member will go over the RTP report and decide the best course of action to address any identified weaknesses.

After tenure, each member of the faculty receives a five-year evaluation. The basic procedures are similar to those outlined for tenure and promotion, except only three designated peer reviewers are required. The RTP committee makes a recommendation to the Dean of Seaver College, and the Dean decides the appropriate merit raised based on the outcome of the evaluation.

g. Mentoring processes

All pre-tenured members of the faculty are assigned a senior mentor by the Associate Dean. In addition, the Associate Dean schedules workshops related to navigating the tenure process. All tenured and tenure-track faculty are required to submit a detailed annual report that outlines their pedagogy, scholarship, and service. The Divisional Dean of Natural Science evaluates these reports and examines student evaluations taught by each member of the faculty. After this initial evaluation, the Divisional Dean writes a formal assessment and provides information on student evaluations for the courses taught. The faculty member also is provided a written response from the Divisional Dean. After the faculty member receives this evaluation, the Divisional Dean and the faculty member meet to discuss any issues raised in the evaluation. The faculty member is provided an opportunity to provide a written response. Both the mid-tenure and five year reviews also provide each faculty member with input as to his or her progress.

h. Professional development opportunities and resources (including travel and research funds)
The program director is provided annual support to attend one professional meeting per year, chosen to be the annual national ACM SIGCSE conference. By choosing to forego teaching during the summer, those months are devoted to scholarly activity, usually in the development of textbook manuscripts in support of courses taught during the year and in the development of corresponding software tools.

i. Sufficient time for research, program development
Writing assessment reports consumes time that would otherwise be used for research and program development. This activity is especially difficult in a program maintained by a single individual.

Evidence
Please attach evidence if applicable.
Teaching_Assignments.pdf

FINANCIAL RESOURCES

Financial Resources

25. Financial Resources:
Please describe your operational budget (revenues and expenditures) and trends over a 3-5 year period.

The budget for the Natural Science Division consists of two separate operational budgets. One budget (11790) allocates funds to support salaries and benefits for staff, student teaching and research assistants, and adjunct professors. In addition, this budget supports student aid, professional travel, office supplies, telephone services, photocopying, computer and equipment upkeep for classrooms and offices, and other general expenses related to maintenance and upkeep of the division. The second budget (11805) provides funds to support laboratories used for research and teaching. Budgeted items include professional services for upkeep of equipment and the physical plant, equipment, rentals, maintenance, and supplies. This particular budget is supplemented from student laboratory fees, and the division receives these fees at the beginning of each semester.
Individual programs do not have an itemized budget. Rather, funds in both of these budget categories are used to support all activities across the division.

Revenue from fees and miscellaneous sources has increased between FY11 and FY14 (Table 1, attached). This particular review is used to offset expenses in operational budget 11805. In addition, general expenses have increased as well. For the past two years, the Dean of Seaver College has provided a significant increase in support for faculty travel.

In addition to the standard operating budgets, the Natural Science Division is awarded support for student scholarships that are awarded at the beginning of each fiscal year. These scholarships are awarded to defray cost of tuition. The following is a breakdown for the past five years: FY11 - $126,646; FY12 - $134,117; FY13 - $140,823; FY14 - $145,048; FY15 - $150,850.
The Natural Science Division also receives revenues from private and public foundations. For the past three years, the division has received awards between $25,000 and $35,000 from Southern

California Edison to support scholarships for students majoring in STEM-related disciplines. Private donors contribute between $25,000 and $40,000 each year to support faculty/undergraduate research projects during the summer. For the past five years (and even before), the Biology Program has received funding ($440,350) for a summer REU (Research Experiences for Undergraduates) from the National Science Foundation (NSF). This grant supports undergraduate research, and aside from the funds from NSF, Seaver College subsidizes these activities.

Evidence
Please attach evidence.
Section_10_Q25_Table_1_Financial_Resources.pdf
Section_10_Q25_Table_1_Financial_Resources.pdf
Financial_Resources.pdf

EXTERNAL REVIEW

External Review Report

In summary please explain how, through the findings in the annual assessments, the program has achieved a holistic evaluation of the educational experience that is supported through benchmarking. (Has the program been reviewed by external stakeholders, such as practitioners in the field, or compared with other similar institutions, or national standards?

I. GUIDELINES FOR ORGANIZING THE EXTERNAL REVIEW
The external review typically occurs after a program or department completes its self-study report, but the selection and invitation of external reviewers can occur during the self-study process to ensure the availability of the best reviewers. However, programs with concurrent accreditation (e.g., AACSB, APA, ABA) can use the visiting team for that discipline-specific accreditation as the external review. The report from the site visitors should be included in the final report. For an illustration of potential areas for the reviewers to consider, see Attachment below.

II. CHOOSING REVIEWERS
The size and composition of the review team can vary, depending on the size of the program under review. Usually, the team involves one or two people. At the time a department or program is notified that it will be conducting a program review, appropriate individuals should submit a list of names of possible reviewers. These reviewers should be external to the school/University. External reviewers should be distinguished scholars/teachers/practitioners in the field and be familiar with campuses that are similar to Pepperdine University and the program undergoing review. It is also helpful for external reviewers to have had experience with program administration and with program assessment. At least one of the reviewers should be experienced with student learning outcomes assessment in order to review and analyze the program's assessment processes and results.

III. MATERIALS FOR THE EXTERNAL REVIEW TEAM
At least 30 days prior to the scheduled department visit, the information from the program self-study and appropriate additional materials are sent to each member of the external review team. An identical information package should be provided to appropriate

members of the administrators overseeing the program. The reviewers should compile a report that includes observations, strengths, weaknesses, and recommendations based on evidence. The attached External Review Report expectations outlines the guidelines for the external reviewers' site visit and report. Reviewers and Divisional Deans should also sign a consultant agreement. External Reviewers should also be given a schedule for their visit and a confirmation letter, and programs will submit a budget proposal for the site visit to the Office of Institutional Effectiveness.

IV. CATEGORIES FOR EVALUATION
• curricular offerings in terms of relevance, currency, and quality.
• the appropriateness and effectiveness of assessment methodologies and Program Learning Outcomes
• whether changes in response to assessment data reflect the best practices of the discipline
• the quality of instruction and faculty members' scholarly activity/accomplishments
• the program's ability to recruit and retain successful students
• the program's strengths and growth areas, based on evidence-based analysis and comparisons to peer/aspirational programs

V. EXTERNAL REVIEW TEAM VISIT AND REPORT
The review team visit typically lasts for two days, during which time the review committee members meet with department faculty, academic advisors, students, and select administrators. The review team typically takes part in an exit interview just prior to concluding its departmental visit.

The team is expected to submit its written evaluation to the campus program review committee as soon as possible after the visit. The written evaluation should include a review of strengths and challenges, resource allocation, and program viability as well as suggestions for policy and resources. Upon submission of the report, off-campus reviewers receive a previously agreed upon stipend and travel expense reimbursement (to be determined by the department under review).

As soon as the program receives the report from the external review team, it is distributed to the appropriate individuals. The department is typically asked to review the report (within a brief time period) for factual inaccuracies and misperceptions. To maximize the effectiveness of program review, the findings and resulting decisions should be shared with all of the stakeholder groups. Such sharing of findings generates buy-in to the program's and/or institution's goals. To facilitate and track the implementation of improvement plans, each year the relevant faculty members should review the progress of programs reviewed in previous years. If the department/program was not successful in implementing all aspects of the plan, they may follow up with their appropriate administrative unit regarding resource allocation or other barriers involved in preventing successful implementation.

External Reviewer Report
Please attach the External Reviewer Report.
computer_science_external_review.pdf

FORMS

1. UAC REPORT

Programs should submit to UAC:
a. The major strengths and weaknesses identified in the Program Review's Quality Improvement Plan (QIP). Please identify and cite the evidence that supports your answer.
b. A list of the program goals established for the next five years (please list in order of priority, the most important goal first). Please cite the evidence that supports your answer.

Other documentation available to the UAC:
1. Program Reviews: found on the OIE web site
2. QIP: Upon Request
3. External Reviewer's Report: Upon Request
4. MOU: Upon Request

The major strengths and weaknesses identified in the Program Review's Quality Improvement Plan (QIP).

A list of the program goals established for the next five years (please list in order of priority, the most important goal first). Please cite the evidence that supports your answer.

The long term goal is to establish a full Computer Science major. The administration states that they will not provide the resources to do so without demonstrated student demand. Therefore, the short term goal is to increase enrollments in computer science courses in order to demonstrate student demand. The following program modifications are intended to increase student demand.
1. The first priority is to propose a joint major in Computer Science/Digital Arts. This modification follows the recommendation of the external reviewer.
2. The second priority is to increase course requirement flexibility. This modification follows the recommendation of the external reviewer.
3. The third priority is to increase prerequisite flexibility. This modification follows the recommendation of the external reviewer.
4. The fourth priority is to enhance the intro computer science courses to include an experimental lab component that will satisfy the general education requirement. This modification follows the recommendation of the external reviewer.
Longer-term plans — There are recommendations by the external reviewer that we agree with, but that we cannot implement because they would require additional funding. These include staffing goals for the next five years, and can be found in the external reviewer’s report. Our plan is to implement only those recommendations that we can without additional funding resources. If enrollment increases in the future, then we will revisit those recommendations.

2. Educational Effectiveness Report

Educational Effectiveness Report
Please download and complete the form.

Educational Effectiveness Report
Please attach the completed form.

3. University Credit Hours

PEPPERDINE UNIVERSITY'S CREDIT HOUR POLICY

For all Pepperdine programs, including but not limited to the undergraduate, master's, juris doctor, and doctoral levels, for each credit hour (unit) granted, students must have successfully met the academic requirements with an amount of work represented in intended learning outcomes and verified by evidence of student achievement that reasonably approximates not less than:

1. One hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester or the equivalent amount of work over a different amount of time; or

2. At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours..

The above policy is applicable to all courses offered, regardless of the mode of delivery and/or session length (e.g. full term-length, weekend mode, abbreviated term, face-to-face, hybrid, online, etc.).

Approved by the University Academic Council
May 2012

PROCEDURE FOR CHECKING CREDIT HOURS

Credit hours will be examined for compliance by Department, by School, and by the Registrar prior to the start of each term.

Official credit hour approval occurs via UAC during new program proposals, changes to programs, changes to courses, and during program review (via UAC and ASLC).

Exceptions such as Independent Studies and Internships are checked on an ongoing basis by faculty, Division Chair and/or Associate Dean, and Registrar.

University Credit Hour Policy Example Table
Please download and complete the form.
University_Credit_Hour_Policy_Example_Table.docx
University_Credit_Hour_Policy_Example_Table.docx

University Credit Hour Policy Example Table.
Please attach the completed form.
Natural_Science_Audit_final.xlsx
Natural_Science_Audit_final.xlsx

QUALITY IMPROVEMENT PLAN

QUALITY IMPROVEMENT PLAN: QIP

For the Quality Improvement Plan, the program should extract from the "preliminary quality improvement goals and action plan" of the self-study (section A.III) as well as from both the external and internal review recommendations.

The following prompts may be helpful in considering your QIP:

1. Are the curriculum, practices, processes, and resources properly aligned with the goals of the program?
2. Are department/program outcomes aligned with the institutional learning outcomes (ILOs)?
3. Is the level of program quality aligned with the school/University's acceptable level of program quality?
4. Aligned with the constituents' acceptable level of quality?
5. Are program goals being achieved?
6. Are student learning outcomes being achieved at the established standard of achievement? What are you using for comparison/benchmarking?
7. How have the results of program review been used to inform decision-making and improve instruction and student learning outcomes?
8. What was identified in the process of examining the institution's program review process that may require deeper reflection, changes, and/or restructuring? What will be done as a result? What resources will be required?
9. What have the reviewers learned as they carried out assessments of student learning? How have assessment protocols, faculty development, choices of instruments, or other aspects of assessment changed as a result?

Many of the changes that occur following program review are related to curricular adjustments that are, in essence, resource neutral. Program faculty or staff should make note of the ways that they used data to make decisions. Changes that are outside the control of the program or need additional support should be noted and reviewed by the dean in the final section, the Memorandum of Understanding (MOU).

See the attached Quality Improvement Plan.

Quality Improvement Plan
Please attach the Quality Improvement Plan
COSC_Quality_Improvement_Plan.pdf