Assessment activities in the Biology BS Program during 2014-15

During the 2014-15 academic year, the Department of Biology continued refining its cycle of assessment activities based on feedback from the recent (2012-13) full Program Review and feedback from the previous year.

The Department of Biology restarted its 7-year Program Review cycle following a Program Review during the 2012-13 academic year. The Department as a whole responded to the external committee’s review of our undergraduate and graduate program, with the Assessment Committee focusing on feedback about learning outcomes and assessment.

As a result, the Assessment Committee undertook a revision of the Department’s undergraduate Student Learning Outcomes Assessment Plan (SOAP). The first step was to update the assessment calendar to match the new program review cycle, which started during the last academic year:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre and Post Test</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. Ecology Lab Reports</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Evolution Term Paper</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Research Experience (Post-Test)</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5. Research Experience (Evolution Term Paper)</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Student Research Tabulation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7. Pipeline Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8. Alumni Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Accordingly the Assessment Committee continued to gather data as defined in the current SOAP. At the same time, we also undertook the process of doing a major revision of the SOAP, and began implementing some new assessment instruments.

The Department has been redesigning its undergraduate Introductory Biology core course sequence (Biol1A and Biol1B). This is one of the first significant steps among other curricular changes being implemented as part of the action plan in response to the Program Review (see below). It is also an activity supported by the NSF WIDER grant at the College level and by the Chancellor’s Office.

Revising the Biology SOAP:

As mentioned previously, the Assessment Committee started the major task of overhauling the Department’s undergraduate SOAP which had not been revised in over a decade. After
studying the previous long and rather too complex list of content-heavy learning outcomes, and taking a broader perspective on where the discipline and pedagogy in Biology was heading nationwide, the Assessment Committee concluded that we need a fresh start on redefining our SOAP, but also do it in such a way as to not increase the burden on faculty in terms of assessing all new learning outcomes. With that in mind, the Assessment Committee recommended to the Department that 1) we adopt the basic framework recommended by the AAAS Vision & Change report (2009), and 2) make this a core part of the Departmental Retreat during summer 2015.

**Vision and Change as departmental vision:**

The Biology department organized a retreat discuss the biology curriculum. The goals of the retreat were

- to introduce the faculty to *Vision and Change*, an initiative by the AAAS (American Association for the Advancement of Science) that aims to transform biology higher education,
- to create buy-in for Vision and Change, and
- to inventorize the core concepts as identified in *Vision and Change* across our curriculum.

To achieve these goals, the retreat comprised an agenda item on *Vision and Change* with four steps:

1. We posed an inventory question about who had read the *Vision and Change* report.
2. We then presented the core concepts as identified in the *Vision and Change* report. We then asked faculty to report if and how they teach which of the five core concepts in one of their courses using the PULSE rubric. This PULSE rubric was developed to track the progress of department with implementing *Vision and Change*.
3. We then asked faculty to inventory of our current coverage of these core concepts in our current curriculum by mapping their courses onto the five core concepts.
4. We then asked faculty to form one team per concept and develop or discuss one assessment activity for their team’s core concept. Each team was led by an instructor who teaches this core concept in a lower-division course.
5. Lastly, we asked a reflection question about *Vision and Change*.

At the end of the retreat:

6. we asked an open-ended reflection question.

**Question (1) “Have you read Vision and Change report?”**

Of the 20 faculty present, three had read the report and about half had heard about the report.

**Question (5) “What are your thoughts about Vision and Change? What are your thoughts about Vision and Change as a guide for our department curriculum?”**

Of the 20 faculty present at the retreat, 19 agreed without reservations to adopting *Vision and Change*. One faculty member commented that the core concept formulated in *Vision and Change* might be improved upon, but overall agreed with adopting those core concepts.
Question (6) “What will you do as a consequence of this retreat?”
Of the 20 faculty present at the retreat, eight vowed to find ways to better reflect or implement core concepts in their courses.

Vision and Change mapped onto our curriculum

Current curriculum map
We mapped the five core concepts onto our current curriculum for three organizational categories (molecular/cellular, physiology, and ecology).

<table>
<thead>
<tr>
<th></th>
<th>Evolution</th>
<th>Information</th>
<th>Struct. &amp; Function</th>
<th>Systems</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ml/cl</td>
<td>Phys</td>
<td>Ecol</td>
<td>ml/cl</td>
<td>Phys</td>
</tr>
<tr>
<td>Lower Division</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A Intro Biol</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>1B Intro Biol</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>101 Ecology</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 Genetics</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103 Cell Biology</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104 Gen Cell lab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105 Evolution</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper division</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 Microbiology</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>121 Med.Micro.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130 Invertebrates</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 Plant Anat.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>143 Vertebr.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>144 Neuroanat.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 Molec Biol.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>155 Devel. Biology</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>156 Plant Develop.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>157 Immunology</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>162 Anim. Physiol.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165 Endocrinology</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>166 Neurophysiol.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64 Human Anat.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65 Hum. Physiol.</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summary of current curriculum map
The table below summarizes the number of occurrences of each concept.

<table>
<thead>
<tr>
<th></th>
<th>Evolution</th>
<th>Information</th>
<th>Struct. &amp; Function</th>
<th>Systems</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ml/cl</td>
<td>Phys</td>
<td>Ecol</td>
<td>ml/cl</td>
<td>Phys</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>23</td>
<td>30</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Lower division</td>
<td>10</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Upper division</td>
<td>17</td>
<td>15</td>
<td>19</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>13</td>
<td>8</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>
Across the curriculum, we cover all core concepts at all organizational levels at both the lower and upper-division level.

The concepts ‘evolution’ and ‘structure and function’ are covered well in the lower and upper division courses.

The concepts ‘energy’ and ‘information’ are least covered in the lower-division curriculum. This shortcoming will be addressed by the current redesign of Biol 1A and Biol 1B, which is part of an NSF-funded college-wide initiative to redesign introductory STEM courses.

**Plans for new curriculum map**

We are in the process of restructuring our curriculum to incorporate the five core concepts onto our curriculum in a more explicit way. c = current; p = planned or piloted

<table>
<thead>
<tr>
<th>Lower Division</th>
<th>Evolution</th>
<th>Information</th>
<th>Struct. &amp; Function</th>
<th>Systems</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ml/cl</td>
<td>Phys</td>
<td>Ecol</td>
<td>ml/cl</td>
<td>Phys</td>
</tr>
<tr>
<td>1A Intro Biol</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>1B Intro Biol</td>
<td>c</td>
<td>p</td>
<td>p</td>
<td>p</td>
<td>c</td>
</tr>
<tr>
<td>101 Ecology</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>102 Genetics</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>103 Cell Biology</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>104 Gen Cell lab</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>105 Evolution</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
</tbody>
</table>

**Developing a new SOAP**

We will use the map of core concepts onto our current curriculum, combined with the recommendation in the *Vision and Change* report and the *PULSE* rubric, to develop a new SOAP for our biology undergraduate program.

The next steps to be taken are:

1. apply the *PULSE* rubric to our curriculum.
2. identify strengths and weaknesses in our current coverage of the core concepts using the *PULSE* rubric and our Core Concept Curriculum Map.
3. map these strengths and weaknesses on our course redesign and faculty recruitment plans.
4. develop new course goals and learning outcomes that reflect *Vision and Change* recommendations about course content and pedagogy.

The new SOAP will be developed and submitted for approval during 2015-16, and fully implemented during the following academic year.

In the interim, during the 2014-15 academic year, the Department carried out the previously approved assessment activities in the undergraduate program as scheduled in the above calendar.

1. **What learning outcomes did you assess?**

During the 2013-14 academic year, we assessed the following departmental goals and learning outcomes as described in our previous undergraduate SOAP, specifically:
Goal 1:
Biology majors will be able to integrate and apply basic knowledge into the unifying themes in Biology.

Outcomes
1 Biology Majors will be able to integrate and apply biological knowledge into the following unifying themes:
1A evolutionary patterns and processes
1B energy transformations and flow
1C nutrient cycles
1D homeostasis and equilibria
1E molecular information flow
1F structure-function relationships
1G hierarchy of biological organization
1H developmental patterns and processes
1I complexity of interactions in biological systems

Goal 2
Biology majors will gain knowledge and experiences in the basic methods, instrumentation and quantitative analytical skills used to conduct scientific research in biological science.

Outcomes:
2.1 Scientific Method: Biology Majors will be able to
2.1A apply the scientific method to biological questions
2.1B generate testable hypotheses
2.1C design experiments to test hypotheses
2.2 Analytical and quantitative skills: Biology Majors will be able to
2.2A make appropriate measurements and create data sets
2.2B graph and display data
2.2C objectively analyze data
2.2D interpret results of experiments
2.3 Lab and field skills: Biology Majors will be able to
2.3A use appropriate equipment and instrumentation
2.3B understand and follow safety procedures
2.4 Teamwork skills: Biology Majors will be able to
2.4A work cooperatively in a group
2.4B solve problems in a group

Goal 3:
Biology majors will develop critical thinking and communication skills, both oral and written, for purposes of conveying biological information to both professional scientists and the lay public.
Outcomes:

3.1 Critical thinking and problem solving: Biology Majors will be able to
   3.1A develop an argument and support it
   3.1B recognize and use deductive and inductive reasoning
   3.1C integrate concepts within and among disciplines
   3.1D synthesize knowledge and apply concepts to solve problems
   3.1E distinguish between data and inferences based on data

3.2 Biological information skills: Biology Majors will be able to
   3.2A understand and evaluate primary biological literature
   3.2B integrate published information in oral and written communication
   3.2C use biological databases

3.3 Communication: Biology Majors will be able to communicate science effectively
   to their peers and to the broader scientific community using:
   3.3A oral presentations
   3.3B written scientific papers and reports

2. What instruments did you use to assess them?

1. Pre- and Post-Tests: During 2014-15, the Assessment Committee recommended
   that the Pre-/Post-Tests used in Biol 1B previously should be replaced by new tools
   developed by the WIDER Biology FLOCK for use in both the Intro classes. In Biology
   1A, we developed and administered a new biology “pre-test/post-test” including (i)
   graph interpretation and basics of cellular structure to assess the student’s
   biological knowledge starting point; and (ii) Colorado learning attitudes about
   science survey to investigate students’ perspectives on biology. In Biol 1B, we
   developed a new pre-test/post-test metric to assess students’ attitudes towards
   biology and science and assessed their ability to read and interpret scientific tables
   and graphs.

2. Ecology Lab Reports: A random sample of lab reports from the Biol 101 Ecology
   class were collected to assess relevant learning outcomes.

3. Undergraduate student research activity: As is done annually, undergraduate
   student involvement in research in faculty labs is being tabulated as part of the
   Department’s annual report.

3. What did you discover from the findings?

1. Assessing the new Pre-/Post-Tests in Intro Bio classes:
   Preliminary analysis of data from these new FLOCK-designed assessments leads us to
   conclude that both the tests need further fine-tuning to address program learning
   outcomes.
   - Some of the questions were too easy (high performance already in the pre-
   test).
• **Biol 1A.** The pre/post tests are composed of six questions (1 point each) that evaluate the students’ ability to interpret graphed data about chemical reaction rates. The test shows high scores already in the pretest (three of six questions had a 74% to 88% correct score). The Biol 1A pre-/post-test may need to be redesigned to better align with the level of incoming students and more accurately assess student success (or lack thereof) by the end of the semester.

• **Biol 1B.** The Biol 1B pre- and post-tests are composed of six questions (1 point each) that evaluate the students’ ability to interpret tabular data from a study on cavity nesting birds, and a single 4 point question that asks each student to draw and label a phylogenetic tree. In addition the students are asked to respond to a series of attitudinal and demographic questions. The pre-test was administered in the second class lecture period of Fall 2014, the post-test at the conclusion of the final exam.

Pre-test: n = 129, mean = 4.05, SD = 1.63  
Post-test: n = 81, mean = 3.53, SD = 1.81  

These results are significant at both 95% and 99% confidence.

Analysis of the remaining questions is pending.

As in the case of Biol 1A, the 1B pre-/post-test may need to be redesigned to better align with the level of incoming students and more accurately assess student success (or lack thereof) by the end of the semester.

1. **Ecology Lab Reports:** The data from the assessment of Biol 101 Ecology Lab Reports need further analysis, but the patterns are consistent with what has been reported in previous years.

2. **Undergraduate student research activity:** Research-active students continued to be strongly represented in a majority of publications and presentations originating from the Biology department.

4. **What changes did you make as a result of these findings?**

   1. **Overview:** As described above, we are in the process of a comprehensive revision of the department’s undergraduate SOAP. We have adopted a new Pre-Test / Post-Test instrument which is being fine-tuned for the lower division, and in light of the Vision & Change concept inventory. The Department is redesigning several core courses, and updating the curriculum in other areas, all in light of the consensus to adopt the AAAS Vision & Change framework for our pedagogy across the undergraduate Biology curriculum.

   2. Additionally, as part of the action plan, the department is moving ahead with the development of a Biology Honors program. The Department has also proposed the development of a Biology pre-major to better address the bottleneck in our introductory biology courses.

   3. **Curricular redesign:** Biol 1A, 1B, and 1BL are all being redesigned currently, by a core of faculty members who are part of the Biology FLOCK in the NSF-WIDER grant
in the College of Science & Mathematics. The Department’s Assessment Coordinator is part of the Biology FLOCK, making it easier to facilitate the feedback (and loop-closing) between curricular content and delivery redesign, and outcomes assessment – not only for these specific courses, but for the undergraduate program as a whole. Other courses being redesigned include Biol 33, 64, and 65.

Assessment activities in the Biology MS Program during 2014-15

The Department of Biology offers graduate training with the opportunity to specialize in several areas of advanced biological study. One graduate degree is offered, the Master of Science in Biology. The department also offers a Master of Biotechnology degree and via the Moss Landing Marine Laboratories a Master of Marine Science Degree. Neither are addressed in this SOAP or this year’s assessment report. The M.S. in Biology degree requires a formal thesis following the completion of a field- and/or laboratory-based research project.

Three major emphases of the Department’s graduate program are 1) to provide training for those wishing to enter Master’s level careers in the biological sciences, 2) to prepare graduate students for teaching biological sciences in the primary and secondary schools, and junior college ranks and, 3) to provide a foundation for students seeking more advanced training at universities offering doctorate or professional degrees.

Mission Statement.

The graduate program of the Department of Biology will provide state-of-the-art educational experiences that will prepare students to make valuable contributions to society where a knowledge and understanding of biological organisms and processes are required (e.g., biodiversity, conservation and the environment, health sciences, and biotechnology). Students will learn laboratory and/or field techniques and will conduct independent research within the biological sciences. They will also acquire the skills necessary for communicating biological information to professional scientific peers as well as to the lay public.

Learning Goals.

GOAL 1. To enhance the student’s depth of understanding of selected topics in the biological sciences.

GOAL 2. To cultivate skills for acquiring knowledge in the life sciences, both for matriculation and life-long learning.

GOAL 3. To increase the student’s understanding of experimentation, observation and data analysis, and their application to defined questions in biology.

GOAL 4. To develop an awareness of available tools and fiscal limitations of conducting specific scientific endeavors.

GOAL 5. To enhance communication skills, both written and oral, for purposes of conveying biological information to both professional scientists and the lay public.
Areas of Progress.
To the best of our knowledge, all graduates of the Biology Masters program have found employment in their field or have entered professional or Ph.D. programs. We are currently collecting specific data for student placement through our survey instrument and intend to present more quantitative data in the next annual report.

1. Curricular Roadmap
Since the last extensive program review in 2012, the graduate committee has made significant progress in restructuring the curricular roadmap for the MS Biology program. Our data suggested that getting students into a writing course early on (i.e. semester 1, see Appendix I) to make substantive progress towards the GWR requirement would accelerate the student’s pace through the graduate degree. Furthermore, offering this class in both semesters would allow the smaller number of spring semester admits to take advantage of a writing commitment as well. In keeping with the mission of offering flexibility in our program, the courses for each degree are individualized and are established by mutual agreement between the student and the adviser with input from the student’s thesis committee. The result creates a cohesive graduate program selected from among classes that are taught with regularity and topics or “T” classes that represent new offerings that may subsequently be transformed into regular offerings.

2. Core Course Admission Requirement
Historically, admission to the MS Biology program has relied upon the basic university requirements (3.0 GPA+, GREs, letters, Statement of purpose) for applicants as well as the scholarly completion of core courses within our biology core (Ecology, Genetics, Cell Biology, Genetics/Cell Biol lab, Evolution). This has at times limited incoming graduate students to Conditional standing until they have successfully passed with B or better these core courses. For some disciplines in program, this requirement was deemed unnecessary and increasing the time to graduation. Over the past couple of years, these core requirements have been waived such that all incoming students have Classified status. We believe this will have two positive impacts: (i) improve recruiting by removing a barrier for some potential applicants to the program, and (ii) increase student success by decreasing the time to graduation standard. We think that this has minimal impact on the overall rigor of our program and puts more ownership of the graduate study plan/degree progress on the student and faculty mentor.

3. Rubric Development
Over the past couple of years, the graduate committee has continued to develop strong assessment tools for program evaluation. Specifically, several rubrics have been improved with greater faculty participation including:

i. GWR cover letter – To assist the student mentoring committee in better understanding the style of writing requirement—typically a journal pub format or thesis proposal (see Appendix II).

ii. GWR scoring rubric – This scoring instrument is consistent with the MS Biotech program and provides summative assessment for the student in the areas of Style
& format, Writing mechanics, Content & organization, Integration & critical analysis.

iii. Thesis scoring rubric – This scoring instrument also provides summative assessment for the student in the areas of Quality of Science (47% weighting), Quality of Writing (33% weighting), and Quality of Presentation (20% weighting). This important rubric is used in combination with other material to help determine student success/ranking towards scholarship and merit (i.e. Dean’s medalist and Best graduate student thesis, etc). This rubric also becomes the basis for assigning the final grade for the thesis units (BIOL 299) (see Appendix III).

iv. Exit seminar scoring rubric – This scoring instrument also provides summative assessment for the student in the areas of Quality of Science (64% weighting) and Quality of Presentation (36% weighting). This rubric is similar in structure to the thesis-scoring rubric, which improves the ease of use for faculty and thesis committee members (see Appendix IV).

4. Faculty Hires
The Biology Department experienced significant faculty turnover since the last period of review. Four faculty members retired, three others are current participants in the Faculty Early Retirement Program, two others left to serve in Dean roles at other CSU campuses, and one new hire subsequently left the university for a faculty appointment at another university. This great state of flux and turnover has been a challenge for continuity of course offerings, particularly for the graduate and upper-division major courses. Fortunately, in the last 4 years six new faculty members were recruited which helps to enrich our diversity and improves our marketability to recruit strong graduate students applicants both regionally and nationally.

**Areas to Improve the Biology Graduate Program.**

1. Continue to increase the number of graduate students in the program.
2. Increase number of graduate assistantships.
3. Increase stipends for graduate assistantships.
4. Provide fee waivers for teaching assistantships.
5. Increase recruitment activities.
6. Increase number of graduate course offerings.
7. Increase levels of graduate student support through external grants.
8. Build greater comradery among graduate students in the program through social activities and team-building exercises.

**Assessment cycle according to SOAP.**

The Biology graduate program will perform an assessment every five years.
Appendix I

Graduate Program Roadmap

**Fall Semester 1 (7 units)**

- Writing course (3 units)  
  Ulrike Muller/Brian Tsukimura/Otto Berg
- Experimental Design (3 units)  
  (Behavioural and Ecological/Molecular)  
  David Lent/Madhusudan Katti/Steve Blumenshine
- Colloquium (1 unit)

**Objective:** Set up committee. Have draft of GWR completed.

**Spring Semester 1 (8 units)**

- Bioethics (1 unit)  
  Joe Ross
- Colloquium (1 unit)
- Course elective (3 units)
- Research (3 units)

**Objective:** Finish GWR

**Fall Semester II (7 units)**

- Course elective (3 units)
- Independent Study (3 units)
- Seminar (1 unit)

**Objective:** Meet with committee

**Spring Semester II (8 units)**

- Thesis Units (4 units)
- Course elective (3 units)
- Seminar (1 unit)

**Objective** Finish thesis, Graduate seminar
Appendix II

Graduate Writing Requirement

Thesis/Project Proposal
Department of Biology
California State University, Fresno

Overview
In consultation with your Thesis/Project committee you have prepared your GWR in one of two formats:

- Grant Proposal
- Journal Publication

Requirements

<table>
<thead>
<tr>
<th>Sections</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary/Abstract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific Aims (optional)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Description/Introduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental Design/Methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preliminary Data (optional)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timeline (optional)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budget (optional)*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The following is to be included in the GWR based on format chosen and must be approved by the chair prior to submission to the rest of your committee. Refer to Thesis proposal guidelines for complete description.

Evaluation
Your committee will evaluate using the Biology Departments scoring rubric and you will be scored from 1 to 5 in the following four areas:

I. Style and format
II. Mechanics
III. Content and organization
IV. Integration and critical analysis

Materials
It is your responsibility to provide:
- Proposal sheet
- GWR
- Rubric
- Score sheet

Dates & Deadlines
Date submitted:
Date scores requested:
Please allow two weeks for your committee to mark your GWR and submit your scores.

Deadlines:
If you have impending deadlines that require your committee to grade in less than two weeks, please provide data above. Note: meeting this deadline is not guaranteed.

Signature of Student:
Signature of Committee Chair:
### Appendix III

**Student’s name:**

**Thesis evaluation rubric. Assessed by:**

**Date:**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Inadequate (1)</th>
<th>Adequate (2)</th>
<th>Good (3)</th>
<th>Excellent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of science</td>
<td>□ Inadequate literature review, lacking scientific context</td>
<td>□ Literature review is present, but scientific context for current work is not complete</td>
<td>□ Hypothesis/goals are articulated, but in an unclear or disorganized manner</td>
<td>□ The student has reviewed the literature and explained how current work fills a gap</td>
</tr>
<tr>
<td>Score/28</td>
<td>□ Hypothesis/goals are not clearly stated</td>
<td>□ Experimental design is explained, repeatable, and adequate</td>
<td>□ Hypothesis/goals are clearly articulated</td>
<td>□ Hypothesis/goals are clearly articulated and are exceptionally creative</td>
</tr>
<tr>
<td></td>
<td>□ Experimental design is inadequate or inadequately explained</td>
<td>□ Data analysis is explained, repeatable, and adequate</td>
<td>□ Experimental design is thoroughly explained and repeatable</td>
<td>□ Experimental design is thoroughly explained and repeatable, modern or cutting edge methods employed</td>
</tr>
<tr>
<td></td>
<td>□ Data analysis is inadequate or inadequately explained</td>
<td>□ Reasonable interpretation of the results, but incomplete discussion of alternative explanations</td>
<td>□ Data analysis is thoroughly explained and repeatable</td>
<td>□ Data analysis is thoroughly explained and repeatable, modern or cutting edge methods employed</td>
</tr>
<tr>
<td></td>
<td>□ No interpretation of the results</td>
<td>□ Reasonable interpretation of the results, along with discussion of alternative explanations</td>
<td>□ Reasonable interpretation of results, along with discussion of alternative explanations</td>
<td>□ Thoughtful interpretation of results, along with thorough discussion of alternative explanations</td>
</tr>
<tr>
<td>Quality of writing</td>
<td>Score/20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Writing is not understandable and engaging to readers</td>
<td>□ Writing can be clearer and more engaging.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Writing is not organized, inconsistent and does not flow in a logical manner</td>
<td>□ It is possible, but not easy, to follow the main themes of the thesis as the writing is mostly logical and consistent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Thesis contains excessive spelling/grammar errors</td>
<td>□ Thesis is mostly free from spelling/grammar errors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Organization of thesis does not follow standard scientific format</td>
<td>□ Organization of thesis somewhat follows standard scientific format</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ The writing within each section often belongs in another section (e.g. discussion in results section)</td>
<td>□ The writing within each section is generally appropriate for that section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Writing is understandable and engaging to the reader</td>
<td>□ Writing is organized, consistent, and logical with main themes that are easy to follow.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Writing is exceptionally well organized, consistent, and logical with main themes that are easy to follow.</td>
<td>□ Thesis is free from spelling/grammar errors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Organization of thesis follows standard scientific format</td>
<td>□ The writing within each section is appropriately for that section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ The writing within each section is appropriate for that section</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality of presentation</th>
<th>Score/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Tables and figures are unclear, incorrect, or misleading</td>
<td>□ Tables and figures are somewhat clear and appropriate</td>
</tr>
<tr>
<td>□ Figure captions are incomplete or unclear</td>
<td>□ Figure captions are somewhat appropriate</td>
</tr>
<tr>
<td>□ Citations are missing or inconsistent</td>
<td>□ Citation format is consistent, although a few errors exist</td>
</tr>
<tr>
<td>□ Figure captions are clearly described the visual elements</td>
<td>□ Figure captions are consistently and appropriate</td>
</tr>
<tr>
<td>□ Citations are consistent and appropriate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall assessment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Inadequate</td>
<td>□ Adequate</td>
</tr>
<tr>
<td>□ Good</td>
<td>□ Excellent</td>
</tr>
</tbody>
</table>

TOTAL: score/60  Percentage: ________
Additional notes:
### Appendix IV

Student's name:  
Exit seminar evaluation rubric. Assessed by:  
Are you a member of the student’s thesis committee?  
Date:  

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Inadequate (1)</th>
<th>Adequate (2)</th>
<th>Good (3)</th>
<th>Excellent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of science Score:28</td>
<td>□ Inadequate literature review, lacking scientific context</td>
<td>□ Literature review is present, but scientific context for current work is not complete</td>
<td>□ The student has reviewed the literature and explained how current work fills a gap</td>
<td>□ Student has reviewed the literature &amp; explained how current work moves the field forward</td>
</tr>
<tr>
<td></td>
<td>□ Hypothesis/goals are not clearly stated</td>
<td>□ Hypothesis/goals are articulated, but in an unclear or disorganized manner</td>
<td>□ Hypothesis/goals are clearly articulated</td>
<td>□ Novel hypotheses/goals are clearly articulated</td>
</tr>
<tr>
<td></td>
<td>□ Experimental design is inadequate or inadequately explained</td>
<td>□ Experimental design is explained, repeatable, and adequate, but may have some flaws</td>
<td>□ Experimental design is appropriately explained and repeatable</td>
<td>□ Experimental design is thoroughly explained and repeatable, modern or cutting edge methods employed</td>
</tr>
<tr>
<td></td>
<td>□ Data analysis is inadequate or inadequately explained</td>
<td>□ Data analysis is explained, repeatable, and adequate but may not be thorough</td>
<td>□ Data analysis is thoroughly explained and repeatable</td>
<td>□ Data analysis is thoroughly explained and repeatable, modern or cutting edge methods employed</td>
</tr>
<tr>
<td></td>
<td>□ No interpretation of the results</td>
<td>□ Reasonable interpretation of the results, but incomplete discussion of alternative explanations</td>
<td>□ Thoughtful interpretation of results, along with discussion of alternative explanations</td>
<td>□ Thoughtful, creative, exceptional interpretation of results, along with discussion of alternative explanations</td>
</tr>
</tbody>
</table>

### Quality of science (cont.)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Inadequate (1)</th>
<th>Adequate (2)</th>
<th>Good (3)</th>
<th>Excellent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No attempt to discuss implications or place results into broader context</td>
<td>□ No attempt to discuss implications or place results into broader context</td>
<td>□ Implications and placing results into broader context is included, but not comprehensive</td>
<td>□ Implications and placing results into broader context are comprehensively discussed</td>
<td>□ Implications and placing results into broader context are comprehensively, creatively, and insightfully discussed</td>
</tr>
<tr>
<td>No attempt to discuss future directions</td>
<td>□ No attempt to discuss future directions</td>
<td>□ Future directions are discussed, but are not comprehensive</td>
<td>□ Future directions are comprehensively discussed</td>
<td>□ Future directions are comprehensively, creatively and insightfully discussed</td>
</tr>
</tbody>
</table>

### Quality of presentation Score:16

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Inadequate (1)</th>
<th>Adequate (2)</th>
<th>Good (3)</th>
<th>Excellent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization of talk does not follow a logical or standard scientific format</td>
<td>□ Organization of talk does not follow a logical or standard scientific format</td>
<td>□ Organization of talk follows a logical or standard scientific format</td>
<td>□ Organization of talk follows a logical and/or standard scientific format</td>
<td>□ Organization of talk follows a logical and/or standard scientific format, with clear outline etc.</td>
</tr>
<tr>
<td>Tables and figures are unclear, incorrect, or misleading</td>
<td>□ Tables and figures are unclear, incorrect, or misleading</td>
<td>□ Tables and figures are generally clear and appropriate</td>
<td>□ Tables and figures are of good quality</td>
<td>□ Tables and figures are of good quality</td>
</tr>
<tr>
<td>Quality of slides is poor</td>
<td>□ Quality of slides is poor</td>
<td>□ Slides are of good quality</td>
<td>□ Slides are of good quality and enhance the talk</td>
<td>□ Slides are of excellent quality and enhance the talk</td>
</tr>
<tr>
<td>Citations in the background portion of the presentation are missing or inconsistent</td>
<td>□ Citations in the background portion of the presentation are missing or inconsistent</td>
<td>□ Citation format is consistent, although a few errors exist</td>
<td>□ Citations are consistently appropriate</td>
<td>□ Citations are thoroughly consistent, and appropriate</td>
</tr>
</tbody>
</table>

### Overall assessment

<table>
<thead>
<tr>
<th>Inadequate</th>
<th>Adequate</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
</table>

TOTAL Score: /44 Percentage:  

Additional notes:
This Assessment Report addresses the Student Outcomes Assessment Plan (SOAP) submitted on October 7, 2015 and pertains only to the undergraduate biomedical physics program within the Department of Physics. It follows the format requested by the Provost’s Office.

1. **What learning outcome(s) did you assess this year?**

   This is the first assessment report submitted after a revised SOAP was submitted on October 7, 2015. The following learning outcomes (LO) labeled as 3, 4, 5, and 6 in the SOAP were addressed this first year of review:

   **LO3.** Students will demonstrate a solid understanding of fundamental concepts, principles, and problem solving in medical physics as identified in textbooks used as standards in graduate medical physics education:
   - *Introduction to Health Physics* by Cember
   - *Fundamentals of MRI* by Berry and Bulpitt
   - *The Essential Physics of Medical Imaging* by Bushberg, Seibert, Leidholdt, and Boone
   - *Physics in Nuclear Medicine* by Cherry, Sorenson and Phelps
   - *The Physics of Radiation Therapy* by Khan

   **LO4.** Students will demonstrate practical understanding of medical imaging equipment through collection of data and analyses as part of a “hands-on” experience at the local medical centers.

   **LO5.** Students will clearly, effectively, and professionally communicate their understanding and results from the “hands-on” laboratory experience in common written format.

   **LO6.** Students will demonstrate core skills in applied statistics, error analysis, and experimental design and methods in radiation instrumentation.”

2. **What instruments did you use to assess them?**

   To assess LO3, LO4, and LO6, a longitudinal track of the rates of admission of our graduates (from the inception of our program) who applied for graduate programs across the US and Canada was employed as a measure.
The learning outcomes listed above LO3 – LO6, were also evaluated via an alumni feedback survey (see Appendix A) sent approximately a year after graduation since the inception of the program. The alumni were approached to provide feedback on the quality and adequacy of their medical physics education at Fresno State. This survey obtained data concerning each respondent’s career path and any further achievements towards education goals. The duration of a year after graduation was to allow the formation of a perspective based on experience after graduation outside of Fresno State.

3. What did you discover from these data?

The Biomedical Physics Program at Fresno State is the nation’s first undergraduate program. It was conceived in 2000 and was first approved as a special major in biomedical physics. Our first single graduate under the special major was in 2007. From the inception of the program as a special major in biomedical physics and then a regular major, we have had 23 graduates to date. The years 2012 and 2013 saw no graduates for various reasons, one of which included not being able to offer courses at the right time due to wavering CSM commitment in hiring a faculty member to teach the courses. The program was conceived of as an interdisciplinary program in the area of quantitative neuroscience and students graduating from this program were expected and encouraged to enter other related fields for graduate study. Based on the survey respondents, we found 12 entering graduate schools for a MS or Ph.D. program primarily in biomedical physics but also in related fields such as medicine (MD), chemistry, and even health related business administration. Two students decided to become nuclear medicine technologists and continue to work in the valley. Two joined government work: one in California Department of Health Services (Radiologic Health Branch) and the other works for the Radiological Affairs Division of the US Navy. Three students joined the industry in the area of health physics. One student chose to get a teaching credential and teach high school and 3 responses were not received and hence, their path after graduation is unknown. In terms of gender, 9 out of 23 graduates have been women. Although physics in general, has traditionally been a male-dominated science, it seems that this branch of physics has been able to attract several women in the field.

These are excellent data for any program. All the students who applied for graduate school were admitted in their chosen area of study. It is also remarkable that our students have been admitted to prestigious schools such as Stanford, UCLA, UCSF, UC Davis, University of Wisconsin, Oregon State University, UNLV, etc. In the past, accreditation was not critical for graduate studies in biomedical physics but since the last two years CAMPEP-accredited graduate programs are the most competitive programs in the field. It is encouraging to see that all our students who applied to these programs in the last couple of years were admitted to the graduate programs. This is in keeping with the initial goal of the program to ensure that students graduating from this program are well prepared for graduate instruction in medical physics (M.S. or Ph.D.) or related fields.

The alumni survey sent a year after graduation also asks the student how well the program prepared them in specific areas for their current grad school or job. A scale of 1 to 5 is given as follows: 1= Inadequate; 2= Barely Acceptable; 3= Fair; 4= Good; 5= Excellent
Of the respondents, the average score in the following areas were:

<table>
<thead>
<tr>
<th>Area</th>
<th>Score ± Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Physics</td>
<td>4.5 ± 0.6</td>
</tr>
<tr>
<td>Basic Chemistry</td>
<td>4.0 ± 0.7</td>
</tr>
<tr>
<td>Basic Biology</td>
<td>4.2 ± 0.8</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4.4 ± 0.5</td>
</tr>
<tr>
<td>Comp Science</td>
<td>2.9 ± 0.9</td>
</tr>
<tr>
<td>Radiation Science</td>
<td>4.7 ± 0.4</td>
</tr>
<tr>
<td>Medical Imaging</td>
<td>4.7 ± 0.4</td>
</tr>
<tr>
<td>Radiation Therapy</td>
<td>4.5 ± 0.6</td>
</tr>
<tr>
<td>Laboratory Methods</td>
<td>4.6 ± 0.6</td>
</tr>
<tr>
<td>Radiation Safety</td>
<td>4.8 ± 0.3</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>4.5 ± 0.5</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>4.6 ± 0.4</td>
</tr>
</tbody>
</table>

Most of the comments by the respondents were of high praise. Every one (100%) of the respondents said that they would recommend the Fresno State Biomedical Physics Program to a prospective student. A few responses are shown below:

“The professors are all very concerned with the well-being of the students and extremely qualified in their respective fields. The coursework has mirrored the courses I have encountered in graduate school, making the transition much smoother.”

“It is probably one of the best, if not the best program Fresno State has to offer. I’ve already recommended it to several people.”

“Overall the Biomedical Physics Program at Fresno State prepared me for one of the top medical physics research universities in the country and I was able to easily transition into graduate school.”

4. **What changes did you make as a result of the findings?**

Based on the input from the former students, one thing that stands out remarkably is the computer science preparation at Fresno State is not meeting their expectations. Frankly, the biomedical physics program has been aware of this for a while. However, there is not much the program can do other than point out to the computer science department of the deficiencies in the coursework. Our students take CSCI 40, which does not prepare them to program in C/C++ or learn MATLAB. We have found a way around this by encouraging our students to take two classes both in electrical engineering which cover the subject far better. These courses are ECE 70 and ECE 72.

The other change we are considering is asking the alumni association to have a better mechanism to trace graduates after a year. Unfortunately, unlike some other schools, the email address at Fresno State seems to expire after a year or so of graduation. We have deliberately decided to send out the survey a year after graduation and find it returned
sometimes. It would be useful if we can partner with the alumni association to obtain the current email addresses of our graduates after a year.

5. **What assessment activities will you be conducting in the 2015-16 academic year?**

In accordance with our timeline in the SOAP, we plan to assess LO1 and LO2 which pertain to demonstration by the students of a solid physics foundation of the core disciplines at the level defined by the textbook *Physics for Scientists and Engineers* by Serway and Jewett, as well as ability to conduct laboratory work in physics in a safe and socially responsible manner, keeping accurate and complete records of their work.

In addition, we also plan to collect feedback from permanent and temporary faculty and instructors on their perceptions of student strengths and weaknesses.

6. **What progress have you made on items from your last program review action plan?**

Our action plan dates from 2009 (see Appendix B), and has “vision” items I to V. Per the former chair, the department has completed all of the items in the last program review action plan.

Item I. The department has completed this list of “Short Term Changes and Improvements”.

Item II. Repairs and Renovations: This item is a continuing work in progress as our main classrooms are in constant need of repair. Many rooms in the D Wing of McLane hall have faulty plumbing, HVAC problems, and ceiling tiles are always stained and moldy. Chairs in McLane 162 are in need of repair.

Item III. Establishment of a High Energy Physics Research Program: So far this is a big success. This year Dr. Gao was given a third 3-year National Science Foundation (NSF): $509,994 core grant from Elementary Particle Physics (EPP) for his research.

Item IV. Expand FTEs and Increase Physics Majors: We have made progress on increasing enrollment for all majors, and have a very active outreach program. This year we opened a third section of our popular GE Astronomy course PSci 21 hoping for a combined enrollment of more than 250.

Item V. Revise Undergraduate and Graduate Program assessment plans. The department has a revised SOAP for all our programs.
APPENDIX A

Survey of Recent Graduates
Biomedical Physics Program, Physics Department
California State University, Fresno

Name: ____________________________________________________________________________
(First) (Last) (Maiden, if applicable)

Address:_____________________________________________________

City:_____________________State:_________Zip (postal) code:______Country:______

Year of Graduation:__________
1. What are you doing now?
   - Clinical Medical Physics
     - Diagnostic
     - Therapy
     - Nuclear Medicine
   - Health Physics
   - Research, Medical/Health Physics or related area
   - Graduate school, Medical or Health Physics
   - Graduate school, other medical science (specify)___________________________
   - Graduate school, other field (specify)______________________________
   - Other:________________________________________________________

2. How long did you spend looking for the job or applying for the graduate school?
   ______________________
3. How would you assess the preparation you received at Fresno State’s Biomedical Physics Program for your current occupation or your current graduate/training program in the following areas?

1 = inadequate, 2 = barely acceptable, 3 = fair, 4 = good, 5 = excellent

<table>
<thead>
<tr>
<th>Area</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Basic Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>B. Basic Chemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>C. Basic Biology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>D. Mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>E. Computer Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>F. Radiation Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>G. Medical Imaging Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>H. Radiation Therapy Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>H. Laboratory Methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>I. Radiation Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>J. Critical Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>I. Problem Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

4. Are you satisfied with your current school or employment? Yes___ No___

Please Explain Briefly.______________________________________________________________

_____________________________________________________________________________

5. Would you recommend the Biomedical Physics Program at Fresno State to a prospective student? Yes___ No___

Please Explain Briefly.______________________________________________________________

_____________________________________________________________________________
6. With your current prospective, please list any prominent strong points or areas for improvement in the Biomedical Physics Program at Fresno State.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________
1. Seven Year Vision

Our program review identified areas within our program for growth and improvement, but did not identify any completely new initiatives. Instead the review team responded favorably towards our presented set of goals and initiatives and offered insights toward furthering these aims. As listed in the bullet point of separate visions below, these ongoing initiatives include:

Repairs and renovations to our department facilities and classrooms, increasing our enrollment with a related expansion of outreach activities, a robust investment towards our experimental high energy physics program, revision and implementation of departmental program assessment a continued vigorous effort to expand our solid state physics program. In addition the review team (and program review office) offered some short term actionable changes and improvements that the department has set out to implement. We address these short term items in the first bullet point and follow with five further long term visions for the physics program. Note that the ordering of this list does not necessarily reflect a ranking of priority.

2. Specific actions to be taken to achieve the vision

I. Vision: Short Term Changes and Improvements

a. Proposed actions and expected outcomes:
   i. Revise the Physics Department mission statement to provide consistency when referring to BS in biomedical physics program.
   ii. Institute core curriculum for MS degree and make explicit in catalog.
   iii. Institute and publish guidelines for completing a graduate student project under the course title Phys 298.
   iv. Coordinate and incorporate advising for pre-teaching majors utilizing the services of the new coordinator for teacher preparation within the CSM.
   v. Review laboratory space to ensure the physics department’s needs in terms of instruction and research are met within the plans of the CSM.

b. Cost/Resource Implications:
   i. Department administrative assistant will oversee allocation and alteration of documents to change instances of “medical physics” to “biomedical physics”. No costs above employee time for regular duties.
   ii. The graduate advisor, with consultation of graduate instructors, will draft a document of a core curriculum.
   iii. Similarly, the graduate advisor and faculty will draft a document for Phys 298 guidelines.
   iv. The department will designate a faculty member as a primary liaison to the new
coordinator of teacher preparation. No cost above this faculty member’s time is needed.

v. Department faculty and staff will review instructional and research facilities allocation and develop a plan for improvement. No additional costs are projected to complete this review.

c. Source of Funds/Resources
i. through v. No further internal or external funding needed.

d. Benchmark and Timeline for Action:
i. through v. We hope to implement all five short term changes within the year the review was received.

II. Vision: Repairs and renovations in the wake of the 98-99 McLane Hall remodeling.

a. Proposed actions and expected outcomes:
McLane Hall is among the oldest buildings on campus. The remodeling in 1998-99 was not as successful as promised leaving behind unfinished work and shoddy construction. The physics department will maintain a list of needed repairs and will endeavor to work with plant operations with occasional help from the college. Expected outcome is an urgent attention to the following high priority repairs: the movable whiteboards, seating, staircases, and elevator in McLane 162, repairs to ceiling tiles and mold in many offices and laboratories in the D Wing due to faulty air conditioning and leaking roofs.

b. Cost/Resource Implications:
We assume most of these repairs should fall within standard maintenance from plant operations, and thus far the physics department has not produced a cost estimate on these repairs.

c. Source of Funds/Resources
As mentioned, we hope that most of the cost would be covered in maintenance from plant operations. If we find that the cost of any of these repairs is excessive, or can not be handled by the plant operations budget, we will pursue capital outlay funds to cover costs.

d. Benchmark and Timeline for Action:
Given the budget situation we will hope for the best and push hard on repairs that most directly impact instruction or student/staff safety as our highest priorities.

III. Vision: Invest heavily in a new direction for our experimental high-energy program- Collaboration and federal funding with the ATLAS experiment on the Large Hadron Collider at the CERN physics laboratory.
a. Proposed actions and expected outcomes: Dr. Yongsheng Gao will pursue becoming a member of the ATLAS detector collaboration and associated funding through NSF and DoE. He will establish an active research program to involve undergraduate and graduate students in the analysis of particle physics data from the world’s most powerful particle collisions, including student research at CERN. Fresno State will become the only CSU campus listed as an official collaborating institute in this major multinational research effort in high-energy physics. The research program will include a presence at the CERN laboratory in Switzerland with a post doctorial position stationed 50% of the time there and the remaining 50% on campus.

b. Cost/Resource Implications:
The initial cost of the program will be provided by Dr. Gao’s startup funds and through an agreement with the College of Science and Mathematics in the form of salary for the post doctoral position for the first year. The program will need additional funds for the second and continuing years of the post doc salary, travel funds, summer salary, student stipends, student travel funds, and computing.

c. Source of Funds/Resources
Funding for the continuation and expansion of the program will be sought in the form of external grants. Specifically Dr. Gao will target the 3-year NSF Elementary Particle Physics (EPP) base/core award hopefully for $500K which will include salary for the post doctoral position, travel funds, summer salary and student stipends. This grant is very prestigious and in the history of its awarding; the recipient groups have always grown and obtained renewed funding every three year cycle. Given the support already allocated by the CSM we feel there is a good chance for obtaining this grant and more.

d. Benchmark and Timeline for Action:
Given the grant submission cycle and time for implementing the startup funds and ATLAS application process, we project our first external grants to be funded within two years of Dr. Gao’s hiring.

IV. Vision: Expand FTEs and Increase Physics Majors.

a. Proposed actions and expected outcomes:
Continue our efforts to improve our graduate and undergraduate programs in terms of enrollment of high quality and diverse students. Our primary and tested techniques concerning the recruitment process will use a combination of targeted outreach recruitment trips, advertising through the Downing Planetarium, and showcasing our new Biomedical Physics Special Major and Astronomy Minor.

b. Cost/Resource Implications:
We must fund travel for recruitment trips by our faculty across California if we want to ensure the success of the Physics programs. A cost estimate for the needed travel, assuming a frequency of about 3 presentations every two months (targeting other CSUs and local community and city colleges) for roughly 12 talks per academic year at about $200 per trip for travel and lodging if needed. So a budget of at least $2000 may be
needed.

c. Source of Funds/Resources
The above cost can be mitigated by making some of the presentation as day trips, reducing the cost by avoiding lodging. In addition, our faculty get invited to give colloquia where the travel is covered by the visited institution. Given these reductions we hope to use physics department funds to cover about $1200 of recruitment travel per year to meet our goals.

d. Benchmark and Timeline for Action:
We will implement this program immediately depending on budgetary constraints.

V. Vision: Revise Undergraduate and Graduate Program assessment plans as per the request of the Program Review Office.

a. Proposed actions and expected outcomes:
The department will convene a small committee to review and if necessary modify our program assessment plans created in AY 2000. Special attention will be made towards incorporating a mechanism where the results of previous assessments will be used on an annual basis to measure performance and implement any associated improvements. The committee will also assess whether or not the current plans include activities that provide actionable data for this annual review.

b. Cost/Resource Implications:
No cost above faculty members’ time on this committee work is needed. However, some assessment tools that might be incorporated in the plans may have annual fees associate with them. Until the committee evaluates the needs of the department in terms of assessment tools we can not provide a cost estimate for the implementation of our assessment plans.

c. Source of Funds/Resources
Sources will be sought as appropriate.

d. Benchmark and Timeline for Action:
The Program Assessment Office requests that new assessment plans for both undergraduate and graduate programs be delivered to it by October 1, 2009.

3. Additional information the department may wish to include:
In addition to the above vision items we continue to strengthen our condensed matter program, our longest running research program of our department and the largest research area in physics today. This area is dynamical in both science and industry and is a fruitful source of student research projects. AIP statistics show that the largest employer of physics bachelors comes from the design and development, manufacturing, and research needs of the industry in the private sector. The physics department used to have four faculty members in this field. For various circumstances we were down to two FTEF until 2007. Our most recent search has added one more – Dr. Pei-Chun Ho –
and we expect another position in this area in the near future. With strong support towards the research of Drs. Ho and Zhang we will rebuild our condensed matter program to our original strength.
BA/BS Chemistry Annual Assessment Report 2014-15

1. What learning outcome(s) did you assess this year?

**Learning Outcome 1.** Students will apply their understanding of terminology, concepts, theories, and skills to solve problems by defining problems and research questions clearly, formulating testable hypotheses, designing and conducting experimental tests of hypotheses, analyzing and interpreting data, and drawing appropriate conclusions within professional ethical guidelines. (ACS Standards 7.1 & 7.6).

**Learning Outcome 4.** Students will demonstrate the ability to clearly and effectively communicate their scientific results and opinions using written formats while following professional style and format conventions within professional ethical guidelines. (ACS Standards 7.4 & 7.6)

2. What instruments did you use to assess them?

**Method A1 – Laboratory Report Rubric (section 2).** From the SOAP: “Laboratory Report Rubric – This rubric will be used to assess full laboratory reports for the quality of writing (section 1) and experimental design and data analysis (section 2). When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.”

For the BA Chemistry program, the rubric was used to assess final written reports in CHEM 156, a senior-level Biochemistry lecture/lab course primarily for B.A. Chemistry and B.S. Biochemistry majors. Students conducted an open-ended capstone project in which they conducted experiments, analyzed and interpreted their results, and then wrote a paper in the style of a research journal article.

For the BS Chemistry program, the rubric was used to assess final written reports in CHEM 111, a senior-level Physical Chemistry lecture/lab course exclusively for B.S. Chemistry majors. These students performed an open-ended set of experiments to answer a research question of their own choosing. Approaches were taken from the scientific literature or were designed by the students in consultation with their instructor.

For each assessment, six lab reports were selected such that two were considered excellent by the instructor, two were average, and two were weak. Four of the reports (two from CHEM 156 and two from CHEM 111) were scored and discussed by three faculty members to ensure consistency. The remaining lab reports were read and scored by 1-2 of these faculty members.

**Method B3 – Graduating Students Focus Group Method.** From the SOAP: “The department will periodically hold a focus group with existing chemistry majors and chemistry club members. This will provide an opportunity to identify emerging problems quickly before they show up in tracked data. The department expects that student responses will be generally positive, yet constructive in improving department programs.”

All Spring 2015 graduating students were invited to participate in a focus group to provide their perceptions of whether the degree had adequately prepared them for their chosen career. The
focus group met on May 7, 2015 with emeritus chemistry professors Dr. David Zellmer and Dr. Ron Marhenke. The focus group was comprised of four undergraduate students, two men and two women. Two of the students had attended community college before transferring, while the other two began as freshmen at CSUF. The students were provided with sample questions (Appendix B3 of the Chemistry SOAP) but they were encouraged to discuss whatever topics they chose.

**B4 – Faculty Feedback on Experimental Design.** From the SOAP: “The department will periodically collect feedback from faculty and instructors on their perceptions of student strengths and weaknesses.” Results from assessments A1 and B3 were shared with department faculty and the topic was discussed at a department meeting on 08/26/15.

3. What did you discover from these data?

**Laboratory Report Rubric**  
Student presentations were evaluated in ten categories on a scale of 0 (poor) to 3 (excellent) as shown in the Figure below. 1A-E provide data on Learning Outcome 4 (Writing Skills) and 2A-E provide data on Learning Outcome 1 (Experimental Design).

![Figure 1. Mean Rubric Scores for B.A. and B.S. Chemistry Students in Written Reports.](image)

**Writing Skills.** In both the B.A. and B.S. Chemistry programs, students met or exceeded the departmental standard of 1.5 out of 3 in all five categories. The reports that were assessed were
the last in a series of reports written by the students over the semester, and it is clear from these scores that students have acquired an appropriate level of mastery in their writing skills by this point.

**Experimental Design.** In the area of experimental design, students in both degree programs fell below the expected levels in two categories: 2.D. Data Processing/Reporting (B.A.: 1.3 / 3.0; B.S. 1.3 / 3.0) and 2.E. Data Analysis/Conclusions (B.A. 1.3 / 3.0; B.S. 1.4 / 3.0). In several cases, students presented processed data without discussing how the raw data had been analyzed. Students were generally weak in interpreting the significance of their experimental results. No more than one student in each program scored zero in any category.

**Faculty Feedback**
Discussions with faculty were consistent with the results of the direct assessment, with many noting that students struggle to connect their experimental results to their hypothesis, and to frame their findings in the broader context of the discipline. Faculty also noted that the program generally does not truly require students to design and execute experiments to answer research questions. Typically, students adapt or follow existing procedures, but are required to critically analyze the procedure to identify strengths and weaknesses, and to propose improvements.

**Graduating Students Focus Group**
While the discussions in the student focus group did not primarily focus on the learning outcomes assessed this year, the facilitators reported that students noted that, “The program required them to go beyond the lecture experience to the hands on experience of the laboratories and the independent work required in many classes. They had the opportunity to work at a state of the art analytical laboratory, in various internships and in research groups.”

**4. What changes did you make as a result of the findings?**
The department will integrate several additional inquiry-based labs into General Chemistry (CHEM 1AL and 1BL) to facilitate the development of data process and analysis skills at an earlier stage in the program. As a part of these changes, students will write more extensive lab reports that will undergo peer-review, which will support the development of these learning outcomes. The department curriculum committee will review how these student learning outcomes are developed in all of our major laboratory courses (CHEM 1AL, 1BL, 102, 106, 111, 124, 129A, 129B and 156) and will make recommendations to the department on possible changes to integrate and reinforce these skills through the curriculum. These recommendations will be discussed at the department retreat in Spring 16 and any approved changes will be implemented in Fall 16.

**5. What assessment activities will you be conducting in the 2014-15 academic year?**
**BA and BS**
Learning outcomes 2 and 6 will be assessed using instruments A2 and A3, and using indirect measures B1 and B4.
Learning Outcome 2. Students will demonstrate the ability to conduct laboratory work of high quality including handling chemicals and other laboratory hazards in a safe, ethical, and socially responsible manner, keeping accurate, clear, concise, and complete records of their laboratory work in a notebook, properly using standard laboratory equipment and instruments, and evaluating the reliability and significance of laboratory data, all within professional ethical guidelines. (ACS Standards 7.1, 7.3, 7.6)

Learning Outcome 6. Students will demonstrate the ability to function effectively in collaborative and group work environments including the ability to work on a component of a larger project and connect work with previous results within professional ethical standards. (ACS Standard 7.5 & 7.6)

Instrument A2. Laboratory Notebook Rubric – This rubric will be used by instructors to provide feedback to students and assess the quality of the students’ laboratory notebooks and record keeping. It may be applied to individual laboratories or to the notebook as a whole. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.

Instrument A3. Instructor Evaluation Rubric – This rubric will be applied primarily in laboratory courses as a check on the quality and ethics of student laboratory work along with their ability to function in teamwork and collaborative assignments. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.

Indirect Measure B1. On a periodic basis the department will solicit feedback on graduate skills from alumni and their employers using either surveys or focus groups. These mechanisms may allow the department to reevaluate the target student outcomes to match changing needs in the chemistry community. The department expects that all numerical responses on this survey will be a 3 or higher and that written responses will be generally positive, yet constructive in improving department programs.

Indirect Measure B4. The department will periodically collect feedback from faculty and instructors on their perceptions of student strengths and weaknesses.

6. What progress have you made on items from your last program review action plan?
Please provide a brief description of progress made on each item listed in the action plan. If no progress has been made on an action item, simply state "no progress."

1. Biochemistry Programs. (From our action plan: Implement, Evaluate, and Improve a new degree in Biochemistry to provide better preparation for students interested in pursuing careers and advanced degrees in biochemistry and biochemical related fields such as pharmacy and medicine.)
The Biochemistry degree was approved by the Chancellor’s office in Fall 14. The department developed and distributed advising materials, and recruited students to the program. The first two B.S. Biochemistry students graduated in Spring 2015, and the program had 101 declared majors as of 08/21/15.

2. Culminating Experiences. (From our action plan: The department will strengthen and formalize the opportunities it provides students to apply principles and concepts introduced in coursework to solve problems and answer questions in research and/or industrial settings.)

The department discussed the culminating experience at a retreat in March 2015. Faculty identified courses as the culminating experiences in our undergraduate programs (CHEM 156 for B.A. Chemistry and B.S. Biochemistry; CHEM 106/111/124 for B.S. Chemistry). The department plans to develop syllabus language and the policy for the departmental culminating experience during this academic year.

3. Student Outcome Assessment Plan. (From our action plan: The department will revise the department SOAPs based on feedback from external reviewers, college level feedback, and new WASC requirements and guidance to achieve a well-structured, meaningful, and sustainable assessment plan that will guide program improvement.)

The department SOAPs were revised during the 2013-14 academic year and were formally adopted during summer 2014. Our assessment activities in 2014-15 have been in-line with those outlined in the SOAPs.

4. Advising and Enrollment Management. (From the action plan: The department will continue efforts to strengthen advising, manage enrollments, and provide tutoring and other support services to increase retention and reduce time-to-graduation for STEM majors.)

The department implemented advising holds for ‘at risk’ students (defined as those earning D or F grades in a major course and students that do not register for a Chemistry course in consecutive semesters) in Fall 14 and Spring 15. This process flagged approximately 90 students each semester. Students were required to meet with their major advisor to lift the registration hold. We will monitor the impacts of these holds on retention and progress towards graduation in the coming semesters.
M.S. Chemistry Annual Assessment Report 2014-15

1. What learning outcome(s) did you assess this year?
The department analyzed data on critical thinking and scientific writing skills this year (Student Learning Outcome D & E, SLO D & E), as defined below in our SOAP.

“D. Students will demonstrate competency in interpreting and critically evaluating experimental results
Students will present current state of knowledge of a topic including balanced descriptions of various and possibly conflicting opinions. The gaps in current knowledge are clearly identified and significant directions and approaches that fill these gaps are identified. The relationship to the students’ own research is clearly explained (when appropriate).”

“E. Students will demonstrate competency in scientific writing skills
Students will write papers that meet the style and format of an appropriate peer-reviewed journal. The paper follows conventions for spelling and grammar and is the paper is essentially error free in terms of mechanics. Writing flows smoothly from one idea to another. Transitions effectively establish a sound scholarly argument and aid the reader in following the writer's logic.”

2. What instruments did you use to assess them?
Direct Assessment Measures
The department uses rubrics to assess the graduate writing requirement (GWR, typically written between the 2nd and 3rd semester) and the thesis. The rubric contains categories on: style and format, mechanics, content and organization, and, integration and critical analysis. The rubric is used for both the GWR and thesis, allowing for formative and summative assessment of critical thinking and writing skills. Two faculty evaluated each submitted GWR and three faculty for the thesis.

For this analysis, we looked at assessments carried out over six semesters between 2009 and 2014, for the GWR and theses. A total of 36 GWRs were assessed in this period and 12 theses representing the five chemistry subareas (analytical, biochemistry, inorganic, organic, and physical chemistry) are represented. One category (Integration and Critical Analysis) on the rubric specifically addresses SLO D, while two other categories (Style and Format, and Mechanics) addresses SLO E. Students are evaluated on a scale from 1 (beginning) to 5 (exemplary). The department considers that students achieving an average score of 3.5 or higher in a given category have demonstrated the corresponding learning outcome.

Indirect Assessment Measures
The department uses surveys of current students and alumni to indirectly assess student learning outcomes. For this assessment we used results from seven survey sets of current graduate students (conducted from Fall 2008 to Spring 2015) and two alumni surveys (Spring 2010 and Spring 2014) that surveyed M.S. Chemistry recipients from the preceding five years. The surveys ask students to rate the program and the quality of their learning in the same categories, allowing us to evaluate changes in perceptions of the program when our students graduate and have begun to apply their knowledge in the next stage of their careers.
The surveys ask students/alumni to rate the development of two sets of skills relevant to SLO E: understanding of chemical information; and writing of chemistry papers and reports. Respondents rate their learning on a scale from 1 (poor) to 5 (excellent). The department considers an average response of 3.5 or higher as meeting the learning outcome.

3. What did you discover from these data?

**Direct Assessment Measures**

Average scores on the four areas of the rubric are shown in the Figure below for both the GWR and thesis. An average score of 3.5 out of 5.0 demonstrates achievement for the direct measures. Figure 1 shows that the average score for Content and Organization and Integration and Critical Analysis (or two out of the four areas) do not demonstrate achievement by our student GWR. However, each rubric category is higher for the thesis than for the GWR suggesting student improvement during the program. We used a two sample t-test to check for statistically significant improvements from the GWR to the thesis, and found that there is a statistically significant increase in assessment scores for all four areas (p = 0.0036, 0.036, 0.014, 0.014, respectively). Students had the lowest mean (3.4) for the category of Integration and Critical Analysis, for the GWR, yet showed the greatest average gain (0.9) in the thesis, showing a statistically significant improvement throughout the program in this key area (SLO D).

![Figure 1. Mean Rubric Scores for Graduate Student Writing](image)

**Indirect Assessment Measures**

The results of the surveys are shown in the Figure below. Average responses are shown for the seven student surveys and the two alumni surveys. All average responses are at or above the department target. Ratings of both categories are higher among alumni compared to current students (p = .0001 and 0.005, respectively) indicating that students have improved competency based on their own self-rated progress, though not as large of a difference when compared to the direct measurements.
4. What changes did you make as a result of the findings?
Since our students are meeting/exceeding departmental expectations for the SLOs assessed in 2014-15, no programmatic changes have been implemented. The department did, however, discuss the fact that students do not meet expectations earlier in the program, as evidenced by the results of the GWR assessment. The departmental curriculum committee and graduate committee will meet to discuss the course content for CHEM 260 (Advanced Research Techniques). This course is a core part of the graduate curriculum typically taken during the 2nd semester of our graduate program. Graduate students typically begin writing the GWR during this course and are encouraged to submit their GWR for official evaluation after completing this course. Formative assignments will be designed to develop proficiency in the areas of ‘content and organization’, and ‘integration and critical analysis’; these two areas were below 3.5/5.0 for our direct measurement of the GWR proposals. The department graduate committee and coordinator will discuss ideas to encourage small graduate group discussions, peer review, and introduction and utilization of resources (e.g. Division of Graduate Studies – Graduate Writing Studio; GraduateNet Initiative) to foster written communication skills. The discussions and summaries will be reviewed during the spring 2016 departmental retreat.

5. What assessment activities will you be conducting in the 2014-15 academic year?
Learning Outcome A (SLO A): Students will demonstrate competency in searching and reading chemical literature
Direct Measure 1. Literature seminar (CHEM 280) using faculty rubric for section 1D. “Literature Review and Citation” (SOAP Appendix A).
Indirect Measure 1-2. Graduate student and alumni survey: Item 4: Searching of Chemical Literature and Item 5: Reading of Chemical Literature (Appendix D & E)).

Learning Outcome C (SLO C): Students will demonstrate competency in organizing complex information
Direct Measures 1-2: Literature seminar and thesis defense (CHEM 280) using faculty rubric for Section 1C “Organization of Material”

Direct Measure 3-4. Graduate writing requirement (GWR) paper and thesis, evaluation by faculty using writing rubric (SOAP Appendix C). Section III. Content and Organization.

6. What progress have you made on items from your last program review action plan?

1. Student Support. (From the action plan: Identify and compete for internal and external sources of financial support for Chemistry graduate students. We will advocate for fee waivers for full time teaching assistants, and will apply for external support (such as a renewal of our NSF S-STEM grant) when appropriate.)

The Chemistry department participated in a CSM proposal for fee waivers to support full time teaching assistants, which was submitted to the President, Interim Provost and Dean of Graduate Studies in December 2013. A tuition waiver proposal was brought before the Academic Senate during spring 2015 and faculty from the CSM, including several chemistry faculty showed their support at the Senate meetings. President Castro and the Provost are in support of tuition waivers. Further discussions will take place in the Senate and subsequent release of tuition waivers may occur during the spring 2016 or fall 2016 semesters.

An NIH Bridges to Doctorate grant was awarded (July 2015 to PI: Krishnan) and will support M.S. students in the CSM to pursue a doctorate in biomedical and behavioral sciences. This will bridge our M.S. students to Ph.D. programs at UC Merced and UC Davis. Graduates students will be financially supported by this grant, including internships during the summer.

2. Student Recruitment. (From the action plan: Evaluate and improve graduate student recruitment to bring in higher quality students with interests in the research specialties of the Chemistry graduate group. Strategies will include identifying funding to support graduate students (specific action 1) and improved selection criteria to increase the quality of students while maintaining an influx of 10-15 new MS Chemistry students each year. The department will evaluate the use of interviews and applications to specific Chemistry sub-disciplines in the admissions process since an analysis of our program has shown no correlation between traditional admissions criteria (undergraduate GPA; GRE scores) and success in our program (graduation rate; time to completion of the degree; graduate GPA).)

Progress has focused on student support (see action 1). Recruitment talks were given during the 2014-15 AY, in the chemistry departments at CSU Sonoma and Stanislaus, both do not have M.S chemistry programs. As a result ~4 students applied to our program last spring. We admitted a total of 15 students and 9 have started our program this fall 2015.

3. Research. (From the action plan: Improve the quality of departmental research and expand graduate opportunities. The department will continue to advocate for tenure track positions to replace retiring faculty and meet programmatic goals. We anticipate a need for a minimum of 4-6 research-active hires to replace retiring faculty in the next ten years. Additional tenure track
lines will be requested when appropriate to support department, college and university goals. Requested hires will both support the broad range of research across the department and strengthen emerging areas of excellence in bio-related and environmental chemistry. The department will conduct a comprehensive survey of its use of space to ensure that laboratories are used efficiently and to maximize potential for research within the department. The department will explore various options to optimize space such as assigning research space within teaching laboratories when classes are not in session. The department will also work with the College of Science and Mathematics to consider sharing labs/facilities with other departments when appropriate. The department will also develop a list of critical equipment needs for the next five years that will include current, shared instrumentation that requires maintenance and new equipment needed to modernize our teaching and research laboratories.

The department conducted two tenure-track faculty searches for 2014-15 in Organic Chemistry and Chemical Education and were successful in bringing in two new faculty. One new faculty position has been approved for the 2015-16 AY.

The department space committee convened and conducted a preliminary assessment of research space within the department. An expansion plan was developed to accommodate additional new research active faculty hires.

The department research committee has developed a list of critical equipment and each area developed a list of critical needs equipment for both research and teaching use.

4. Student Outcome Assessment Plan. (From the action plan: The department will revise the department SOAPs based on feedback from external reviewers, college level feedback, and new WASC requirements and guidance to achieve a well-structured, meaningful, and sustainable assessment plan that will guide program improvement.)

The M.S. Chemistry SOAP was revised during the 2013-14 academic year and was formally adopted during summer 2014. No other changes have been made to the SOAP.
I. What learning outcome(s) did you assess this year?

During AY 2014-15, we have assessed the following learning outcome:

A. Demonstrate solid understanding of fundamental concepts and principles in each specific area of computer science and how they are applied in various scenarios and applications;
B. Demonstrate solid skill of problem solving by applying appropriate data organization, programming methods, algorithms, and communications;

II. What instruments did you use to assess them?

For learning outcome A & B, we used direct method A.1 (Major Field Test from ETS).

The Major Field Test by ETS is a national level standard test that assesses how students performed in the core requirements of the computer science field. Each year, several thousands of students from 100-200 institutions in US. The standard is that the mean and median of Fresno State examinees achieve the same or higher than the national mean and median score.

We also implemented indirect assessing method B.1 (Exit Interview) and B.3 (Faculty Discussion of Student Strength and Weakness).

III. What did you discover from these data?

a. ETS Major Field Test

A total of 19 students volunteered to take the test over the past several years. Specifically, there are four cohorts: Spring 2015 (5 students), Spring 2014 (6 students), Spring 2012 (5 students), and Fall 2008 (3 students). All examinees were graduating students in their last semesters. There were no specific mechanism for selecting students. Participation was completely voluntary.

2015 national data shows 149 and 147 mean and median respectively. In comparison, our Spring 2015 cohort has mean and median of 150 and 157, respectively. For all cohorts, the mean and median score is 152 and 155, respectively. Therefore, we conclude that Fresno State students meet the assessment standard identified in the SOAP.

We also look at the rank in percentile for cohorts of Spring 2014 and Spring 2015. The average and mean percentile is 66% and 58%, respectively. Therefore, most students performed better than the
national average.

The analytic results of ETS MFT scores are as follows.

- **Strength**
  - Three students ranked top 2% (or with 98% below)
  - Two student ranked top 20% (or 80% below)
  - Ten students (over 50% of all examinees) received scores between 141-164, which is close to the national mean and median.

- **Weaknesses:**
  - Four students (21% of all examinees) are ranked in percentile of below 20%.

Further analysis of the results show consistency between student GPA and MFT scores. Specifically, students in the highest performance group (top 20% nationally) have average campus GPA of 3.8, while students in the lowest performance group (bottom 20% nationally) have average campus GPA of 2.79.

In summary, considering that MFT is widely recognized as an instrument for assessing student competence in core computer science areas, we conclude that our program is nationally competitive.

**b. Exit Interview**

We sent an online exit survey to graduated students with the assistance of TILT. However, no response has been received.

**c. Discussion of Student Strength and Weakness**

On August 24, we discussed the strength and weakness of undergraduate students during the department annual assessment retreat. The results are as follows.

**Strength**

- Students are mostly passionate for computer science, partly due to the strong job market since 2011
- Many students have been active and motivated on programming and community projects. More students received offers for internship in local companies as well as national ones (e.g., Microsoft).
- More undergraduate students are interested in doing research. Two students (Carlos Moreno, Jennifer Garner) presented in the annual Central California Research Symposium. Ying Vang was selected to attend the National Science Foundation Summer Research Experiences for Undergraduate (REU) program in Purdue University Calumet.

**Weakness**

- Some students lack sufficient programming skills. A significant number of students do not use version control software such as GitHub or GitLab.
- Student preparation for CSci 40 and CSci 41 courses need to be improved.
• Theoretical background of some students, especially those from India VSIT program, needs to be enhanced.

### IV. What changes did you make as a result of the findings?

From the analysis of the assessment data, we plan to make the following changes.

**a. Major Field Test**
- Continue to encourage students to take voluntarily
- Create yearly cohorts so that students graduating in both Fall and Spring semesters will take
- Purchase more detailed report when the total examinees reach 30

**b. Exit Interview**
- Conduct face to face interview as well as paper based to increase response rate

**d. Student Strength and Weakness**
- Introduce GitHub or GitLab in major courses for juniors and seniors
- New prerequisite or corequisite for CSci 40
- Evaluation VSIT student performance for renewal consideration

### V. What assessment activities will you be conducting in the 2015-16 academic year?

During the next academic year, we will work on three assessment methods:

- **Method A.2** Programming Projects (SLO C)
- **Method B.3** Discussion of Student Strength and Weakness
- **Method B.4** Client Survey

### VI. What progress have you made on items from your last program review action plan?

The department has made the following progress on BS action plan.

**a) Rebuild the faculty**

**Progress:** we recruited two tenure track faculty: Dr. Jin Park and Dr. Cui Lin in Fall 2011. Dr. Cui Lin resigned in December 2013. Dr. Shigeko Seki has retired starting Fall 2014. The department currently has only five tenured and tenure track faculty (Brent Auernheimer, Ming Li, Shih-Hsi Liu, Jin Park, and Todd Wilson), one 3-year temporary faculty (Prudence Lowe), and three part-time temporary faculty (David Ruby and Andy Clifton). The department has been approved to conduct a tenure track search in AY 2015-16 in the area of game development and computer graphics.

**b) Develop new assessment plan (SOAP) for B.S., along with supporting instruments**
A new BS SOAP has been made with the following improvement:

- Five “measurable” learning outcomes have been devised to replace the previous “topic” based “non-measurable” learning outcomes.
- “Research Activities” was removed from direct method
- Elective courses were removed from curriculum map to ensure consistency assessment
- Major Field Test (MFT) as a comprehensive evaluation will be required for all graduating students. So far, 19 students volunteered to take the exam.
- Student capstone project was moved to direct assessing methods
- Student course project was added to direct methods
- Clear criteria was set for all direct methods
- Employer survey was added to the indirect methods
- A four year timeline for implementation has been included and will be updated annually to make it current.

c) Develop CSci 100 for GE Area IB (course title: Introduction to Computational Science)

Progress: the course was successfully offered in Fall 2013. It will be offered every Fall semester.

d) Establish an Advisory Board

Progress: The department faculty has selected a list of eight potential candidates for an Industry Advisory Board. It is currently pending approval by the college.

e) Develop Internship and funded-Project procedures

Progress: Dr. Todd Wilson and Dr. Ming Li have been involved in the university Internship Faculty Learning Community (FLC) to understand issues, policies, procedures and required documents for setting up an internship program. Dr. Ming Li has met with Dr. Jaime Arvizu, the Director of the newly established CSM Advising and Resource Center (ARC) and look forward to work with ARC on this effort within the next academic year. In addition, Internship (CSci 196) will be one of the elective courses in the newly proposed CSCI BS curriculum.

f) Curriculum reviewed with respect to ACM and IEEE Computer Society curriculum recommendations, and ABET accreditation criteria.

Progress: The department faculty understand that it is critical to improve student success. We have established a formal department curriculum committee with members being all full time tenured and tenure track faculty.

The department curriculum committee has studied the ACM Curriculum Recommendation 2013 as a group and proposed a new CSCI curriculum in December 2014. We have received feedback from related programs on the new curriculum and will submit to college curriculum committee
for review in Fall 2015.

We plan to reach the “ABET ready” status by May 2018.

Progress in other items include:
• Allocation of four faculty research labs.
• Grading support for faculty teaching classes with large enrollment (over 48 students)
• Lab refreshment for computer lab McF 201 in July 2014.
CSM

MS Program in Computer Science
Department of Computer Science

Annual Assessment Report for AY 2014-15

I. What learning outcome(s) did you assess this year?

In AY 2014-15, we have assessed the following learning outcome:

C.1. Produce scientific and research reports.

II. What instruments did you use to assess them?

We used direct method A.4 (Evaluate writing skills) in CSci 298 (Master Project)

The criterion is that “A score of 0-5 is given for each item on the rubric. It is considered acceptable that 70% of the evaluated projects receive an average of 3.5.”

III. What did you discover from these data?

During this assessment period, there were totally 12 graduate students graduated in AY14-15 evaluated. The assessment concentrated only on writing skills of CSCI 298. It is suggested that writing and programming capabilities will be added to assessment plan in coming years. The oral presentation assessment used the SOAP rubric form designed by the Computer Science Department. The evaluation scales from 0-5. Students’ scores range from 3.04 to 4.04. The average is 3.57. Eight out of 12 students earned above 3.5 (i.e., the department’s minimum requirements) and 4 students earned below 3.5 and are identified for further improvements.

As shown above 8 out 12 (75%) students received scores at or above 3.5 (70%) based on the SOAP Rubric for A3.

The analytic results of CSCI 298 assessment conducted in 2015 are as follows.

- **Strength (>= 3.80)**
  - Adheres to conventional rules of grammar and punctuation: 3.97
  - Uses graphs, tables, and diagrams to explain, interpret, and assess information.: 3.86
  - Organizes written materials in a logical sequence (paragraphs, subheading, etc.): 3.83
  - Grammar and spelling are correct: 3.83
  - Is clear, concise, unambiguous, and direct: 3.80

- **Average performance: 3.5 – 3.79**
  - Key ideas and contributions are easy to find and follow: 3.69
  - Conforms to the prescribed style guide or format: 3.69
  - Report/Thesis has a clear purpose that is well suited to its discipline and audience: 3.625
Written work is presented neatly and professionally: 3.58
- Weaknesses: below 3.5
  - References are formatted and cited appropriately: 3.47
  - Experimental results/Case studies show the validity of the approach: 3.3
  - Conclusions reflect the motivation, approach and contributions: 3.17

As can be seen from the above statistics, students performed above average on the writing skills itself, including grammar, punctuations, graphs, and logical sequence of writing. However, when it comes to the writing parts related to research, students had difficulty explaining results and validating (or expressing) whether the hypothesis defined in introduction is proved or not.

IV. What changes did you make as a result of the findings?

The graduate committee has been aware of students’ weaknesses regarding CSCI 298 from the analysis of the assessment data as well as the feedback from CSCI 200 instructor. One key reason the committee identified is insufficient unit that students spent on research methodologies and writing. Hence, based on the committee’s conclusion, the department plans to introduce a 2-unit CSCI 201 (Computer Science Colloquium). The course requests students to read, analyze, present and discuss recent research topics in Computer Science. Currently, the course proposal is under review by the university curriculum committee. Once it is approved, the department will adopt it in the next academic year.

V. What assessment activities will you be conducting in the 2015-16 academic year?

During the next academic year, we will work on three assessment methods:

- Method A.2 Evaluate software design and implementation ability in CSci 250 (for SLO B.1 and B.2)
- Method B.3 Discussion of Student Strength and Weakness

VI. What progress have you made on items from your last program review action plan?

The department has made the following progress on MS action plan.

a) Replace lost faculty

Progress: we recruited two tenure track faculty: Dr. Jin Park and Dr. Cui Lin in Fall 2011. Dr. Cui Lin resigned in December 2013. Dr. Shigeko Seki has retired starting Fall 2014. The department currently has only five tenured and tenure track faculty (Brent Auernheimer, Ming Li, Shih-Hsi Liu, Jin Park, and Todd Wilson), one 3-year temporary faculty (Prudence Lowe), and three part-time temporary faculty (David Ruby and Andy Clifton). Dr. Ruby holds Ph.D. in Computer Science from University of California, Irvine and contributed to teaching of CSci 226 (Database) and CSci 264 (Artificial Intelligence). The department has been approved to conduct a tenure track search in AY 2015-16 in the area of game development and computer graphics. The new faculty will be
able to contribute to graduate courses such as CSci 272 (Computer Graphics) and supervise student research in his area of expertise. We plan to request 2-3 additional tenure track faculty positions to restore to an appropriate faculty size within the next five years.

b) Adding laboratory and classroom facilities

**Progress:** The department has refreshed McF 201 computer lab with 30 new Windows PCs in July 2015. The department has been approved to convert McF 205 to a hybrid lecture/computer lab by placing 12-15 PCs. Meanwhile, more Computer Science graduate courses (e.g., Csci 250, Csci 253, Csci 256, etc.) have been scheduled in IT 104, which partially alleviate the needs for more lab facility access.

In addition, the department has allocated research lab spaces:
- Software Engineering Research Lab (Science II 276) by Dr. Brent Auernheimer and Dr. Shih-Hsi Liu
- Open Source Software Development Lab (Science II 262) by Dr. Todd Wilson
- HPC and Bioinformatics Lab (Science II 282) by Dr. Jin Park
- Wireless and Multimedia Networking Research Lab (Science II 278) by Dr. Ming Li

The availability of these research lab spaces will help support student research activities.

c) Re-examining culminating experiences

**Progress:** The graduate committee approved the implementation of a “comprehensive exam” option. Two courses were proposed: CSci 297 (Comprehensive Exam, 3 units) and CSci 201 (Colloquium, 2 units). The proposal has been approved by the college curriculum committee and is currently being reviewed by the university curriculum committee.

d) Graduate prerequisites and admission requirements

**Progress:** The graduate committee has discussed improvement on the admission requirements. For Fall 2015, we have significantly improved our admission standard as follows:
- Students who needs lower division courses such as CSci 40, 41, and 60 will not be admitted
- Students who need more than 2 prerequisites will be given low priority for admission

As a result, for Fall 2015, we admitted 67 students with only 4 students with conditional admission of CSci 117. The arriving rate is 28% (19 out of 67 admissions), which is similar to 25% arriving rate in Fall 2014.

We conclude that the new standard significantly improved the quality of graduate students starting Fall 2015. It will help most students graduate within 2 years.

e) Assessing course and program
**Progress**: We have not yet assessed regular courses. However, CSci 298 (master project) has been implemented by evaluating both oral communication and writing skills.

**f) Graduate retention plan**

**Progress**: The department continues to support graduate students with TAs and GAs. The department recently established two endowed scholarships and one of them is for graduate students. The department also established a CSCI Student Club with president and many active members were graduate students.

Recently, the department has worked together with local companies to provide job opportunities for students. Many graduate students received part-time job employment during summer or regular semesters.

In addition, the reputation of our graduate program plays an important role in improving retention. Yogesh Bansal entered Apple Inc. after graduation. Ryan Melvin received an offer as a full time faculty in Cuesta College in San Luis Obispo. More students consider Fresno State a place for high quality graduate education.
B.S. in Environmental Sciences
Student Outcomes Assessment Report
2014-2015 Academic Year Results

Environmental Sciences Assessment Committee
Department of Earth and Environmental Sciences
California State University, Fresno
Background of the Environmental Science Degree

The environmental Science degree is relatively young, especially compared to the geology degree also offered by the Earth and Environmental Science department. The Environmental Science program initially began as a joint offering between The University of California Riverside and California State University Fresno. In the original program students at UC Riverside took a majority of their program in-house then travel to CSU Fresno to take specific offerings during a single semester to complete their degree. Similarly the CSU Fresno students took a majority of their classes at CSU Fresno and then moved to UC Riverside for a semester. Overall the program suffered because the move at the end of the program dictated uprooting the student and required changes in location, as well as the loss of jobs, friends, and limited access to family. A very limited number of students finished the program and almost all were CSU Fresno students travelling to UC Riverside. The program was officially terminated in 2010. The current Environmental Science program was initiated from these beginnings and we consider the 2010 date as the first real cohort for the Environmental Science program offered at CSU Fresno. In terms of the program as well as assessments, the Environmental Science program currently reflects a heavy influence of the Geology degree from which is was split out of. We have now established our program to the point that we see necessary changes to make it more distinct and better suited for employing our students as Environmental Scientists. Money was made available during the summer of 2014 to restructure the overall program and the changes are currently underway and will result in future changes in the program as well as the assessment tools.

1. Learning outcome assessed
   For the 2014 to 2015 academic year, the Environmental Sciences SOAP requires the assessment of Outcome D (Students will integrate Knowledge and skills previously acquired throughout the curriculum into independent projects.). In addition an evaluation of the exit interviews is to be conducted, as well as the evaluation of CSET data if meaningful and reliable.

2. Instruments used to assess the outcomes
   To assess Outcome D, the EES 199 project and thesis was reviewed. The assignment is to pick a topic and/or project during a student’s junior year. The project should be associated with one of the professors within the EES department. The written thesis is scored using a rubric including at least two distinct evaluations related to the Environmental Sciences learning outcomes. The individual scores on these outcomes are disaggregated and used for program evaluation. At least 70% of students who pass the course will score 3 or better on each rubric line.

3. Results of Assessment
There were six students completing their degrees during the 2014-2015 academic year. They were graded on their final project following the table below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>SOAP Goal</th>
<th>Max</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Introductory, background, development and summary</td>
<td>1</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Evaluation and integration of the scientific literature used</td>
<td>2</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Correct spelling and grammar on the poster, document or presentation</td>
<td>3</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Overall command of the English language</td>
<td>3</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>20.0</strong></td>
</tr>
</tbody>
</table>

Each of the documents were carefully reviewed and a grade between 1 and 5 was assessed for each of the criterion. Upon tallying all the scores, averages were calculated as shown below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>SOAP Goal</th>
<th>Average Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Introductory, background, development and summary</td>
<td>1</td>
<td>4.0</td>
</tr>
<tr>
<td>Evaluation and integration of the scientific literature used</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Correct spelling and grammar on the poster, document or presentation</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>Overall command of the English language</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>4.45</strong></td>
</tr>
</tbody>
</table>

Graduating seniors in environmental science did a good job at their overall command of the English language along with its use, as demonstrated by correct spelling and grammar. The overall loss of points occurred in the use of evaluation and integration of the scientific literature. This is primarily seen as a lack of attention to detail in terms of background information (Criterion 1) and how disparate facts relate to each other. In addition, students lacked consistency in terms of the amount and quality of the material that was used in their documents. Top students provided multiple high quality references for their topic (Criterion 2). The faculty is looking for appropriate citations that build upon the arguments being made within the text of the project. Though the thesis is not intended to be about teaching students the rules, norms and conventions of the English Language, the faculty does feel that any student in the program must be able to write intelligently and correctly. Of the four categories being assessed those concerning “correct spelling and grammar” along with “Overall command of the English language” rated consistently high (Criterion 3 and 4).
As stated in the SOAP, at least 70% of students who pass the course will score 3 or better on each rubric line. For Criterion 1, 2, 3, and 4, all students passed except for a single value in single line of a graduate. However, she was judged at the 5 out of 5 level for both criterion 3 and 4, thus her overall value was 3.75.

3.2 Student Exit Interviews

With the small overall number of graduates (~10) since the in-house CSU Fresno Environmental Science program began data are limited. We sent an exit survey to Alumni of the Environmental Sciences Program but have not received results from the six graduates from the last year. The questions included.

1. What elements of the Environmental Science Degree Program are the strongest elements in your opinion?
2. Do you feel you have the knowledge necessary for success in your chosen field of endeavor? If not where do you feel the program content could be stronger?
3. Do you feel that you were advised well throughout the degree program concerning your progress toward degree completion? If not, where could this have been improved?
4. You selected the Environmental Science Degree over other degrees within the College of Science and Mathematics. Why did you choose the Environmental Science Degree program? Would you recommend this program to others now that you have completed the degree?
5. Did you feel as an Environmental Degree program major that you were part of the overall Earth and Environmental Science department?
6. Do you feel that the Environmental Science Degree has the same status in the College of Science and Mathematics as other degree programs? If not, why not?
7. Were you advised or was it ever suggested that you consider a major other than Environmental Science or you then current major? If so, what reason(s) were you given for this advice?
8. What are your career goals?
9. Are there recommendations you can provide concerning program changes that might improve Environmental Science degree?
10. Any other comments?

4. Changes made as a result of the findings

What changes did you make as a result of the findings? Describe what action was taken based on the analysis of the assessment data.
Based upon the assessment of EES 199 no action is necessary as the goal for Outcome D was met. Changes based upon feedback from student responses to exit interview questions are pending and will be added once they are received. The program continues to be relatively small, thus the reply rates on the exit surveys is expected to be small as well. This does not mean that we are beyond changing the program, and in fact we received funds from the Deans Office to make curriculum changes. These changes will occur this coming academic year and then we will expect to start regular assessments and University level reviews of the program.

5. Future assessment activities in the 2015-2016 academic year.
   The assessment schedule in the SOAP schedules a review using Outcome A. With the curriculum development funds made available this past summer there will be additional changes to the program this fall. Part of those changes will be a review of the overall SOAP schedule, therefore assessment activities will be for outcome A but the specifics of outcome A may change.

6. Progress made on items from the last program review action plan.
   The current Environmental Science program was initiated about four years ago, therefore it has not gone through a program review at this time. With the curriculum development funds made available this past summer additional changes will occur this fall as they move through the College and University curriculum committees.
B.S. in Geology Student Outcomes Assessment Report
2014-2015 Academic Year Results

Geology Degree Assessment Committee
Department of Earth and Environmental Sciences
California State University
1 Learning outcome assessed

For the 2014-2015 academic year, the Geology B.S. SOAP required assessment of Outcome B ("Use the scientific method to organize and conduct research, and apply quantitative methods to solve problems, analyze data and formulate models, either independently or collaboratively."). Also, the SOAP called for one indirect measure of assessment this year; exit interviews.

2 Instruments used to assess the outcomes

To assess Outcome B, the department originally thought of assessing EES 100 (Analytical Methods Labs) and use student homework or laboratory assignment that involves mathematical reasoning. Students will be free to choose the best examples of such work, i.e., select assignments that seem particularly challenging to them, and on which they feel to have performed well. Faculty will compare the assignments to discover whether their qualitative reasoning ability has improved.

An online exit interview was sent this year and the replies of 12 respondents were analyzed.

3 Results of assessment

3.1 EES 100

During the Spring semester, Dr. Mathieu Richaud, assessment coordinator, met with Dr. Keith Putirka, EES 100 instructor to chose an assignment that would best gauge outcome B. Both agreed that a homework on the geothermal gradient was suitable. However, because the assignment was not originally designed with formally evaluating quantitative reasoning, both faculty rewrote several questions. Concurrently, an appropriate grading rubric was drafted. Both documents are attached to this report (please note that the newly added questions are shown in red in the text).

For each outcome evaluated on the rubric, a score of 2 on a 3 point scale (proficient) will define having met the learning outcome. The department expects a mean score for each outcome >2.0 when all student scores are averaged.

Because the geothermal gradient assignment has already been given when Dr. Richaud and Dr. Putirka met – and could not de facto be used for this report – it was decided to resort to 5 multiple choice questions as our replacement. Unfortunately, only 1 student attempted to answer them, leaving us with no meaningful results.

4 Changes made as a result of the findings

Since there is no findings this year for Outcome B, no changes were made. It should be noted that Outcome B will be assessed in 2 academic years again, this time with an assignment and a rubric.

5 Assessment activities conducted in the 2015-16 academic year

This year, Outcome C – Effectively disseminate technical findings and conclusions by means of written reports, and organize and give professional oral presentations. A rubric on a student writing sample from EES 12 (usually a review of a peer-review journal article) and from EES 107 (final field report) will be used. We will try to track old EES 12 report to compare them to students currently taking EES 107 to discover whether their writing ability has improved.

We will also do exit interviews and an employer survey.
6 Progress made on items from our last program review action plan

The department has been reviewed in the Spring and the program action plan has not been sent to the department yet.

7 Student exit interviews

Student exit interviews were collected from 6 students this year with questions and responses which suggest relatively high satisfaction with the degree program.

Several comments and facts demonstrating overall student satisfaction are below;

- To the question “I was able to obtain instruction (courses) in subjects that I am interested in,” 7 students strongly agree, 2 agree, 1 is neutral and 2 disagree.
- To the question “Formal, course-based field experiences contributed to my learning,” 11 students strongly agree and 1 is neutral.
- To the question “I was able to obtain the knowledge and training from the courses that will help me advance my career objective,” 10 strongly agree, 1 agrees and 1 is neutral.
- To the question “I was intellectually challenged by the teaching of the faculty,” 11 strongly agree, 1 agrees.
- To the question “Faculty members are competent undergraduate level instructors,” 9 strongly agree and 3 agree.
- To the question “My advisor was a good mentor,” 10 strongly agree and 2 agree.
- To the question “your over-all ranking of your undergraduate education experience is (1 for the worst; 5 for the best), the mean is 4.67 (12 responses).

Similar to last year’s answers, several comment point toward some unsatisfactory parts of the undergraduate experience related mostly to lab space for the students;

- To the question “The College provides adequate laboratory space and equipment for undergraduate work for EES majors,” (1 for the worst; 5 for the best), the mean is 3.75 (12 responses).

Out of the 12 students replying, 4 hold a professional position (petroleum geologist or geologist) while 8 have advanced (MS/PhD) degree program immediate career goal (7 accepted and planned to attend, 1 not yet accepted).

8 B.S. in Geology Action Plan Progress

The Geology Bachelor of Science degree program is currently in the process of program review so we are reporting on progress from our previous review action plan. The External Review Panel during the last review found the program and faculty to be of high quality. They were impressed by the Department’s growth, since the previous review, in numbers of undergraduate majors, graduate students, faculty and FTES. The Review Panel made note of the program’s ability to meet the professional needs of the surrounding area, thus helping to achieve the University’s mission of being a regionally engaged university. The Panel stated that the Department is “poised to become a leader in training students to solve important environmental, engineering, and other geological
problems in the central San Joaquin Valley.” “The Department is a primary regional resource for
governmental agencies and private industry and maintains strong community ties through industry
and alumni interactions.”

In addition to the above, the Review Panel identified several areas for attention moving forward.
As a result of their review, the Panel made five recommendations.

- The Department should develop a long-range plan outlining future goals.
- The Department should consider assessing its course offerings in the General Education area.
- The Department must be given more technical support, particularly for maintenance and
  repair of instrumentation, so that it does not fall into a state of disrepair.
- Facilities modifications are needed to support research and instructional activities of present
  and new faculty. Examples include addition of fume hoods, appropriate environmental con-
  trols, and adequate power supply in Science 1.
- Classroom 118 in Science 2 should be subdivided to ensure maximum use of Department
  space, particularly in light of the impending loss of McLane Hall Room 277A and its storage
  capacity.

From the list above the Department developed an Action Plan, for which our progress is listed
below.

1. Department long-range plans and future goals.

   The Department held a faculty/staff retreat to address this issue. This was timely given new
   tenure-track faculty hires. The faculty concluded that the geology degree programs overall were
   strong, up-to-date, and were relevant to the employment trends in the discipline. Only minor
   modifications to the geology degree programs were suggested, otherwise they would continue along
   their current path, emphasizing strong, field-based programs. A significant outcome of the retreat,
   relating to the department’s long-range planning, was a decision to emphasize development of a
   high-quality, in-house environmental sciences B.S. degree program.

2. Department consideration of assessing General Education courses.

   In concert with the University GE committee, the Department undertook assessment of one GE
   class, EES 167. This was done on a trial basis. The Department will consider further assessment
   of GE courses once we complete our planned modifications to the Geology B.S. degree program
   SOAP and fully implement, evaluate and adjust the SOAP for the B.S. in Environmental Sciences
   program.

3. Department technical support.

   The Department technician at the time of the 2007 program review resigned his position in
   2008. A half-time temporary technician served the Department through summer 2013. The lack
   of full-time technician support, particularly for equipment maintenance and repair, was a critical
   issue for the Department until recently. The Department was approved for a full-time technician
   position search during the 2012-2013 academic year. As a result of the search, Kellie Townsend
   has been hired as the Department’s new full-time instructional support technician. Ms. Townsend
   began her position in September 2013.

4. Facilities modifications are needed to support research and instructional activities of present
   and new faculty. Examples include addition of fume hoods, appropriate environmental con-
   trols, and adequate power supply in Science 1.
Facility issues persist, particularly in the Science 1 building. Fume hoods are available for research in the Department only in McLane Hall Room 294, which is used by several faculty, and Science 1, Room 228. An effort to place a fume hood in Science 1, Room 264 failed due to lack of duct work from the second floor to the roof of the building and the high cost of fume hood installation. Power supply in Science 1 continues to be a critical issue, not just for our Department, but for all occupants of the building.

5. Classroom 118 in the Science 2 building should be subdivided to ensure maximum use of Department space, particularly in light of the impending loss of McLane Hall Room 277A and its storage capacity.

Since the last program review, the Department worked with the Dean’s office to redesign space in Science 2, dividing Room 118, with one-half used as a 24-seat introductory geology lab room and the other room serving as a larger office for Department Teaching Associates. The old Teaching Associate office was combined with a dysfunctional 12-seat classroom (Room 125 Science 2) to create a much needed 40-seat classroom for Department use (current Room 125, Science 2). Not all of the work was completed when this was undertaken several years ago. The Department is now seeking to upgrade Science 2, Room 118 further by renovating it to an active learning classroom and making technology and specimen storage upgrades to Science 2, Room 125. Additionally, the Department seeks to make a number of upgrades to our undergraduate teaching lab in McLane Hall Room 278.
Homework– Geothermal Gradient

For this assignment you will create a graph of depth v. temperature to a depth of 100 km. Your graph will show the increase in temperature as one goes to greater depths within the crust, which we otherwise refer to as the ‘geothermal gradient’. Recall from lecture that we used:

\[ T_z = T_{z_0} + \frac{J_z}{k} (z-z_0) - \frac{A_0}{2k} (z-z_0)^2 \]

(1)

to describe the geothermal gradient.

1. Provide a detailed explanation of the terms and indices of equation (1) in your own words (copying what the book or the lecture slides say is not acceptable).

2. For the conductive geotherm, presume that the surface heat flow is 85 mW/m² (milliwatts per square meter) and that thermal diffusivity is 2.5 W/mK (Watts per meter*Kelvins). The heat productivity is 0.5 µW/m³ (micro Watts per cubic meter). Presume that the surface T is 30°C. Plot the geotherm to a depth of 80 km. In Excel, create a vertical column with z that varies from 0 to 30 km, at 2 km increments: use the fill series command to help you do this. Convert that column to meters. Then in the next column, for each value of z, calculate T using the quadratic equation above. Recall that you only need enter the equation once, for say, z = 0 m, then fill down to calculate for all your other values of z. Fill down to z = 30 km.

2. On the same graph as in 2.) graph the convective geotherm depth-pressure from 0-100 km. We must use the mantle adiabat calculations:

\[ \frac{\partial T}{\partial P} = \frac{V\alpha T}{C_p} \quad \text{or} \quad \frac{\partial T}{\partial z} = g\alpha T \]

(2)

Here, \( g \) = gravitational acceleration, \( \alpha = 10^{-5}/\text{K} \), molar V = 4.4 J/bar, \( C_p = 60\text{J/mol*K} \) (just as in the prior HW, so you should already have the answer to this slope, which you are free to use here). The only change is that we will let \( T \) be the temperature at 100 km which we will have as 1450°C. Use the point-slope equation of a line; the slope you calculate above (it is the value for \(dT/dP\)).

3. Provide a detailed explanation of the terms and indices of equation (2) in your own words (copying what the book or the lecture slides say is not acceptable).

4. At what depth does convection begin? What assumptions must you do to calculate the convection depth? What uncertainties are there that limit the accuracy of your depth value?

5. On the same graph as above, plot the solidus curve for mantle peridotite, using this equation from Marc Hirschmann:

\[ T_{\text{solidus}} = 5.1404654P(\text{GPa})^2 + 132.899012P(\text{GPa}) + 1120.66061 \]

At what depths does partial melting begin? What assumptions must you do to calculate the partial melting depths? What uncertainties are there that limit the accuracy of your depth values?

Note: You must provide an Excel spreadsheet containing all your formulas, data and graphics.
Fresno State Assessment Rubric: Quantitative Reasoning

Fresno State Quantitative Reasoning Rubric is based on the Scientific Method of Inquiry, Advancing Assessment of Quantitative and Scientific Reasoning, Numeracy, 3 (2): Article 2 by Sundre, Donna L. and Amy D. Thelk. 2010, and adapted from the College of Marin Common Scientific and Quantitative Reasoning Rubric, and the Association of American Colleges and Universities’ Quantitative Literacy VALUE Rubric.

Quantitative Reasoning includes the ability to interpret and represent data; perform mathematical calculations and carry out an analysis with clear assumptions; and finally communicate results appropriately.

**Interpretation And Representation:** The student is able to interpret and represent mathematically the data provided.

<table>
<thead>
<tr>
<th>Advanced (3)</th>
<th>Proficient (2)</th>
<th>Novice (1)</th>
<th>Not Evident (0)</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>➤ Provides accurate explanations of information presented in mathematical form.</td>
<td>➤ Provides mostly accurate explanations of information presented in mathematical form.</td>
<td>➤ Provides inaccurate explanations of information presented in mathematical form.</td>
<td>➤ Does not provide explanations of information presented in mathematical form.</td>
<td>➤ Assessment task does not reflect these characteristics for student performance.</td>
</tr>
</tbody>
</table>

**Calculation, Analysis and Assumptions:** The student is able to perform mathematical calculations and perform an analysis with clear assumptions.

<table>
<thead>
<tr>
<th>Advanced (3)</th>
<th>Proficient (2)</th>
<th>Novice (1)</th>
<th>Not Evident (0)</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>➤ Performs accurate calculations which are sufficiently comprehensive to solve the problem.</td>
<td>➤ Performs mostly accurate calculations which are sufficiently comprehensive to solve the problem.</td>
<td>➤ Performs inaccurate calculations which are insufficiently comprehensive to solve the problem.</td>
<td>➤ Does not perform accurate calculations.</td>
<td>➤ Assessment task does not reflect these characteristics for student performance.</td>
</tr>
</tbody>
</table>
| ➤ Uses correct and complete quantitative analysis. | ➤ Uses mostly correct and complete quantitative analysis. | ➤ Uses incorrect and complete quantitative analysis. | ➤ Does not use correct and complete quantitative analysis. | |}
| ➤ Makes relevant and correct conclusions. | ➤ Makes mostly relevant and correct conclusions. | ➤ Make irrelevant and correct conclusions. | ➤ Does not make relevant and correct conclusions. | |}
| ➤ Explicitly describes assumptions and provides rationale for why each assumption is appropriate. | ➤ Somewhat explicitly describes assumptions and provides rationale for why each assumption is appropriate. | ➤ Vaguely describe assumptions and provides rationale for why each assumption is appropriate. | ➤ Does not explicitly describe assumptions and provides rationale for why each assumption is appropriate. | |}
| ➤ Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions. | ➤ Mostly Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions. | ➤ Shows minimal awareness that confidence in final conclusions is limited by the accuracy of the assumptions. | ➤ Does not show awareness that confidence in final conclusions is limited by the accuracy of the assumptions. | |}

**Communication:** The student is able to communicate results appropriately.

<table>
<thead>
<tr>
<th>Advanced (3)</th>
<th>Proficient (2)</th>
<th>Novice (1)</th>
<th>Not Evident (0)</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>➤ Presents work in an effective format, and explicates it with high quality.</td>
<td>➤ Mostly presents work in an effective format, and explicates it with high quality.</td>
<td>➤ Ineffectively presents work, and mostly below standard quality.</td>
<td>➤ Does not present work in an effective format, and explicates it with high quality.</td>
<td>➤ Assessment task does not reflect these characteristics for student performance.</td>
</tr>
</tbody>
</table>
B.S. in Geology Student Outcomes Assessment Report
2014-2015 Academic Year Results

Assessment Committee
Department of Earth and Environmental Sciences
California State University
1 Learning outcome assessed

For the 2014-2015 academic year, the Geology B.S. SOAP required assessment of Outcome B (“Use the scientific method to organize and conduct research, and apply quantitative methods to solve problems, analyze data and formulate models, either independently or collaboratively.”). Also, the SOAP called for one indirect measure of assessment this year; exit interviews.

2 Instruments used to assess the outcomes

To assess Outcome B, the department originally thought of assessing EES 100 (Analytical Methods Labs) and use student homework or laboratory assignment that involves mathematical reasoning. Students will be free to choose the best examples of such work, i.e., select assignments that seem particularly challenging to them, and on which they feel to have performed well. Faculty will compare the assignments to discover whether their qualitative reasoning ability has improved.

An online exit interview was sent this year and the replies of 12 respondents were analyzed.

3 Results of assessment

3.1 EES 100

During the Spring semester, Dr. Mathieu Richaud, assessment coordinator, met with Dr. Keith Putrika, EES 100 instructor to chose an assignment that would best gauge outcome B. Both agreed that a homework on the geothermal gradient was suitable. However, because the assignment was not originally designed with formally evaluating quantitative reasoning, both faculty rewrote several questions. Concurrently, an appropriate grading rubric was drafted. Both documents are attached to this report (please note that the newly added questions are shown in red in the text).

For each outcome evaluated on the rubric, a score of 2 on a 3 point scale (proficient) will define having met the learning outcome. The department expects a mean score for each outcome >2.0 when all student scores are averaged.

Because the geothermal gradient assignment has already been given when Dr. Richaud and Dr. Putrika met – and could not de facto be used for this report – it was decided to resort to 5 multiple choice questions as our replacement. Unfortunately, only 1 student attempted to answer them, leaving us with no meaningful results.

4 Changes made as a result of the findings

Since there is no findings this year for Outcome B, no changes were made. It should be noted that Outcome B will be assessed in 2 academic years again, this time with an assignment and a rubric.

5 Assessment activities conducted in the 2015-16 academic year

This year, Outcome C – Effectively disseminate technical findings and conclusions by means of written reports, and organize and give professional oral presentations. A rubric on a student writing sample from EES 12 (usually a review of a peer-review journal article) and from EES 107 (final field report) will be used. We will try to track old EES 12 report to compare them to students currently taking EES 107 to discover whether their writing ability has improved.

We will also do exit interviews and an employer survey.
6 Progress made on items from our last program review action plan

The department has been reviewed in the Spring and the program action plan has not been sent to the department yet.

7 Student exit interviews

Student exit interviews were collected from 6 students this year with questions and responses which suggest relatively high satisfaction with the degree program.

Several comments and facts demonstrating overall student satisfaction are below;

• To the question “I was able to obtain instruction (courses) in subjects that I am interested in,” 7 students strongly agree, 2 agree, 1 is neutral and 2 disagree.

• To the question “Formal, course-based field experiences contributed to my learning,” 11 students strongly agree and 1 is neutral.

• To the question “I was able to obtain the knowledge and training from the courses that will help me advance my career objective,” 10 strongly agree, 1 agrees and 1 is neutral.

• To the question “I was intellectually challenged by the teaching of the faculty,” 11 strongly agree, 1 agrees.

• To the question “Faculty members are competent undergraduate level instructors,” 9 strongly agree and 3 agree.

• To the question “My advisor was a good mentor,” 10 strongly agree and 2 agree.

• To the question “your over-all ranking of your undergraduate education experience is (1 for the worst; 5 for the best), the mean is 4.67 (12 responses).

Similar to last year’s answers, several comment point toward some unsatisfactory parts of the undergraduate experience related mostly to lab space for the students;

• To the question “The College provides adequate laboratory space and equipment for undergraduate work for EES majors,” (1 for the worst; 5 for the best), the mean is 3.75 (12 responses).

Out of the 12 students replying, 4 hold a professional position (petroleum geologist or geologist) while 8 have advanced (MS/PhD) degree program immediate career goal (7 accepted and planned to attend, 1 not yet accepted).

8 B.S. in Geology Action Plan Progress

The Geology Bachelor of Science degree program is currently in the process of program review so we are reporting on progress from our previous review action plan. The External Review Panel during the last review found the program and faculty to be of high quality. They were impressed by the Department’s growth, since the previous review, in numbers of undergraduate majors, graduate students, faculty and FTES. The Review Panel made note of the program’s ability to meet the professional needs of the surrounding area, thus helping to achieve the University’s mission of being a regionally engaged university. The Panel stated that the Department is “poised to become a leader in training students to solve important environmental, engineering, and other geological
problems in the central San Joaquin Valley.” “The Department is a primary regional resource for governmental agencies and private industry and maintains strong community ties through industry and alumni interactions.”

In addition to the above, the Review Panel identified several areas for attention moving forward. As a result of their review, the Panel made five recommendations.

- The Department should develop a long-range plan outlining future goals.
- The Department should consider assessing its course offerings in the General Education area.
- The Department must be given more technical support, particularly for maintenance and repair of instrumentation, so that it does not fall into a state of disrepair.
- Facilities modifications are needed to support research and instructional activities of present and new faculty. Examples include addition of fume hoods, appropriate environmental controls, and adequate power supply in Science 1.
- Classroom 118 in Science 2 should be subdivided to ensure maximum use of Department space, particularly in light of the impending loss of McLane Hall Room 277A and its storage capacity.

From the list above the Department developed an Action Plan, for which our progress is listed below.

1. Department long-range plans and future goals.

   The Department held a faculty/staff retreat to address this issue. This was timely given new tenure-track faculty hires. The faculty concluded that the geology degree programs overall were strong, up-to-date, and were relevant to the employment trends in the discipline. Only minor modifications to the geology degree programs were suggested, otherwise they would continue along their current path, emphasizing strong, field-based programs. A significant outcome of the retreat, relating to the department’s long-range planning, was a decision to emphasize development of a high-quality, in-house environmental sciences B.S. degree program.

2. Department consideration of assessing General Education courses.

   In concert with the University GE committee, the Department undertook assessment of one GE class, EES 167. This was done on a trial basis. The Department will consider further assessment of GE courses once we complete our planned modifications to the Geology B.S. degree program SOAP and fully implement, evaluate and adjust the SOAP for the B.S. in Environmental Sciences program.

3. Department technical support.

   The Department technician at the time of the 2007 program review resigned his position in 2008. A half-time temporary technician served the Department through summer 2013. The lack of full-time technician support, particularly for equipment maintenance and repair, was a critical issue for the Department until recently. The Department was approved for a full-time technician position search during the 2012-2013 academic year. As a result of the search, Kellie Townsend has been hired as the Department’s new full-time instructional support technician. Ms. Townsend began her position in September 2013.

4. Facilities modifications are needed to support research and instructional activities of present and new faculty. Examples include addition of fume hoods, appropriate environmental controls, and adequate power supply in Science 1.
Facility issues persist, particularly in the Science 1 building. Fume hoods are available for research in the Department only in McLane Hall Room 294, which is used by several faculty, and Science 1, Room 228. An effort to place a fume hood in Science 1, Room 264 failed due to lack of duct work from the second floor to the roof of the building and the high cost of fume hood installation. Power supply in Science 1 continues to be a critical issue, not just for our Department, but for all occupants of the building.

5. Classroom 118 in the Science 2 building should be subdivided to ensure maximum use of Department space, particularly in light of the impending loss of McLane Hall Room 277A and its storage capacity.

Since the last program review, the Department worked with the Dean’s office to redesign space in Science 2, dividing Room 118, with one-half used as a 24-seat introductory geology lab room and the other room serving as a larger office for Department Teaching Associates. The old Teaching Associate office was combined with a dysfunctional 12-seat classroom (Room 125 Science 2) to create a much needed 40-seat classroom for Department use (current Room 125, Science 2). Not all of the work was completed when this was undertaken several years ago. The Department is now seeking to upgrade Science 2, Room 118 further by renovating it to an active learning classroom and making technology and specimen storage upgrades to Science 2, Room 125. Additionally, the Department seeks to make a number of upgrades to our undergraduate teaching lab in McLane Hall Room 278.
M.S. in Geology Student Outcomes Assessment Report
2014-2015 Academic Year Results

Assessment Committee
Department of Earth and Environmental Sciences
California State University
1 Learning outcome assessed

For the 2014-2015 academic year, the Geology M.S. SOAP required assessment of Outcome A ("Students will demonstrate the application of inductive and deductive methods of reasoning, the use of geological and geophysical data for interpretation, and how to arrive at valid, defensible conclusions. Students will demonstrate their ability to conduct background studies using published scientific research."). Also, the SOAP called for examining exit interviews.

2 Instruments used to assess the outcomes

To assess Outcome A, students will submit a thesis proposal in EES 201 (Graduate Seminar) that will be reviewed during the thesis proposal presentations. All faculty are invited to attend the presentations and fill out evaluation forms, which are collected and summarized by the course instructor.

The department expects a mean score for each section evaluated on the rubric (i.e., Content, Presentation and Visuals) >3.0 out of 5 points when all student scores are averaged.

An online exit interview was sent this year and the replies of 2 respondents were analyzed.

3 Results of assessment

3.1 EES 201

The thesis proposal of 3 students were analyzed and scores previously assigned by instructors were used to create the table below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Maximum score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>5</td>
</tr>
<tr>
<td>Presentation</td>
<td>5</td>
</tr>
<tr>
<td>Visual</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
</tr>
</tbody>
</table>

Upon tallying all the scores given by the 6 instructors present at the thesis proposal presentations last Spring, averages were calculated as shown below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>4.60</td>
<td>4.20</td>
<td>4.30</td>
</tr>
<tr>
<td>Presentation</td>
<td>4.50</td>
<td>4.00</td>
<td>4.50</td>
</tr>
<tr>
<td>Visual</td>
<td>4.50</td>
<td>4.00</td>
<td>4.75</td>
</tr>
<tr>
<td>Total</td>
<td>13.60</td>
<td>12.20</td>
<td>13.55</td>
</tr>
</tbody>
</table>

Students from the geology masters program scored high on all criteria. A closer look at the scoring distribution within the sub-categories of each criterion shows no particular deficiency amongst the students.

As stated in the SOAP, the department expects a mean score for each criteria >3.0 when all student scores are averaged. This goal has been met by each and every criterion (data available upon request). Thus, the faculty consider that Outcome A has been met.

3.2 What if these students were defending their thesis?

Though the students scored high during the proposal defense, do they actually progress by the time that they defend their thesis? Dr. Pluhar and Dr. Richaud decided to also grade the students
as if they were defending their thesis. In 2 or 3 years, when these students defend their actual thesis, the same rubrics will be used. We hope to see progress in all categories, in particular their ability to field questions from the audience.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>3.50</td>
<td>3.30</td>
<td>3.15</td>
</tr>
<tr>
<td>Presentation</td>
<td>3.92</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Visuals</td>
<td>3.75</td>
<td>4.13</td>
<td>3.63</td>
</tr>
<tr>
<td>Question answering</td>
<td>2.50</td>
<td>0.88</td>
<td>1.25</td>
</tr>
<tr>
<td>Total (out of 20 points)</td>
<td>13.67</td>
<td>12.30</td>
<td>12.03</td>
</tr>
</tbody>
</table>

3.3 Student exit interviews

Student exit interviews were collected from 2 students this year with questions and responses which suggest relatively high satisfaction with the degree program.

Several comments and facts demonstrating overall student satisfaction are below;

- To the question “I was able to obtain instruction (courses) in subjects that I am interested in,” 1 strongly agrees and 1 agrees.
- To the question “I was able to obtain the knowledge and training from the courses that will help me advance my career objective,” both strongly agree.
- To the question “The program in general met my expectation,” 1 strongly agrees, 1 agrees.
- To the question “I was intellectually challenged by the teaching of the faculty,” both strongly agree.
- To the question “The graduate faculty of the department is active and up-to-date in their fields of expertise,” both strongly agree.
- To the question “My advisor was a good mentor,” both strongly agree.
- To the question “On a scale of 1 to 5 (1 for the worst; 5 for the best), your over-all ranking of your graduate education experience is:”, 1 student chose a 5 while the other chose a 4.

There were no comments pointing toward any unsatisfactory parts of the graduate experience.

4 Changes made as a results of the findings

Based upon the assessment of EES 201, no further action is necessary as the goal for Outcome A was met.

Based upon feedback from student responses to exit interview questions, no further action is necessary as there appears to be substantial satisfaction with the Masters in Geology Degree Program.

5 Future assessment activities in the 2015-16 academic year

In 2015-16, we will evaluate Outcome A (Students will demonstrate the application of inductive and deductive methods of reasoning, the use of geological and geophysical data for interpretation, and how to arrive at valid, defensible conclusions. Students will demonstrate their ability to conduct
background studies using published scientific research) again to get as much data as possible since our pool of graduate students is rather small each year, and Outcome B (Use the scientific method to organize and conduct research, and apply quantitative methods to solve problems, analyze data and formulate models, either independently or collaboratively), perform another set of exit interviews and conduct an alumni survey.

6 M.S. in Geology Action Plan Progress

The Geology Masters of Science degree program is currently in the process of program review so we are reporting on progress from our previous review action plan. The External Review Panel found the graduate program and faculty to be healthy and of high quality. Important strengths identified in that review were the program’s ability to meet the professional needs of the surrounding area, thus helping to achieve the University’s mission of being a regionally engaged university, and sending an increasing number of M.S. graduates on to Ph.D. programs.

The Review Panel identified several areas for attention moving forward.

• The Department should develop a long-range plan outlining future goals.

• The Department should continue its assessment efforts and use the data to make program modifications where needed. The Department should continue efforts to survey more alumni.

• The Department must be given more technical support, particularly for maintenance and repair of instrumentation, so that it does not fall into a state of disrepair.

• Facilities modifications are needed to support research and instructional activities of present and new faculty. Examples include addition of fume hoods, appropriate environmental controls, and adequate power supply in Science 1.

• Classroom 118 in Science 2 should be subdivided to ensure maximum use of Department space, particularly in light of the impending loss of McLane Hall Room 277A and its storage capacity.

From the list above the Department developed an Action Plan, for which our progress is listed below.

1. Department long-range plans and future goals.

The Department held a faculty/staff retreat to address this issue. This was timely given new tenure-track faculty hires. The faculty concluded that the geology degree programs overall were strong, up-to-date, and were relevant to the employment trends in the discipline. Only minor modifications to the geology degree programs were suggested, otherwise they would continue along their current path, emphasizing strong, field-based programs. A significant outcome of the retreat, relating to the department’s long-range planning, was a decision to emphasize development of a high-quality, in-house environmental sciences B.S. degree program.

2. Department consideration of assessing General Education courses.

The Department conducts a variety of assessment methods at the graduate level, including: 1) graduate exit survey, 2) EES 201 (seminar) thesis proposal presentation, 3) thesis defense, and 4) alumni survey. Feedback from the EES 201 thesis proposal presentations helps to identify areas for adjustments to the EES 201 course, so that we are emphasizing development of skills that students need to undertake their thesis research. The exit survey and alumni survey data have aided us with evaluation of the overall graduate program to make sure it is current and relevant to the employment needs of our graduates. The External Review Panel recommended that we
survey more alumni. In 2011, the Department hosted an alumni event, which attracted over 60 of our graduates. Through discussions with our alumni at the event, we were able to gather information about their employment experiences and recommendations to us regarding student preparation for the job market. Also, we were able to update our alumni contact information via event attendees and the personal contacts they maintain with their classmates who were unable to attend. We subsequently distributed an alumni survey via email. Of primary significance to us was feedback from alumni about their career experiences and suggestions to us to best prepare our current and future students for the job market. The graduation range of alumni survey respondents was from 1958 to our most recent graduating class. Older alumni provided valuable insight into their professional careers, whereas recent graduates were able to reflect upon which aspects of the program were most valuable to them. Alumni emphasized several common points in their feedback:

- Students must be well trained in field work. This benefited graduates when first employed and gave them an advantage over co-workers with weaker preparation in field work.
- Students need strong oral and written communication skills.
- Awareness of the current state and needs of the professional industry is important.
- Recent graduates with the B.S. in Geology, who went on to graduate school, noted that the senior thesis was good preparation for them.
- Students need technical training for the job market (e.g., geophysical (seismic) equipment, 3-D mapping software).
- Students must have a well-rounded undergraduate education in geology. As one alumnus stated, “if students don’t have a well-grounded understanding of geological processes, knowledge of such a robust and powerful tool as 3D interpretation software is meaningless.”
- It is important to work with the private sector and public agencies to establish internships for students, which can lead to permanent jobs upon graduation.

Additional comments by alumni that caught our attention were from individuals who have spent long careers in private industry. They suggested incorporating some team projects into our courses, since many jobs in the private sector require teamwork. Also, a course on environmental policies and regulations, project management and budgeting would be valuable as students enter the workforce.

3. Department technical support.

The Department technician at the time of the 2007 program review resigned his position in 2008. A half-time temporary technician served the Department through summer 2013. The lack of full-time technician support, particularly for equipment maintenance and repair, was a critical issue for the Department until recently. The Department was approved for a full-time technician position search during the 2012-2013 academic year. As a result of the search, Kellie Townsend has been hired as the Department’s new full-time instructional support technician. Ms. Townsend began her position in September 2013.

4. Facilities modifications are needed to support research and instructional activities of present and new faculty. Examples include addition of fume hoods, appropriate environmental controls, and adequate power supply in Science 1.

Facility issues persist, particularly in the Science 1 building. Fume hoods are available for research in the Department only in McLane Hall Room 294, which is used by several faculty, and Science 1, Room 228. An effort to place a fume hood in Science 1, Room 264 failed due to
lack of duct work from the second floor to the roof of the building and the high cost of fume hood installation. Power supply in Science 1 continues to be a critical issue, not just for our Department, but for all occupants of the building.

5. Classroom 118 in the Science 2 building should be subdivided to ensure maximum use of Department space, particularly in light of the impending loss of McLane Hall Room 277A and its storage capacity.

Since the last program review, the Department worked with the Dean’s office to redesign space in Science 2, dividing Room 118, with one-half used as a 24-seat introductory geology lab room and the other room serving as a larger office for Department Teaching Associates. The old Teaching Associate office was combined with a dysfunctional 12-seat classroom (Room 125 Science 2) to create a much needed 40-seat classroom for Department use (current Room 125, Science 2). Not all of the work was completed when this was undertaken several years ago. The Department is now seeking to upgrade Science 2, Room 118 further by renovating it to an active learning classroom and making technology and specimen storage upgrades to Science 2, Room 125. Additionally, the Department seeks to make a number of upgrades to our undergraduate teaching lab in McLane Hall Room 278.
1) What learning outcomes did you assess this year?

Undergraduate Program:

B2. Students will read, understand, and be able to reconstruct rigorous proofs of elementary theorems in various areas of mathematics.

Graduate Program:


A draft of an employer survey has been written.

2) What instruments did you use to assess them?

Undergraduate Program:

B2. Two embedded questions on the final exam in Math 111.

3) What did you discover from these data?

Undergraduate Program:

B2. Of those who passed Math 111 with a C or better, 71% got a satisfactory score on each of the two evaluated embedded questions. It should be noted that the two embedded questions were rather different in difficulty. One was a straightforward proof that followed a standard “template”. The other one, while a well-known theorem and proof, required a deeper understanding of the concepts. While 100% of passing students got a satisfactory score (of which 86% got the perfect score) on the first question, only 71% got a satisfactory score (43% got the perfect score) on the second question. The student performance on these two embedded questions was slightly higher than the expectation set by the instructor (at least 90% getting a satisfactory score on the first question, and at least 70% getting a satisfactory score on the second question). However, the department still feels that improvements need to make in this class (see item 4 below).

4) What changes did you make as a result of the findings?
We have had several discussions in department meetings regarding assessment. We established that interpreting results is difficult in the sense that we are not sure what a satisfactory result (or our goal) might be. Namely, when we see that of those who passed a certain class, a certain percentage have achieved a satisfactory level on a certain Student Learning Outcome, what does that mean? Is this percentage good enough? We have decided that prior to conducting an assessment activity, the instructor should state his/her expectations and then compare results with the expectations. However, the question still remains, what should we strive for (realistically)? The assessment committee as well as the whole department plan to discuss this question further this year.

Another topic that has been discussed in the department meetings is the need to review and make Math 111 (Transition to Advanced Mathematics) more uniform. Since Math 111 is a prerequisite for many upper division classes for math majors, those classes rely on Math 111 to provide the fundamentals. When Math 111 was developed over 10 years ago, a list of topics and a textbook were suggested. However, it seems that presently different faculty have different opinions and are teaching/emphasizing somewhat different topics in Math 111. A committee has been formed that will look at this important class again. Our major concern is preparing students for Math 151 and Math 171, which have high failure rate. We are hoping that the passing rates in these hard abstract courses could be improved if students could be better prepared for them. It has been agreed that those faculty who regularly teach Math 151 and Math 171 will compile a list of concepts/skills needed for these classes. The Math 111 committee will then revise the list of topics/concepts/skills to be taught in Math 111.

5) What assessment activities will you be conducting in the 2015-16 academic year?

Undergraduate Program:

1. As described in item 4 above, a committee will work on revising Math 111 in order to (1) make it more uniform so that other classes can rely on it, and (2) prepare students better specifically for Math 151 and Math 171.

2. Compare percent of students passing Math 75 or Math75AB given their score on the Calculus Readiness Test (CRT). This activity will evaluate effectiveness/necessity of CRT and determine an appropriate CRT score for admittance into Math 75 and Math 75A. (Completed every 5 years.)

Graduate Program:

1. Embedded questions in Math 251.

2. Review/evaluate the exit survey.
6) What progress have you made on items from your last program review action plan?

From the Department of Mathematics Undergraduate Program Review Self-Study Report, 2014, with updates:

Recommendations by the Review Panel

A. **Recommendation:** We (the Review Panel) recommend that the department make a five-year hiring plan for tenure track and full-time lecturers.

**Response in Self-Study:** In the department’s initial response to this recommendation, we laid out a plan for 4 to 5 additional full-time instructional faculty over five years. Our top priority was to build a strong undergraduate research program. For this, we proposed 2 to 3 new tenure track faculty (beyond replacements). The response of the Dean: our hiring plan was, for budget reasons, “impossible at this time.” And as you can see, we have fewer T/TT/FERP faculty members now than we did in 2008.

**Update:** We conducted two TT searches in 2014-2015: one in the area of analysis and one in the area of mathematics education. Both searches were successful. We are conducting one search this year, in the area of mathematical biology.

B. **Recommendation:** Enlarge the pool for tenure-track positions by considering applicants with PhDs in mathematics who have begun to make the transition from mathematics to mathematics education in their professional development.

**Response in Self-Study:** As noted in our initial response, we tried this in 2007-2008 without success. Our problem now is an acute need for another Mathematics Education specialist as well as traditional PhD mathematicians. The Dean has recently approved our request for a search (commencing this Fall) for a Math Ed PhD. As far as we know, the search has not yet been approved by the Provost.

**Update:** A Mathematics Educator has been hired this year.

C. **Recommendation:** Find and cultivate some retired high school mathematics teachers to supervise student teachers.

**Response in Self-Study:** This is our current practice.
D. **Recommendation**: Explicitly encourage one of the current faculty with an interest in math education to change the direction of their research and professional activities to devote time and energy in the math education area.

**Response in Self-Study**: Indeed, we have several of our traditional PhD mathematicians teaching some of our math education related courses. None have chosen, however, to engage in math education research, as they have their own ongoing and successful research programs.

E. **Recommendation**: The Department Chair might consider a full-time lecturer position to coordinate and direct the remedial program.

**Response in Self Study**: The department chair coordinates the remedial program.

**Update**: Two full-time lecturers and one graduate TA coordinate three different parts of the remedial program.

F. **Recommendation**: We recommend that the Department begin a dialog in multiple formats with math majors.

**Response in Self-Study**: The Department maintains a math major listserv to communicate announcements and opportunities to our majors. We have also started an annual Fall picnic for faculty and math majors.

**Update**: In AY 2014-15 we started holding an annual new math majors welcome event and the chair is conducting exit meetings with math majors. In addition, faculty hold regular informal problem-solving gatherings to which all math majors are invited. The Math Club is also an active organization that is run by students and advised by faculty.

G. **Recommendation**: We recommend analyzing the student grades in Math 75 to judge the effect of the calculus readiness exam.

**Response in Self-Study**: Data supplied by the Office of Institutional Research show a slight increase in the pass rates of Calculus I (Math 75, 75A/B) since 2008. The most noticeable increase was in Fall of 2011 when the CRT format changed to include more trigonometry questions and the passing score was increased.

**Update**: one of our assessment activities scheduled for AY 2015-2016 is to compare passing rates in Math 75 and Math 75A versus the score on CRT to ensure that the CRT requirements are efficient.
H. **Recommendation:** As an assessment tool we recommend continued use of the embedded questions in the final exams of Math 151, 152, 171, but with more analysis of the results.

**Response in Self-Study:** This is ongoing.

I. **Recommendation:** We recommend that the Office of Institutional Research work with the Mathematics Department to answer the question of how successful mathematics majors are in completing their degrees.

**Response in Self-Study:** No work has been done on this recommendation. (A symptom of an understaffed department.)

**Mathematics Department Action Plan from Previous Program Review**

In 2009, as part of the Action Plan for the previous review, the department chose to develop a research experience program for undergraduates. This took time, and engaged faculty. We are pleased to report that the program is a success, despite the fact that we have fewer faculty members than when the plan was conceived. Undergraduates are engaged in research with faculty members, presenting their work at national conferences, winning awards and publishing in peer reviewed journals.

The undergraduate SOAP has also undergone changes making it more realistic and useful. This will be discussed further in a later section.

**From the Department of Mathematics Graduate Program Review Self-Study Report, 2014, with updates:**

**Recommendations by the Review Panel**

A. **Recommendation:** We recommend that the Department make a five-year hiring plan for tenure track and full-time lecturers. The plan needs support of the Dean and Provost. The plan should take into account potential retirements, enrollment growth, student interest and demand, remedial and service course needs, and the graduate program. The Department appears to be under-funded relative to other departments in the College and in the University, but because the remedial program is large, the analysis of the need for additional tenure-track faculty should be based on the undergraduate major, the graduate program, and the calculus service courses. (This is also Recommendation A in the undergraduate report.)

**Response in Self-Study:** The Department of Mathematics made the following seven-year hiring plan in the Action Plan, based on the fact that the Department of Mathematics was already down four tenure-track positions to start the 2009-2010 academic year and based on projected departures/entrance into FERP over the succeeding five to seven years.
1. 2009-2010: two tenure-track positions (mathematics);
2. 2010-2011: two tenure-track positions (one in mathematics, one in mathematics education);
3. 2012-2013: two tenure-track positions (mathematics); and

In addition, the Action Plan states that the Department of Mathematics will need an additional two to three tenure-track faculty and one or two full-time lecturers to implement an undergraduate research program as outlined in the seven year vision.

The Department of Mathematics was only approved for the following:
- one search during 2012-2013 for a tenure-track position (statistics/probability), which failed; the search resumed during 2013-2014.

In addition, a number of new part-time lecturers have been hired, as evidenced by the fact that the number of part-time lecturers increased from 5 in 2009 to 13 in 2013.

**Update:** we conducted two TT searches in 2014-2015: one in the area of analysis and one in the area of mathematics education. Both searches were successful. We are conducting one search this year, in the area of mathematical biology.

**B. Recommendation:** We recommend analyzing the graduate program curriculum and course offerings to achieve a good balance between the two options and to consolidate courses if possible. This analysis could be the basis of a five- to ten-year strategic plan for the graduate program.

**Response in Self-Study:** The Department of Mathematics has offered all of the required mathematics courses for the Teaching Option every year, as well as the required courses for the traditional track. In addition, one to two elective courses are offered every semester. A new course, MATH 220, Coding Theory, was also added to the catalog after having been taught twice as a topics course. This course has broad appeal, attracting both traditional track and teaching option students.

**C. Recommendation:** We would like to encourage the Department, College, and University to work together to create a vibrant graduate mathematics culture. The top priority would be to create a gathering place for graduate students. Eventually there should be desk space for graduate students. A common solution outside the CSU is to use large rooms with partitions, desks, and small bookcases.

**Response in Self-Study:** Although the Department of Mathematics does not have a room set aside specifically for graduate students, the
Department does have two rooms that both graduate students and undergraduate students may use for study. In PB 428, the Department has a longstanding study room that both undergraduate and graduate students use to study. This room is equipped with two computers, two white boards, a large table with chairs, and two couches. In addition, the Department has added another student study lounge in Science 2 323. Our graduate students who are also TAs have used this room for office hours.

Furthermore, many of our graduate students commute to campus, and they do not stay on campus beyond attending classes. The exceptions to this are the TAs, who are assigned offices. However, some of the TAs prefer to study in one of the study lounges with their fellow students.

D. Recommendation: When students enter the graduate program we recommend that they routinely receive information about the qualifying exams with a list of topics, copies of previous exams or lists of questions from previous exams, and suggested texts.

Response in Self-Study: For the last few years, students entering in the Fall have been required to attend an orientation, at which they receive information about the program. In addition, the students receive a hard copy of the Department of Mathematics Graduate Studies Handbook – Master of Arts in Mathematics: Traditional Track and Teaching Option. This handbook contains all of the policies of the Department with regards to the Master’s program. While the qualifying exams were still being administered, the handbook also contained a detailed syllabus for each exam, listing the topics to be covered and suggested texts. In addition, previous exams (many with full or partial solutions) were posted on the Department web page. The qualifying exam is no longer required, having been replaced by uniform requirements for all graduate students of (1) taking the mathematics subject GRE before admission, and (2) writing a formal paper demonstrating writing skill in mathematics at the graduate level to satisfy the graduate writing requirement. Detailed information regarding requirements, deadlines, and grading rubrics for this paper are available in the aforementioned handbook.

E. Recommendation: During the application process students should receive information about all forms of financial assistance available for graduate students.

Response in Self-Study: Recently, the Department began making available in the Department office a flyer, Some Financial Aid Information, which lists available Department assistance; fellowships, grants, and awards; loans; and tuition/fee waivers. Although this flyer is not sent to students when they apply to the program, the Department orientation for graduate students contains some information on financial aid and refers
students to the *Financial Aid Sourcebook* (available from the Division of Graduate Studies) for more information. In addition, this flyer was given to students at recruitment events in 2013.

**F. Recommendation: We recommend that the Department begin to implement the assessment activities already planned.**

Response in Self-Study: The Department of Mathematics prepared a new SOAP for the graduate program in Spring 2010 in order to create a SOAP with more tangible, realistic goals. The new SOAP contained the activities outlined in the action plan:

- the use of embedded questions in the departmental qualifying exams (which had already been implemented previously);
- evaluation of the departmental qualifying exams and master projects (MATH 298);
- exit interviews for every student upon completion of MATH 298; and
- alumni surveys.

In addition, the new SOAP originally required embedded questions on exams in four master’s courses (MATH 251 and MATH 271, required for the traditional track; and MATH 250 and MATH 270, required for the teaching option). Later, as can be seen in the current SOAP, the oversight of omitting embedded questions in MATH 260 was corrected.

The Department has implemented most of the assessment activities planned, including embedded questions on the course exams and on the qualifying exams, and has discussed some of the results at a Department meeting. The alumni surveys are scheduled to be implemented this year, and the five-year evaluation of the qualifying exams was not completed due to the elimination of these exams. The only other assessment activity not completed was the collection of reports from the master’s project committees. This year, the Assessment Committee plans to create a form for these reports.

**University Suggestions/Recommendations**

1. **Recommendation: Connect the program action plan more closely to the SOAP using specific timelines.**

Response in Self-Study: As mentioned above, the Department of Mathematics prepared a new SOAP for the graduate program Spring 2010. The SOAP had specific timelines regarding completion of assessment activities. Since the SOAP was not available at the time the previous Action Plan was prepared, the previous Action Plan could not be aligned to the SOAP.
2. **Recommendation:** Create a hiring plan for the next 5-7 years for specialties in the discipline.

**Response in Self-Study:** The Department of Mathematics made the following seven-year hiring plan in the Action Plan, based on the fact that the Department of Mathematics was already down four tenure-track positions to start the 2009-2010 academic year and based on projected departures/entrance into FERP over the succeeding five to seven years.

1. 2009-2010: two tenure-track positions (mathematics);
2. 2010-2011: two tenure-track positions (one in mathematics, one in mathematics education);
3. 2012-2013: two tenure-track positions (mathematics); and

In addition, the Action Plan states that the Department of Mathematics will need an additional two to three tenure-track faculty and one or two full-time lecturers to implement an undergraduate research program as outlined in the seven year vision.

The Department of Mathematics was only approved for the following:
- one search during 2012-2013 for a tenure-track position (statistics/probability), which failed; the search resumed during 2013-2014.

In addition, a number of new part-time lecturers have been hired, as evidenced by the fact that the number part-time faculty increased from 5 in 2009 to 14 in 2013.

**Update:** see above, section Program Review Committee Suggestions/Recommendations, item A.

3. **Recommendation:** Encourage continued implementation of the assessment plan.

**Response in Self-Study:** As the annual reports for the last five years demonstrate, the Department of Mathematics has continued to implement much of the assessment plan set forth in the SOAP, including embedded questions on the course exams and on the qualifying exams. The alumni surveys are scheduled to be implemented this year, and the five-year evaluation of the departmental qualifying exams was not completed due to the elimination of these exams. The only other assessment activity not completed was the collection of reports from the master’s project committees. This year, the Assessment Committee plans to create a form for these reports.

**Update:** the report form has been created.
B.A. in Natural Science Outcomes Assessment

Report 2014-2015 Academic Year Results

Natural Science Degree Program Assessment Sub-Committee

9/1/2015
1. Learning outcomes assessed

For the 2014-2015 academic year, the Natural Science SOAP requires the assessment of Outcome A in Goal 1 (“Synthesize knowledge and skills in the basic components of the Sciences, and develop a familiarity with the scientific methodology.”) and Outcome B in Goal 2 (“Students will demonstrate scientific literacy by applying their scientific knowledge and critical thinking skills to evaluate and interpret scientific claims.”).

2. Instruments used to assess the learning outcomes
   a. Direct Measures

To assess Outcome A, a science literacy survey designed to collect information from students concerning their perception of the nature of scientific research and the scientific enterprise was administered to all students (5 enrolled in Spring 2015) enrolled in Natural Science 106. Results by mean score on concepts are provided below.

<table>
<thead>
<tr>
<th>Concept number</th>
<th>Science Literacy Concept</th>
<th>Mean Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Science explains physical phenomena based upon testable information about the physical world.</td>
<td>86.7%</td>
</tr>
<tr>
<td>2</td>
<td>In modern life, science literacy is important to both personal and collective decisions that involve science content and reasoning.</td>
<td>70.0%</td>
</tr>
<tr>
<td>3</td>
<td>Doubt plays necessary roles in advancing science.</td>
<td>100.0%</td>
</tr>
<tr>
<td>4</td>
<td>Scientists use evidence-based reasoning to select which among several competing working hypotheses best explains a physical phenomenon.</td>
<td>90.0%</td>
</tr>
<tr>
<td>5</td>
<td>A theory in science is a unifying explanation for observations that result from testing several hypotheses.</td>
<td>100.0%</td>
</tr>
<tr>
<td>6</td>
<td>Peer review generally leads to better understanding of physical phenomena than can the unquestioned conclusions of involved investigators.</td>
<td>90.0%</td>
</tr>
<tr>
<td>7</td>
<td>Science can test certain kinds of hypotheses through controlled experiments.</td>
<td>90.0%</td>
</tr>
<tr>
<td>8</td>
<td>All science rests on fundamental assumptions about the</td>
<td>50.0%</td>
</tr>
</tbody>
</table>
9 Science differs from technology.  70.0%

10 Scientific knowledge is discovered, and some discoveries require an important history.  80.0%

11 Science employs modeling as a method for understanding the physical world.  80.0%

12 Scientific knowledge imparts power that must be used ethically.  80.0%

Overall Score  82.4%

In Outcome A (Goal 1), a student is considered to have met the outcome if a score for the questions answered correctly is 70% or higher. This is not stated in the SOAP and hence the inclusion here in the report. The SOAP will be revised to include this change. The attained 82.4% score indicates that the class as a whole has a respectable level of scientific literacy based upon the concepts measured through the series of survey questions. Accordingly, Outcome A in Goal 1 has been met.

Note: The “score” of 50% recorded for the question on the concept that “all science rests on fundamental assumptions about the physical world” warrants further “drilling down” and examination in class.

To assess Outcome B in Goal 2, students were asked to complete an integrated science lesson (all students are planning on a career as a science teacher) that reflects an ability to apply the 3 dimensions of the latest Next Generation Science Standards (NGSS) and demonstrate an ability to teach students how to integrate concepts in more than one scientific discipline. A successful lesson must have all components (built into the lesson plan design) as provided by the instructor for a complete lesson plan. Students are given multiple opportunities to re-submit their lessons until they are completely satisfactory in terms of effectively addressing the lesson to the 3 dimensions of the NGSS, demonstrate some level of integration of two or more science disciplines, are grade level appropriate, and include an assessment component. A pass or fail score is assigned by course instructor with input from at least one other Science Education expert. This approach to scoring is different from that provided in online SOAP as it evolved during the semester of this course and meets the objective very well. The SOAP will be revised to reflect this change.
It was determined by expert reviews that all of the integrated lessons submitted were complete and meet the objectives of the assignment. Therefore Outcome B in Goal 2 has been met.

b.) Indirect measures

Student exit interview questions and responses from the four of the five graduating seniors are provided below.

1.) What elements of the Natural Science Degree Program are the strongest elements in your opinion?

“By having multiple options for the natural science major than every student gets the in depth study for their personal study option while also being exposed to components of the other options. There is a lot of crossover between the sciences of biology, physics, chemistry, and geology. If someone only focused on one area then they are missing the interconnections between all the sciences that strengthen the understanding of the subject material.”

“I think that the diversity in science that the Natural Science Degree allows its students to get is great. For example, if I would have remained a Biology B.S. major I would have taken more Biology classes but I would have not been able to take classes for geology, earth science, and astronomy. The Natural Science Program allowed me to have a more broad understanding of science instead of a narrow understanding.”

“The advising and early field experience.”
“You can obtain competency in two subject areas.”

2.) Do you feel you have the knowledge necessary for success in your chosen field of endeavor? If not, where do you feel that program content could be stronger?

“I feel like I do possess the knowledge to go out and be successful in any aspect of my chosen field.”

“Yes, I feel that I have the knowledge to be successful in my chosen field. I feel that the Natural Science program has given me the knowledge I need.”

“Yes, the NSci Biology option has been helpful in taking science courses of biology, chemistry, physics, earth environmental science, and physical science.”

“I feel that I have enough knowledge to be successful in my field of endeavor.”
3.) Do you feel that you were advised well throughout the degree program concerning your progress toward degree completion? If not, where could this be improved?

“I feel like I was advised pretty well on my progress towards completion of my degree. I am not the kind of student that uses the supplied advising very much, but whenever I did have questions or concerns the advising I received was accurate and appreciated.”

“Yes, I believe I was advised very well. My academic plan was set up well and if I ever had any questions my advisor would answer them.”

“Yes, my adviser was great in supporting my goals and directing outside experiences to improve my academic success.”

“I was advised well throughout the degree program.

4.) You selected the Natural Science Degree with a discipline option over a regular degree in a discipline. Why did you choose the Natural Science program? Would you recommend this program to others now that you have completed the degree program?

“I saw that this degree was designed for high school science teachers and since I want to be a biology teacher for high school I choose this major. I would recommend this major because of all the extra classes taken from the other fields of science. A good biology teacher needs to understand aspects of chemistry, physics, and geology and how they all connect. I feel like I am better prepared to be a teacher than someone from just a biology major background.”

“I chose this program because I knew I wanted to go towards the teaching field. I also liked the diversity in science classes that it would allow me to take. I would definitely recommend this program to any of my friends that are interested in becoming a science teacher.”

“I chose the program because I felt it was the best option for me since I wanted to pursue a career in science/biology education. If another student wanted to work in the educational field I would recommend the degree, but if not I would not recommend the degree.”
“I chose this degree because of the fact that I could earn competency in two different subject areas, and I would recommend this to someone because of that same reason.”

5.) Did you feel as a Natural Science Degree program major that you were part of the department with which you were associated?

“Not really, I’m not really the type of student that gets involved anyway, but I feel this major is so small it’s hard to feel associated with the department as a whole.”

“To be completely honest, no. The NSci department is fairly small compared to other departments and the communication amongst department and student was fairly poor.”

“I did not feel completely out of part with the Department but I did feel like I wasn’t as welcomed as a Biology major would be.”

“No I did not feel like I was a part of the department.”

6.) Do you feel that Natural Science Degree has the same status in the College of Science and Mathematics as other degree programs? If not, why?

“I think its small size might make it be looked down on from within the College of Science and Mathematics.”

“I feel that it should be the same status because it is just as difficult as other degree programs. However, I feel that some people don’t view it as highly because it is not directly a degree in the discipline.”

“Yes, the courses as an NSci degree is so much similar to an actual regular degree in the major.”

“I feel it has the same status as the other degree programs.”

7.) Were you advised, was it suggested that you consider a major other than Natural Sciences? If so, what reason were you given for this advice?

“I was never advised to be apart of any other major or to change my major.”

“I started off as a Biology B.S. major and last year I was advised to consider the Natural science option because of my interest in teaching.”
“Yes, but in my case the best option was to major in the Natural Sciences since my career goal is in education. The reason for the advice was if I wanted to pursue a different path in the sciences such as lab research or graduate school.”

“It was not suggested for me to pursue this degree, I found it on my own.”

8.) What are your career goals?

“I want to be a high school biology teacher and hopefully coach high school football as well.”

“Educational teacher in the sciences in grade level either 7-12.”

“I want to become a high school science teacher and maybe someday hold an administrative position.”

“To become a high school educator.”

9.) Are there recommendations you can provide concerning program changes that might improve the Natural Science Degree Program?

“Maybe if it was advised more and promoted than maybe more people would choose this major. Any student who desires to be a high school science teacher should be identified and informed about this major. “

“I think the program is doing very well and does not need any changes at this moment. “

“Promote the major for student who want to pursue the field of education.”

“There aren’t any recommendations that I can think of.”

10.) Any other comments?

“I have really enjoyed the natural science program!”

SOAP Measures not included as planned

The CSET (standardized science content knowledge examination) results were not meaningful and so this not included in this report. E-Portfolios to be voluntarily submitted by students were not submitted by students and accordingly were not included in this report. There is also no employer feedback as planned and this measure is going to be removed from the current SOAP.
3. What was discovered from these data?

It appears that students performed well above average on the Science Literacy Survey with the exception on one question dealing with Concept 8. It was anticipated that the scores on the survey would be closer to the 70% minimum for having met the outcome targeted. Results, albeit again with a very small N, indicate students are scientifically literate by this measure. They reflect an ability to synthesize knowledge and skills in the basic components of the sciences, and a familiarity with the scientific methodology as well as the basic tenets of science. The same survey will be used in NSci 106 and results will be more meaningful when the course enrollment returns its normal number of 12-16.

Regarding the integrated science lessons. Students are novices at this stage in their career in creating lesson plans that effectively incorporate the next new Next Generation Science Standards (NGSS) that they will be expected to use effectively as classroom teachers. The strategy of multiple re-submissions (no more than 3) allows them to truly develop lesson plans that are satisfactory for each element expected in the lesson plan design. The quality of the lesson plans (for individuals at this stage in their program) was impressive. They provided learning (and teaching) samples that demonstrate a respectable level of scientific literacy, an ability to apply their scientific content knowledge and critical thinking skills. The lessons really were not tailored well to help us to evaluate student ability to interpret scientific claims as indicated in the SOAP, but the development of an effective integrated science teaching lesson is an excellent tool for measuring student understanding of science, how students learn, and application of critical thinking skills. It actually reaches beyond the stated objective in part.

The exit interviews are indirect, self-reporting measures of student’s perceived valuing of the degree program and what they learned as students. It is not as powerful an instrument and is the alumni survey, but it can help the program potentially to make changes as necessary based upon student feedback. In general, as was the case in last year’s report, students are largely very satisfied with the depth and breadth of science content they were exposed to. Clearly there is need for the degree program to have greater visibility and support within the college.

4. Changes made (or to be made) as a result of the findings.

1.) The matter of too small an N will be dealt with as part of the program self-study. It is clear that assessment data with an N of 4-5 is not very useful.

2.) The E-Portfolio will become a required (as opposed to volunteered) submission in the future
5. Assessment activities for 2015-2016

As clearly delineated in the online SOAP for this degree program, the 2015-2016 assessment activities include a scoring an analysis of student outcomes and specifically Outcome C (Goal 3) using the rubric included in the SOAP. For indirect measures, exit interviews will again be given and evaluated and alumni surveys will be administered and evaluated. If CSET data proves to be of value, that will also be included. Since the electronic portfolios were not completed by students this year (due to a volunteer approach), they will be included (as a required activity) in next year’s assessment and scored as described in the SOAP.

6. What progress has been made on items since the last program review action plan.

- Support for RRT for a degree coordinator: The Dean’s Office in the CSM provides 6 WTU’s release time for coordination of the degree program.
  
- Establishment of a formally appointed faculty for the degree program: A body of faculty designated as Natural Science degree faculty now exists.

- Formation of an assessment committee: An assessment committee, a sub-set of the degree program faculty is now in place.

- Creation of a new SOAP that is unique to the BA in Natural Sciences Degree.
  A new SOAP was developed and approved in 2013-2014.

- Provision for a “home” for the degree program. The program is tentatively housed in Science I 101 in the same office as the Science & Mathematics Education Center.

- Approval of the B.A. Natural Science (all science options) by the California Commission for Teacher Credentialing as a single subject science subject matter preparation program.

- The B.A. Natural Science (all 4 science options) is fully approved by the CTC. (A MAJOR ACCOMPLISHMENT)
Preamble

The Department of Physics has three programs: Physics BS, Biomedical Physics BS, and a Physics MS. The following assessment report only concerns our Physics BS Student Outcomes Assessment Plan (SOAP).

This report follows a question-and-answer format as sent by Elise Rodriguez from the Office of the Provost in an email dated August 14, 2015 (see Attachment A).

1. What learning outcome(s) did you assess this year? Be sure to list the student learning outcome(s) assessed, not simply the activity or assignment evaluated.

   This year we report on two assessment activities:

   I. We assessed the student learning outcome of the Physics BS SOAP Goal 1, Outcome d. “Students will be able to write scientific papers in a format and manner appropriate to publishing in leading journals of physics, and be practiced in the preparation and presentation of scientific ideas and findings.” This is the second time this learning outcome has been measured and we developed an instrument as described in the next section and has been included in our Fall 2014 SOAP revision as Direct Measure 5.

   II. In keeping with our SOAP (Goal 2, outcomes a and b) we also collected data in the form of embedded common questions from our Phys 2A-B and Phys 4A-B series courses (direct measure 3).

2. What instruments did you use to assess them? If this does not align with the outcomes and activities detailed in the timeline of the SOAP, please provide an explanation of this discrepancy.

   I. **Goal 1, Outcome d:** The instrument we developed is a rubric that was synthesized from example rubrics found through a literature search (please see Attachment B). We identified two upper division courses that require significant writing in the form of laboratory reports and these will be used to collect the needed data. The assessment procedure is as follows:

      a.) The instructor of the identified upper division physics courses will select at the end of the semester one lab report from each student enrolled, and this lab report shall reflect the best work of the student (e.g. a report that earned the highest grade for the semester). Typical enrollments for these courses are 8 to 15 students.

      b.) The collected laboratory reports will be scored with the identified instrument (Attachment B) by a writing committee of not less than 3 physics faculty, and the committee will not include the instructor for the course from which the lab reports were collected.
c.) The chair of the writing committee will collect the scored rubrics and provide analysis for the departmental assessment committee. The rubric uses the following scale:

1- Deficient
2- Limited
3- Competent
4- Strong
5- Outstanding

Our benchmark is that the aggregate score averaged over the 28 items on the rubric should be above 3.0 (competent) for all students.

II. Goal 2, Outcome a,b: The instrument consists of 3 embedded questions in the final exams of Phys 2AB and Phys 4AB as described in our SOAP.

3. What did you discover from these data? Provide a discussion of student performance in relation to your standards of performance. Where possible, indicate the relative strengths and weaknesses in student performance on the outcome(s).

I. Goal 1, Outcome d: The sample consisted of 10 students enrolled in the identified course. The average cumulative score for these 10 students was found to be 3.1 with a standard deviation of 0.2, just above competent.

Five students scored above competent (two with highest score of 3.7), and five scored above limited (three at the threshold at 2.9, and the lowest score was 2.4). There was good agreement between the two score givers when comparing the scores on a question by question basis and by comparing averages scores.

Our benchmark was set that all students should score above a 3 (competent). Thus 5 students passed our benchmark, three were on the boarder at 2.9, and two fell into the category of limited with scores of 2.7 and 2.4.

II. Goal 2, Outcome a,b: A review of previous assessment reports on this goal was undertaken in concert with our departmental activities on course redesign funded through the FLOCK grant from NSF (http://www.fresnostate.edu/csm/flock/index.html). The faculty of our physics FLOCK learning community are devising course redesigns for our Physics 4A-B calculus-based physics courses and part of that redesign effort involves measurements of learning outcomes. This group reached a consensus that the current design of this instrument is flawed, in that it uses only three embedded problems (and are often multiple choice) giving data insufficient in scope to allow meaningful results and insights concerning our learning outcomes. The FLOCK group is working on a new instrument that will utilize identical common final exams across all sections. The design of these common final exams is described in the next section.
4. What changes did you make as a result of the findings? Describe what action was taken based on the analysis of the assessment data.

   I. **Goal 1, Outcome d:** The assessment rubric used (see Attachment B) will be reviewed and will redesigned to incorporate more weight to items specific to scientific writing, such as appropriate labeling of graphs and diagrams, correct use of significant figures, and clarity in describing experimental procedure. Some components of the rubric will be kept as is to be able to compare results longitudinally upon a second iteration of one of our target courses this year. In addition, the department will discuss options for increasing the scientific writing components in our curriculum.

   II. **Goal 2, Outcome a,b:** The assessment instrument for this outcome and goal will be revised for the coming academic year and will entail the use of a standard common final exams for all sections across both Physics 4A and Physics 4B. The final exams are being written by the FLOCK faculty and will be designed to survey the learning outcomes with appropriate emphasis on priority of each outcome, and will strive to survey all outcomes at an appropriate level. We expect to submit revisions to our current SOAP next Fall to include these new instruments.

5. What assessment activities will you be conducting in the 2015-16 academic year? Briefly list the outcomes to be assessed and how you will measure them. This should align with the activities provided in your SOAP.

   We will again conduct an assessment of scientific writing in Spring 2015 this time on reports from a course that was similarly evaluated last year to compare results and track our cohort of majors. In addition we will implement a new instruments (including but not limited to the standardized common final exams mentioned above) to assess outcomes in our Physics 4A-B series. If the results of these new instruments provide good assessment data and insights, we will seek to employ them in our Physics 2A-B series in the Spring of 2016 as well. In addition, as part of the ongoing FLOCK redesign effort, the participating faculty will explore numerous assessment tools, and any results pertinent to learning outcomes of our courses will be shared in next year’s report.

6. What progress have you made on items from your last program review action plan? Please provide a brief description of progress made on each item listed in the action plan. If no progress has been made on an action item, simply state "no progress."

   Our action plan dates from 2009 (see Attachment C), and has “vision” items I to V.

   **Item I.** The department has completed this list of “Short Term Changes and Improvements”.

   **Item II.** This item is a continuing work in progress as our main classrooms are in constant need of repair. Many rooms in the D Wing of McLane hall have faulty plumbing to the HVAC for condensation and ceiling tiles are always stained and moldy. Chairs in McLane 162 are in need of repair.
Item III. Establishment of a High Energy Physics Research Program: So far this is a big success. This year Dr. Gao was given a third 3-year National Science Foundation (NSF): $509,994 core grant from Elementary Particle Physics (EPP) for his research.

Item IV. Expand FTEs and Increase Physics Majors: We have made progress on increasing enrollment for all majors, and have a very active outreach program. This year we opened a third section of our popular GE Astronomy course PSci 21 each hoping for a combined enrollment of more than 250.

Item V. Revise Undergraduate and Graduate Program assessment plans. The department has a revised SOAP for our BS program. The SOAPs for the MS and Biomedical programs are still pending review by the department.
Dear Chairs, Associate Deans, Deans, and Assessment Coordinators,

As determined last spring, to improve the process and timeline for reporting on assessment, instead of being included with the department's annual report in June, departmental assessment reports are due this year in the fall. This will allow the programs to complete the assessment cycle before submitting the report. This later date also aligns with the General Education Assessment Reports. This year the assessment reports will be formally reviewed by the Learning Assessment Team, using the attached rubric to score the reports after reviewing department SOAPs. Department chairs and assessment coordinators will receive a memo that includes the score and comments on the report. Departments and programs may also receive feedback from their Dean and the Provost. In the assessment report, departments and programs should address the six questions below separately for each of their degree programs. Responses should be brief, but thoughtful and complete. A well-written assessment report can also be used in the assessment section of self-studies for future program reviews. Please send your assessment reports to Angel Sanchez, in the Office of Institutional Effectiveness, aansanchez@csufresno.edu.

Due: September 1, 2015.

1. What learning outcome(s) did you assess this year?
   Be sure to list the student learning outcome(s) assessed, not simply the activity or assignment evaluated. Note: these should be program level outcomes, not general education outcomes - the GE committee will issue a separate call for GE assessment reports.

2. What instruments did you use to assess them?
   If this does not align with the outcomes and activities detailed in the timeline of the SOAP, please provide an explanation of this discrepancy. If the standards for student performance are not included in your SOAP, you should include them here. For example "On outcome 2.3, 80% of students will score an average of 3.5 out of 5 on the attached rubric."

3. What did you discover from these data?
   Provide a discussion of student performance in relation to your standards of performance. Where possible, indicate the relative strengths and weaknesses in student performance on the outcome(s).

4. What changes did you make as a result of the findings?
   Describe what action was taken based on the analysis of the assessment data.

5. What assessment activities will you be conducting in the 2015-16 academic year?
   Briefly list the outcomes to be assessed and how you will measure them. This should align with the activities provided in your SOAP.

6. What progress have you made on items from your last program review action plan?
   Please provide a brief description of progress made on each item listed in the action plan. If no progress has been made on an action item, simply state "no progress"
Attachment B

Physics Scoring Sheet for Writing Assessment

Student #: 
Course Name/Number: 
Year/Semester: 
Evaluator: 

I. Demonstrates understanding of scientific writing

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>abstract summarizes key points and sections</td>
<td>Deficient</td>
<td>Limited</td>
<td>Competent</td>
<td>Strong</td>
<td>Outstanding</td>
</tr>
<tr>
<td>understands what needs to be cited</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>each section has content appropriate to the section</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>graphics integrated into, and integral to, the paper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>discussion section synthesizes results with literature</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shows evidence of analytical thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

II. Content, comprehension, and development of ideas:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>follows assignment/ stays on topic</td>
<td>Deficient</td>
<td>Limited</td>
<td>Competent</td>
<td>Strong</td>
<td>Outstanding</td>
</tr>
<tr>
<td>title describes and is appropriate to paper’s content</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contains sufficient data and/or information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contains appropriate and challenging content</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>evidence of original work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>defines technical terms, used appropriately, not gratuitously</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>paraphrases correctly and accurately</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>conclusion captures main points</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

III. Structure and organization

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>clearly organized</td>
<td>Deficient</td>
<td>Limited</td>
<td>Competent</td>
<td>Strong</td>
<td>Outstanding</td>
</tr>
<tr>
<td>introduction sets up paper and points follow in order</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flow (has topic sentences, repetition of key words, other transitions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>topic sentences focus paragraphs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shows an understanding of paragraphs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IV. Documenting and Citing

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>has adequate citing</td>
<td>Deficient</td>
<td>Limited</td>
<td>Competent</td>
<td>Strong</td>
<td>Outstanding</td>
</tr>
<tr>
<td>paraphrases without excessive quoting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sources are introduced appropriately</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>citations match references</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>follows appropriate documentation style</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

V. Mechanics

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>correct labeling and referencing of tables and graphs</td>
<td>Deficient</td>
<td>Limited</td>
<td>Competent</td>
<td>Strong</td>
<td>Outstanding</td>
</tr>
<tr>
<td>correct word choice/correct tenses/subject/verb agreement (e.g., data are)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>punctuation (esp. comma use)/correct sentence structure and syntax</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>concise language appropriate to science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Attachment C

Action Plan 2008-2013
Undergraduate and Graduate Degree Programs in Physics
Department of Physics, California State University, Fresno
Revised: June 19, 2009

1. Seven Year Vision
   Our program review identified areas within our program for growth and improvement, but did not identify any completely new initiatives. Instead the review team responded favorably towards our presented set of goals and initiatives and offered insights toward furthering these aims. As listed in the bullet point of separate visions below, these ongoing initiatives include: Repairs and renovations to our department facilities and classrooms, increasing our enrollment with a related expansion of outreach activities, a robust investment towards our experimental high energy physics program, revision and implementation of departmental program assessment a continued vigorous effort to expand our solid state physics program. In addition the review team (and program review office) offered some short term actionable changes and improvements that the department has set out to implement. We address these short term items in the first bullet point and follow with five further long term visions for the physics program. Note that the ordering of this list does not necessarily reflect a ranking of priority.

2. Specific actions to be taken to achieve the vision

I. Vision: Short Term Changes and Improvements
   a. Proposed actions and expected outcomes:
      i. Revise the Physics Department mission statement to provide consistency when referring to BS in biomedical physics program.
      ii. Institute core curriculum for MS degree and make explicit in catalog.
      iii. Institute and publish guidelines for completing a graduate student project under the course title Phys 298.
      iv. Coordinate and incorporate advising for pre-teaching majors utilizing the services of the new coordinator for teacher preparation within the CSM.
      v. Review laboratory space to ensure the physics department’s needs in terms of instruction and research are met within the plans of the CSM.
   b. Cost/Resource Implications:
      i. Department administrative assistant will oversee allocation and alteration of documents to change instances of “medical physics” to “biomedical physics”. No costs above employee time for regular duties.
      ii. The graduate advisor, with consultation of graduate instructors, will draft a document of a core curriculum.
      iii. Similarly, the graduate advisor and faculty will draft a document for Phys 298 guidelines.
      iv. The department will designate a faculty member as a primary liaison to the new coordinator of teacher preparation. No cost above this faculty member’s time is needed.
v. Department faculty and staff will review instructional and research facilities allocation and develop a plan for improvement. No additional costs are projected to complete this review.

c. Source of Funds/Resources
i. through v. No further internal or external funding needed.

d. Benchmark and Timeline for Action:
ii. through v. We hope to implement all five short term changes within the year the review was received.

II. Vision: Repairs and renovations in the wake of the 98-99 McLane Hall remodeling.

a. Proposed actions and expected outcomes:
McLane Hall is among the oldest buildings on campus. The remodeling in 1998-99 was not as successful as promised leaving behind unfinished work and shoddy construction. The physics department will maintain a list of needed repairs and will endeavor to work with plant operations with occasional help from the college. Expected outcome is an urgent attention to the following high priority repairs: the movable whiteboards, seating, staircases, and elevator in McLane 162, repairs to ceiling tiles and mold in many offices and laboratories in the D Wing due to faulty air conditioning and leaking roofs.

b. Cost/Resource Implications:
We assume most of these repairs should fall within standard maintenance from plant operations, and thus far the physics department has not produced a cost estimate on these repairs.

c. Source of Funds/Resources
As mentioned, we hope that most of the cost would be covered in maintenance from plant operations. If we find that the cost of any of these repairs is excessive, or can not be handled by the plant operations budget, we will pursue capital outlay funds to cover costs.

d. Benchmark and Timeline for Action:
Given the budget situation we will hope for the best and push hard on repairs that most directly impact instruction or student/staff safety as our highest priorities.

III. Vision: Invest heavily in a new direction for our experimental high-energy program- Collaboration and federal funding with the ATLAS experiment on the Large Hadron Collider at the CERN physics laboratory.

a. Proposed actions and expected outcomes: Dr. Yonsheng Gao will pursue becoming a member of the ATLAS detector collaboration and associated funding through NSF and DoE. He will establish an active research program to involve undergraduate and graduate students in the analysis of particle physics data from the world’s most powerful particle collisions, including student research at CERN. Fresno State will become the only CSU campus listed as an official collaborating institute in this major multinational research effort in high-energy physics. The research program will include a presence at the CERN laboratory in Switzerland with a post doctoral position stationed 50% of the time there and the remaining 50% on campus.

b. Cost/Resource Implications:
The initial cost of the program will be provided by Dr. Gao’s startup funds and through an agreement with the College of Science and Mathematics in the form of salary for the post doctoral position for the first year. The program will need additional funds for the second and continuing years of the post doc salary, travel funds, summer salary, student stipends, student travel funds, and computing.

c. Source of Funds/Resources
Funding for the continuation and expansion of the program will be sought in the form of external grants. Specifically Dr. Gao will target the 3-year NSF Elementary Particle Physics (EPP) base/core award hopefully for $500K which will include salary for the post doctoral position, travel funds, summer salary and student stipends. This grant is very prestigious and in the history of its awarding; the recipient groups have always grown and obtained renewed funding every three year cycle. Given the support already allocated by the CSM we feel there is a good chance for obtaining this grant and more.

d. Benchmark and Timeline for Action:
Given the grant submission cycle and time for implementing the startup funds and ATLAS application process, we project our first external grants to be funded within two years of Dr. Gao’s hiring.

IV. Vision: Expand FTEs and Increase Physics Majors.

a. Proposed actions and expected outcomes:
Continue our efforts to improve our graduate and undergraduate programs in terms of enrollment of high quality and diverse students. Our primary and tested techniques concerning the recruitment process will use a combination of targeted outreach recruitment trips, advertising through the Downing Planetarium, and showcasing our new Biomedical Physics Special Major and Astronomy Minor.

b. Cost/Resource Implications:
We must fund travel for recruitment trips by our faculty across California if we want to ensure the success of the Physics programs. A cost estimate for the needed travel, assuming a frequency of about 3 presentations every two months (targeting other CSUs and local community and city colleges) for roughly 12 talks per academic year at about $200 per trip for travel and lodging if needed. So a budget of at least $2000 may be needed.

c. Source of Funds/Resources
The above cost can be mitigated by making some of the presentation as day trips, reducing the cost by avoiding lodging. In addition, our faculty get invited to give colloquiums where the travel is covered by the visited institution. Given these reductions we hope to use physics department funds to cover about $1200 of recruitment travel per year to meet our goals.

d. Benchmark and Timeline for Action:
We will implement this program immediately depending on budgetary constraints.

V. Vision: Revise Undergraduate and Graduate Program assessment plans as per the request of the Program Review Office.
a. Proposed actions and expected outcomes:
The department will convene a small committee to review and if necessary modify our program assessment plans created in AY 2000. Special attention will be made towards
incorporating a mechanism where the results of previous assessments will be used on an annual basis to measure performance and implement any associated improvements. The committee will also assess whether or not the current plans include activities that provide actionable data for this annual review.

b. Cost/Resource Implications:
   No cost above faculty members’ time on this committee work is needed. However, some assessment tools that might be incorporated in the plans may have annual fees associate with them. Until the committee evaluates the needs of the department in terms of assessment tools we can not provide a cost estimate for the implementation of our assessment plans.

c. Source of Funds/Resources
   Sources will be sought as appropriate.

d. Benchmark and Timeline for Action:
   The Program Assessment Office requests that new assessment plans for both undergraduate and graduate programs be delivered to it by October 1, 2009.

3. Additional information the department may wish to include:

   In addition to the above vision items we continue to strengthen our condensed matter program, our longest running research program of our department and the largest research area in physics today. This area is dynamical in both science and industry and is a fruitful source of student research projects. AIP statistics show that the largest employer of physics bachelors comes from the design and development, manufacturing, and research needs of the industry in the private sector. The physics department used to have four faculty members in this field. For various circumstances we were down to two FTEF until 2007. Our most recent search has added one more – Dr. Pei-Chun Ho – and we expect another position in this area in the near future. With strong support towards the research of Drs. Ho and Zhang we will rebuild our condensed matter program to our original strength.
1. What learning outcome(s) did you assess this year?

(a) Goal 2, Outcome 6:
6. Students can write an APA style empirical research report, demonstrating an understanding of the various sections the report, including the introduction, method, results, and discussion.

(b) Goal 3, Outcomes 1, 2, and 3:
1. Demonstrate effective written communication skills.
2. Demonstrate effective oral presentation skills.
3. Demonstrate numerical literacy.

2. What instruments did you use to assess them?

(a) As was specified in our 2014/2015 annual report, our plan for this year was to work on rubric development to assess objectives in our recently restructured undergraduate SOAP. In the 14/15 AY, we developed a new rubric for assessing our student research papers in our research methods class (Psychology 144). This is a required course of all psychology majors, with it designed to be taken by second semester sophomores (for our four-year students) or first semester juniors (for our transfer students).

(b) To assess this outcome, we used our senior exit survey, which was administered in the spring semester, 2015. In the 2014/2015 AY, questions were developed to assess student writing, speaking, and numerical literacy skills. A total of 114 students enrolled in our Psychology 182 class completed the survey.

3. What did you discover from these data?

(a) Executive Summary: With this being the first time this assessment has been conducted, we learned that the overall performance on these papers, which are highly technical in nature, was fairly good overall for second- and third-year students, with the mean rating within sampling error of an ‘average’ score on each section of the papers (corresponding to a value of ‘3’), with the exception of ‘mechanics,’ which was rated significantly below a value of ‘3’. Please see below for a more detailed discussion of these data. Specifics about how these data were assessed and interpreted is also provided below.

Detailed Analysis: In the spring 2015 semester, faculty read three randomly selected and assigned papers that were originally submitted in our Psychology 144 class (from fall, 2014). Each paper was assessed in five areas: (1) Introduction/Literature Review, (2) Methods, (3) Results, (4) Discussion, and (5) Mechanics. Faculty rated each component of the paper using a 1
to a 5 scale, with higher scores representing higher quality. In general, a score of ‘3’ approximately represents an ‘adequate’ score on the specific component of the paper. In addition to the components described above, papers were also assessed for overall quality (as measured by final grade on the paper) using a 0 to 100 scale, with higher scores representing higher quality papers. The mean rating on each of the components and the overall score is provided in Table 1 below.

Table 1. Mean (M) Faculty Rating and Standard Deviation (SD) of Each Section and the Overall Score of the Psychology 144 Papers (N = 50 Unique Papers Evaluated).

<table>
<thead>
<tr>
<th>Section</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction/Literature Review</td>
<td>2.82</td>
<td>.88</td>
</tr>
<tr>
<td>Methods</td>
<td>2.92</td>
<td>.83</td>
</tr>
<tr>
<td>Results</td>
<td>2.82</td>
<td>.75</td>
</tr>
<tr>
<td>Discussion</td>
<td>2.94</td>
<td>.84</td>
</tr>
<tr>
<td>Mechanics</td>
<td>2.64&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.90</td>
</tr>
<tr>
<td>Overall</td>
<td>70.84</td>
<td>12.34</td>
</tr>
</tbody>
</table>

<sup>a</sup>Responses to this question were significantly lower than a mean response of 3 (<i>p</i> < .01)

Tests were conducted to examine whether the mean rating on each of the five sections differed significantly from a value of ‘3,’ which approximately corresponds to an ‘adequate’ rating. For the overall grade, a test was conducted to assess whether the mean grade differed significantly from a grade of 70, which is considered a ‘passing’ grade on the paper.

The results indicated that four of the five components did not differ significantly from a score of ‘3,’ suggesting that the mean rating was not significantly different from an ‘adequate’ rating. Furthermore, the overall average grade also did not differ significantly from a passing grade. Finally, the results indicated that one component of the paper was significant, with the average rating for mechanics being significantly lower than a rating of ‘3,’ with a mean rating of 2.64, indicating that, on average, faculty rated the papers as being below ‘adequate’ on this component. The mechanics section consists of organization, typographical related-errors, APA style, and grammar.

(b) **Executive Summary:** With this being the first time this assessment was conducted, we learned that students generally indicated that their writing, public speaking, and numerical literacy skills improved while at Fresno State, with the mean response to these items approximately equal to a ‘3’ (on a four point scale), corresponding to a response of ‘somewhat.’ (The scale responses were 1 = ‘Not at all,’ 2 = ‘A little,’ 3 = ‘Somewhat,’ and 4 = ‘A lot.’) Additionally, the mean response for each of these items was significantly greater than 2.5, indicating that the average response to each of these items was greater than a response between ‘a little’ and ‘somewhat,’ which is encouraging. Please see below for a more detailed discussion of these data.

**Detailed Analysis:** In the spring 2015 semester, as part of our senior exit survey, students were asked the following three questions: Since being a student at Fresno State… (1) my writing skills have improved, (2) my public speaking skills have improved, and (3) my ability to perform statistical calculations has improved. For each question, a four-point response scale was used,
with scale responses corresponding to 1 = ‘Not at all,’ 2 = ‘A little,’ 3 = ‘Somewhat,’ and 4 = ‘A lot.’ The mean response to each item was calculated and is reported in Table 2 below.

Table 2. Mean (M) and Standard Deviation (SD) of Student Responses on the Senior Exit Survey.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing skills improved</td>
<td>3.09</td>
<td>.80</td>
</tr>
<tr>
<td>Public speaking skills improved</td>
<td>3.07</td>
<td>.86</td>
</tr>
<tr>
<td>Statistical calculation skills improved</td>
<td>2.94</td>
<td>.95</td>
</tr>
</tbody>
</table>

*Note. A total of 114 students responded to the first two questions; 113 students responded to the last question.

*aMean responses on all questions was significantly greater than 2.5 (p < .001).

With these questions administered late in the spring 2015 semester, the department faculty as a whole has not yet had the opportunity to develop criteria for evaluating these data. However, it seems reasonable to expect that mean responses to these questions should be no less than between ‘a little’ and ‘somewhat,’ which would correspond to an average rating of 2.5. Given this criteria, statistical tests were run to determine that the mean response was no less than 2.5. The results of these tests indicated that on all three questions, student responses, on average, were significantly higher than this criteria, with mean responses for these questions approximately equal to a mean rating of ‘3’ (see Table 2), corresponding to a response of ‘somewhat’ on the four point scale. (As a point of note, additional tests indicated that these responses were not significantly different from a rating of ‘3.’)

4. What changes did you make as a result of the findings?

(a) As the assessment was conducted at the end of the spring 2015 semester, no changes have been made to date. These results will be considered by the psychology faculty, with further analysis of the mechanics component likely to be conducted. While by no means exhaustive, possible interventions for enhancing performance on this component include discussing the results with 144 instructors (with the desired goal of augmenting coverage in this area), as well as possibly posting blackboard videos on APA format to provide students additional experience on the mechanics of writing an APA format research report. These and other possible interventions will be further considered by the undergraduate curriculum committee under the leadership of its new chair, Dr. Paul Price.

(b) None at this time. The responses to these questions all exceeded the threshold criteria, with average responses suggestive of fairly good overall performance on this measure (i.e., within sampling error of a score of ‘3’).

5. What assessment activities will you be conducting in the 2015-2016 academic year?

Per our SOAP, we are planning to conduct the senior survey and exit exam. We are also scheduled to conduct an evaluation of the 144 presentations.
6. What progress have you made on items from your last program action plan?

As described earlier, we made significant progress on rubric development as well as on assessing objectives this year. We are also continuing work on revising our exit exam. (Data will be presented on the exam when item development and revision is complete.) Under Dr. Price’s leadership, the department will also likely be working on developing a rubric for the 144 presentations later in the 2015/2016 academic year.

**Ed.S. in School Psychology**

Outcomes, Measures, Standards, Data, and Analysis/Actions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Data based decision making</td>
<td>Field evaluations</td>
<td>Practicum and internship skills and dispositions are rated each semester by field supervisors. There are items and categories on the evaluations to match the outcomes listed (e.g., work with academic interventions, consultation skills). Ratings are on a scale of 1 to 4 with 4 being Very Good, <strong>Expected standard is 3 and above.</strong></td>
<td>The average rating for the first year cohort (N=10) in Fall 2014 was 3.83 for Professional Behavior and 3.43 for Communication. In Spring 2015 these ratings were 3.75 for Professional Behavior, 3.44 for Communication, and 3.38 for Skills. For the second year cohort (N = 10) in Fall 2014 was 3.84 for Professional Behavior and 3.66 for Communication, 3.56 for Skills. In Spring 2015 these ratings were 3.82 for Professional Behavior, 3.78 for Communication, and 3.71 for Skills. Intern (N=9) average rating for Fall 2013 was 3.53 and 3.67 for Spring 2015.</td>
<td>Field evaluations are considered critical evidence that students can apply knowledge and skills in the field. These also reflect dispositions and interpersonal skills. The field evaluation forms assess more areas each year as student progress through the program and are completed by different field supervisors each semester. No areas of concern were noted. The field evaluations will be reorganized this fall to meet the new NASP training standards.</td>
</tr>
<tr>
<td>2. Consultation</td>
<td>Functional Behavior Assessment (FBA).</td>
<td>Students conduct a Functional Behavior Assessment and develop a Behavior Support Plan. This is rated on a scale is 1 – 24 <strong>Professional passing standard is 17.</strong></td>
<td>Mean for second year students = 20.89 (N=10) All met and surpassed minimum standard.</td>
<td>The FBA (Functional Behavior Assessment) is an embedded course component and evaluated by a professional Behavior Support Plan (BSP) rubric. All students developed BSPs that were above the minimum. These are real cases, not vignettes as some programs use, so the fact second year students can meet this criteria is excellent.</td>
</tr>
<tr>
<td>3. Academic Interventions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Socialization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. School Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Family-school collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Professional Practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Learning Outcomes for all Psych Graduate Students 4:a**
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Data based decision making</td>
<td>Intervention Case Studies</td>
<td>Data reported as PND; 90 is considered highly effective 70–90 moderately effective 50–70 questionably effective 50 ineffective</td>
<td>Competencies are evaluated through intervention case studies in Psych 278, 279, 286, and 267. The first year cohort completed a consultation project in the spring; the average percent of non-overlapping data points (PND) was 62%. The second year students had two intervention projects. For their behavior intervention project in the fall they obtained 49.3% PND; for their academic intervention in the spring the PND was 77.2%. The third year cohort (interns) had 67% PND for their projects in the fall and spring.</td>
<td>The intervention case studies are also real cases carried out in schools; we consider the intervention strand of our program a strength and evaluate all case studies in 5 courses by the PND. The PND for all except 278 were in the moderate to highly effective size range. The lower PND in 278 last fall was analyzed by the program faculty; measures to improve this for Fall 2015 include closer communication with field supervisors, and emphasizing the need for students to plan for crises, such as their target child moving or being expelled!</td>
</tr>
<tr>
<td>1. Data based decision making</td>
<td>Portfolios</td>
<td>A rubric of 0=no evidence, 1=partial evidence, 2=complete content provided was used. Data reported as percent complete;</td>
<td>The first year cohort has not yet submitted portfolios due to changing of the university e-platform. The second year cohort had an average of 36% complete. They submitted the majority for three domains and partial materials for three other domains. Initially the interns had only 27% complete; they were asked to resubmit and achieved a completion rate of 98%.</td>
<td>The portfolios are collections of student work and demonstrate competence in all domains. These are cumulative and interns finally did document materials in all areas. Initial results for the interns and the data for the second year cohort indicate the students are not carefully reading directions or submitting artifacts in a timely manner. We are revising the requirements slightly to match the NASP 2010 standards, and increased attention will be paid to student</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| 1. Data based decision making | PRAXIS | **Standards:**  
| | | **National NCSP standard of 165**  
| | | **100% passing**  
| | | The current second year cohort averaged 171.9. All nine students obtained the NCSP standard.  
| | | Subcategories:  
| | | Professional Practice = 24.7 (Avg. range is 21 to 25 on norms)  
| | | Direct/Indirect Services = 21.7 (Avg. range is 19 to 23 on norms)  
| | | Systems = 13.9 (Avg. range is 12 to 15 on norms)  
| | | Foundations = 21 (Avg. range is 20 to 25 on norms)  
| | | The PRAXIS is a rigorous exam for professionals; however it is required for all NASP approved programs as well and data are posted on the national website. We use the national standard and have the goal that all second year students will pass before beginning internship. This year all 9 passed. We analyze the data by area (e.g., Professional practice, Foundations) each year in order to determine curricular needs.  
<p>| | | No consistent weaknesses were noted this year. |</p>
<table>
<thead>
<tr>
<th>1. Data based decision making</th>
<th>KREMEN/NCATE (now CAEP) Exit Survey</th>
<th>This is administered to interns as they complete. Scale of 5=Excellent preparation, 4=More than adequate preparation, 3=adequate</th>
<th>2015 Mean = 4.88 for the 11 items. (N = 9)</th>
<th>The CAEP exit survey is a cornerstone of the CAEP accreditation process which we successfully completed in 2014. It is a measure designed to be used by all the credential programs on campus. Therefore</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td>the items are general and pertain to preparation. Last year an area of need noted was more training in professional organization. More emphasis on organizational skills were incorporated into the practicum and internship courses and this year the rating was among the highest items.</td>
</tr>
<tr>
<td>10. Professional practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCTC Standard 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCTC Standard 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td>Thesis Rubric</td>
<td>Mean % with</td>
<td>The Psychology Department utilizes a thesis rubric to evaluate completed theses. Eight school psychology theses were evaluated last year; ratings were lower than past years. Areas to focus on are Methodology, Results and Discussion.</td>
</tr>
<tr>
<td>Topic varies</td>
<td></td>
<td></td>
<td>Excellent (3)</td>
<td>An outcome of the struggles students seem to be having are increased discussions and plans for enhancing the statistics lab for Psych graduate students. In addition, students are being encouraged to take advantage of the University Graduate Writing Studio.</td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 1: a-d</td>
<td></td>
<td></td>
<td>Intro: 2.33 38.1%</td>
<td></td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 2: a-b</td>
<td></td>
<td></td>
<td>Lit Review: 2.24 33.3%</td>
<td></td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 3: a-d</td>
<td></td>
<td></td>
<td>Methods: 2.05 14.3%</td>
<td></td>
</tr>
<tr>
<td>8. Diversity</td>
<td></td>
<td>Psychology Dept. Exit Survey</td>
<td>Ratings for items on 1-4 scale</td>
<td>The Psych Department Graduate Exit Survey was not administered in Spring 2015.</td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td>Standard = Good (3)</td>
<td></td>
</tr>
<tr>
<td>10. Professional practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 1: b-d</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students</td>
<td>Questions embedded in Psych 244 (Research Methods) course</td>
<td>No standard has been established.</td>
<td>The final exam for Psych 244 included eight embedded items testing the students' ability to identify the correct statistical test to use to answer various research questions. The mean number correct was 8.40 (84%) with a standard deviation of 1.13 (11.3%). The final exam also included eight items testing students' ability to read and interpret SPSS output. The mean number correct was 6.13 (76.7%) with a standard deviation of 1.38 (17.3%).</td>
<td>Data were not analyzed by program; these include results for all first year Psychology graduate students (N=30). One action for future years is collecting and analyzing these data in January, immediately following their collection. Previous results for Ed.S students for statistics was 88% correct in 2012 and 96% in 2013. For interpretation they scores 55% correct in 2012 and 56% correct in 2013. The EdS data were similar to the entire Grad student cohort for those two years. It would appear the current cohort achieved a higher percent correct for interpreting statistics. However, it should be noted that the specific items used were modified this year to align better with the approach of the current Psych 244 instructor. Thus, direct comparisons to previous should be made with caution.</td>
</tr>
</tbody>
</table>
5. Assessment activities scheduled for 2015-2016

- All of the above activities are carried out annually and will be continued in 2015-2016.
- The Psychology Department Graduate Student Exit Survey was not administered this year; it may be revised and should be administered in Spring 2016.
- An alumni and employer survey will be administered to determine program strengths and needs.
- Our SOAP has been revised to simplify and combine goals, moving from program, department, state, and national goals to a focus on the national (NASP) standards and blending in any additional goals from the other levels. The schedule of measures was updated.

6. Progress from last program review action plan

The primary action item assigned to the Ed.S. Program at the Program Review Action Plan meeting was the revision and simplification of the SOAP. This has been accomplished.

Hiring a new faculty was part of our action plan; that was completed with the arrival of Dr. Carlos Calderon in August 2014. We obtained new assessment materials last year and will be purchasing more over the next year as new editions of major instruments are published. We continue to work with the ABA faculty to incorporate as much of the BCBA coursework as feasible into our curriculum. This has been complicated by changes in the national BCBA requirements making even more coursework necessary, and changes internally in our own ABA faculty. We have added more coursework on mental health into our curriculum. Thus we are accomplishing the planned activities.

7. Update on changes indicated in the last annual report

The EdS program is minimally addressed in the Psychology Department Annual Report for 2013-14 or the more recent 2014-15 Report. It was noted that we had hired a new faculty, Dr. Carlos Calderon, who would be adding expertise and diversity to both the School Psychology program and the Psychology faculty. As a first year faculty, Dr. Calderon has met expectations; he is an excellent instructor and colleague. Students have benefitted from his experience and expertise in bilingual assessment and cultural studies.

The other annual report note was that one of the Ed.S. students, Elaine Clemings, had been awarded a Presidential Scholar. Lainie attained that honor again as a second year student. This year the school psychology faculty chose her to receive our most prestigious program award, the John Thomas Scholarship.

The only other mention of the Ed.S. program in the annual report is that each year we are admitting 10 graduate students. That is our goal. We are proud not only of the number of graduate students admitted to – and graduating from our program in three years, but the diversity and quality. Including the most recent graduates and in-coming cohort, 49% are Hispanic and 10% Asian Americans. Forty-six percent are bilingual. All 10 recent graduates had positions by the end of June, continuing our record of 100% employment. The employment data are a significant outcome and one that resonates in the community and with potential applicants to our program. All 9 of the second year cohort obtained paid internships for this year. A school psychology intern was chosen as the Psychology Department Outstanding Graduate Student.
8. Analysis of Assessment Measures

Field Evaluations – No systemic changes were indicated by the field evaluations administered last year. The field evaluations, combined with site visits by the practicum liaison and the professor to internship sites allow additional interviews with field supervisors. Information from the rating scales and site visits are regularly reviewed by the school psychology faculty and discussed with students to close the loop.

Functional Behavior Analysis and BICM Quiz - These results indicate students are doing an excellent job of mastering behavior assessment. In the original SOAP the measure used was the BICM exam; however, the state removed the BICM certification in summer 2013 so that quiz was replaced by analysis of their Functional Behavioral Analysis (FBA) case as a SOAP measure.

Intervention Case Studies – The data achieved by the students in the various classes is adequate overall. Better communication with field supervisors was implemented this year in response to lower ratings in one class. We have discussed utilizing additional ways of analyzing the data besides PND that might better depict change in cases where the baseline data are erratic.

Portfolios – No changes were made in content the past year. As noted above, we have had challenges with the university changing the electronic platforms, so for one cohort we returned to using hard copies. Future cohorts will be submitting their artifacts on Pathbrite. We have realigned the expectations for students to document domain competencies with the 2010 NASP standards.

PRAXIS II – No curricular changes were indicated or planned based on the PRAXIS data. The exam was revised and students last year took the new version next year. The revision was administered on computers; formerly this was a paper test. In addition the items were revised in accordance with current training standards. All students passed indicating our curriculum are congruent with NCSP expectations.

Department Exit Survey - The survey was not administered last spring. Previous comments was noted the survey was overly lengthy and redundant; it is suggested that the Department Graduate Committee consider revisions.

Embedded Questions - The graduate faculty decided to revise the research methods courses into a one semester course emphasizing statistics and research design and move thesis proposal writing, which has been a component of the course, to another course. It was hoped this increased emphasis on statistics would result in scores reflecting increased competency in the future. The embedded questions this year indicated competency. However, the change in curriculum did not result in improved progress on thesis or project literature reviews and methodology; we continue to work on these challenges.

Future Measures – Addition of data from psycho-educational reports that are submitted by 2nd and 3rd year students could be used for assessment of critical thinking. Specifically, reports are evaluated on ability of students to summarize and integrate assessment data, relate the information to the referral questions, and to make relevant recommendations.

Report by Marilyn Wilson, Ph.D., NCSP

School Psychology Program Coordinator
SOAP OUTCOMES

Psychology Department Learning Outcomes for all Graduate Students

1. Methodology and Technology. Students can understand and be able to use major research methods in psychology, including design, data analysis, and interpretation.
   a) Students can apply the appropriate use of various research designed for addressing different types of question and hypotheses.
   b) Students can collect data under supervised direction.
   c) Students can enter and analyze data using a computer statistical package and interpret basic descriptive and inferential statistics.
   d) Students can apply the scientific method and statistical techniques in research (e.g., thesis).

2. Critical Thinking, Logic, and Problem Solving. Students can demonstrate the skills and attitudes of critical thinking and sound decision-making in course work and independent work.
   a) Students can evaluate the logic and data of research.
   b) Students can defend arguments, compare perspectives and theories, differentiate assumptions and facts, and develop hypotheses based on research literature.

3. Communication Skills. Students can write clearly and effectively and can display effective oral communication skills.
   a) Students can produce well-organized papers and essays without grammatical errors.
   b) Students can utilize APA format correctly in papers.
   c) Students can compose and deliver an oral presentation on a psychology topic.
   d) Students can develop a presentation appropriate for submission to a scientific conference.

4. Diversity and Awareness. Students can demonstrate appreciation of diverse perspectives.
   a) Students can show an understanding of, respect for, and responsiveness to cultural and individual differences by describing the perspectives of those of other ages, abilities, gender, or ethnicities.

School Psychology Program Student Learning Outcomes / NASP Domains Coordinated with CCTC Standards

Domain 1: Data-Based Decision Making and Accountability
School psychologists have knowledge of varied models and methods of assessment and data collection for identifying strengths and needs, developing effective services and programs, and measuring progress and outcomes.

- As part of a systematic and comprehensive process of effective decision making and problem solving that permeates all aspects of service delivery, school psychologists demonstrate skills to use psychological and educational assessment, data collection strategies, and technology resources and apply results to design, implement, and evaluate response to services and programs.

Domain 2: Consultation and Collaboration
School psychologists have knowledge of varied models and strategies of consultation, collaboration, and communication applicable to individuals, families, groups, and systems and methods to promote effective implementation of services.
• As part of a systematic and comprehensive process of effective decision making and problem solving that permeates all aspects of service delivery, school psychologists demonstrate skills to consult, collaborate, and communicate with others during design, implementation, and evaluation of services and programs.

• **Domain 3: Interventions and Instructional Support to Develop Academic Skills**
  School psychologists have knowledge of biological, cultural, and social influences on academic skills; human learning, cognitive, and developmental processes; and evidence-based curricula and instructional strategies.

• School psychologists, in collaboration with others, demonstrate skills to use assessment and data-collection methods and to implement and evaluate services that support cognitive and academic skills.

• **Domain 4: Interventions and Mental Health Services to Develop Social and Life Skills**
  School psychologists have knowledge of biological, cultural, developmental, and social influences on behavior and mental health, behavioral and emotional impacts on learning and life skills, and evidence-based strategies to promote social–emotional functioning and mental health.

• School psychologists, in collaboration with others, demonstrate skills to use assessment and data-collection methods and to implement and evaluate services that support socialization, learning, and mental health.

• **CCTC Standard 8: Self esteem and Personal and Social Responsibility**
  a) Candidates assess their own self esteem
  b) Candidates demonstrate principles of building self esteem, personal and social responsibility and life long learning

• **Domain 5: School-Wide Practices to Promote Learning**
  School psychologists have knowledge of school and systems structure, organization, and theory; general and special education; technology resources; and evidence-based school practices that promote learning and mental health.

• School psychologists, in collaboration with others, demonstrate skills to develop and implement practices and strategies to create and maintain effective and supportive learning environments for children and others.

• **Domain 6: Preventive and Responsive Services**
  School psychologists have knowledge of principles and research related to resilience and risk factors in learning and mental health, services in schools and communities to support multitiered prevention, and evidence-based strategies for effective crisis response.

• School psychologists, in collaboration with others, demonstrate skills to promote services that enhance learning, mental health, safety, and physical well-being through protective and adaptive factors and to implement effective crisis preparation, response, and recovery.

• **Domain 7: Family–School Collaboration Services**
  School psychologists have knowledge of principles and research related to family systems, strengths,
needs, and culture; evidence-based strategies to support family influences on children’s learning and mental health; and strategies to develop collaboration between families and schools.

- **School psychologists, in collaboration with others, demonstrate skills to design, implement, and evaluate services that respond to culture and context and facilitate family and school partnership/interactions with community agencies for enhancement of academic and social–behavioral outcomes for children.**

- **Domain 8: Diversity in Development and Learning**
  School psychologists have knowledge of individual differences, abilities, disabilities, and other diverse student characteristics; principles and research related to diversity factors for children, families, and schools, including factors related to culture, context, and individual and role difference; and evidence-based strategies to enhance services and address potential influences related to diversity.

- **School psychologists demonstrate skills to provide professional services that promote effective functioning for individuals, families, and schools with diverse characteristics, cultures, and backgrounds and across multiple contexts, with recognition that an understanding and respect for diversity in development and learning and advocacy for social justice are foundations of all aspects of service delivery.**

- **Domain 9: Research and Program Evaluation**
  School psychologists have knowledge of research design, statistics, measurement, varied data collection and analysis techniques, and program evaluation sufficient for understanding research and interpreting data in applied settings.

- **School psychologists demonstrate skills to evaluate and apply research as a foundation for service delivery and, in collaboration with others, use various techniques and technology resources for data collection, measurement, analysis, and program evaluation to support effective practices at the individual, group, and/or systems levels.**

- **Domain 10: Legal, Ethical, and Professional Practice**
  School psychologists have knowledge of the history and foundations of school psychology; multiple service models and methods; ethical, legal, and professional standards; and other factors related to professional identity and effective practice as school psychologists.

- **School psychologists demonstrate skills to provide services consistent with ethical, legal, and professional standards; engage in responsive ethical and professional decision-making; collaborate with other professionals; and apply professional work characteristics needed for effective practice as school psychologists, including respect for human diversity and social justice, communication skills, effective interpersonal skills, responsibility, adaptability, initiative, dependability, and technology skills.**

- **CCTC Standard 16: Supervision and Mentoring**
  (a) Candidates have opportunities and experiences to demonstrate knowledge of models of supervision used to mentor pre-professionals.

**Ed.S. in School Psychology**

Outcomes, Measures, Standards, Data, and Analysis/Actions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Data based decision making</td>
<td>Field evaluations</td>
<td>Practicum and internship skills and dispositions are rated each semester by field supervisors. There are items and categories on the evaluations to match the outcomes listed (e.g., work with academic interventions, consultation skills). Ratings are on a scale of 1 to 4 with 4 being Very Good, <strong>Expected standard is 3 and above.</strong></td>
<td>The average rating for the first year cohort (N=10) in Fall 2014 was 3.83 for Professional Behavior and 3.43 for Communication. In Spring 2015 these ratings were 3.75 for Professional Behavior, 3.44 for Communication, and 3.38 for Skills. For the second year cohort (N = 10) in Fall 2014 was 3.84 for Professional Behavior and 3.66 for Communication, 3.56 for Skills. In Spring 2015 these ratings were 3.82 for Professional Behavior, 3.78 for Communication, and 3.71 for Skills. Intern (N=9) average rating for Fall 2013 was 3.53 and 3.67 for Spring 2015.</td>
<td>Field evaluations are considered critical evidence that students can apply knowledge and skills in the field. These also reflect dispositions and interpersonal skills. The field evaluation forms assess more areas each year as student progress through the program and are completed by different field supervisors each semester. No areas of concern were noted. The field evaluations will be reorganized this fall to meet the new NASP training standards.</td>
</tr>
<tr>
<td>2. Consultation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Academic Interventions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Socialization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. School Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Family-school collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Professional Practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 4:a</td>
<td>Functional Behavior Assessment (FBA).</td>
<td>Students conduct a Functional Behavior Assessment and develop a Behavior Support Plan. This is rated on a scale is 1 – 24 <strong>Professional passing standard is 17.</strong></td>
<td>Mean for second year students = 20.89 (N=10) All met and surpassed minimum standard.</td>
<td>The FBA (Functional Behavior Assessment) is an embedded course component and evaluated by a professional Behavior Support Plan (BSP) rubric. All students developed BSPs that were above the minimum. These are real cases, not vignettes as some programs use, so the fact second year students can meet this criteria is excellent.</td>
</tr>
<tr>
<td>1. Data based decision making</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Socialization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Family-school collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td>1. Data based decision making</td>
<td>Intervention Case Studies</td>
<td>Data reported as PND; 90 is considered highly effective; 70–90 moderately effective; 50–70 questionably effective; 50 ineffective</td>
<td>Competencies are evaluated through intervention case studies in Psych 278, 279, 286, and 267. The first year cohort completed a consultation project in the spring; the average percent of non-overlapping data points (PND) was 62%. The second year students had two intervention projects. For their behavior intervention project in the fall they obtained 49.3% PND; for their academic intervention in the spring the PND was 77.2%. The third year cohort (interns) had 67% PND for their projects in the fall and spring.</td>
<td>No changes are indicated.</td>
</tr>
<tr>
<td>2. Consultation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Academic Interventions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Socialization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. School Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Family-school collaboration</td>
<td>A rubric of 0=no evidence, 1=partial evidence, 2=complete content provided was used. Data reported as percent complete; 90% goal for interns</td>
<td></td>
<td>The first year cohort has not yet submitted portfolios due to changing of the university e-platform. The second year cohort had an average of 36% complete. They submitted the majority for three domains and partial materials for three other domains. Initially the interns had only 27% complete; they were asked to resubmit and achieved a completion rate of 98%.</td>
<td>The portfolios are collections of student work and demonstrate competence in all domains. These are cumulative and interns finally did document materials in all areas. Initial results for the interns and the data for the second year cohort indicate the students are not carefully reading directions or submitting artifacts in a timely manner. We are revising the requirements slightly to match the NASP 2010 standards, and increased attention will be paid to student</td>
</tr>
<tr>
<td>8. Diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Professional practices</td>
<td>Portfolios</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Data based decision making</td>
<td>PRAXIS</td>
<td><strong>Standards:</strong> National NCSP standard of 165 100% passing</td>
<td>The current second year cohort averaged 171.9. All nine students obtained the NCSP standard. Subcategories: Professional Practice = 24.7 (Avg. range is 21 to 25 on norms) Direct/Indirect Services = 21.7 (Avg. range is 19 to 23 on norms) Systems = 13.9 (Avg. range is 12 to 15 on norms) Foundations = 21 (Avg. range is 20 to 25 on norms)</td>
<td>The PRAXIS is a rigorous exam for professionals; however it is required for all NASP approved programs as well and data are posted on the national website. We use the national standard and have the goal that all second year students will pass before beginning internship. This year all 9 passed. We analyze the data by area (e.g., Professional practice, Foundations) each year in order to determine curricular needs. No consistent weaknesses were noted this year.</td>
</tr>
</tbody>
</table>
| 1. Data based decision making  
2. Consultation  
3. Academic Interventions  
5. School Systems  
6. Prevention  
8. Diversity  
9. Research  
10. Professional practices | KREMEN/NCATE (now CAEP) Exit Survey | This is administered to interns as they complete. Scale of 5=Excellent preparation, 4=More than adequate preparation, 3=adequate | 2015 Mean = 4.88 for the 11 items. (N = 9) | The CAEP exit survey is a cornerstone of the CAEP accreditation process which we successfully completed in 2014. It is a measure designed to be used by all the credential programs on campus. Therefore |

The university has changed platforms which complicated data collection and forced us back to hard copies for one cohort. We will be using Pathbrite this year.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td>the items are general and pertain to preparation. Last year an area of need noted was more training in professional organization. More emphasis on organizational skills were incorporated into the practicum and internship courses and this year the rating was among the highest items.</td>
</tr>
<tr>
<td>10. Professional practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCTC Standard 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCTC Standard 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic varies</td>
<td>Thesis Rubric</td>
<td>E (3) = excellent</td>
<td>Mean % with</td>
<td>The Psychology Department utilizes a thesis rubric to evaluate completed theses. Eight school psychology theses were evaluated last year; ratings were lower than past years. Areas to focus on are Methodology, Results and Discussion.</td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 1: a-d</td>
<td>G (2) = good</td>
<td>2.33 38.1%</td>
<td>Excellent (3)</td>
<td>An outcome of the struggles students seem to be having are increased discussions and plans for enhancing the statistics lab for Psych graduate students. In addition, students are being encouraged to take advantage of the University Graduate Writing Studio.</td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 2: a-b</td>
<td>A (1) = average</td>
<td>2.24 33.3%</td>
<td>Lit Review: 2.24 33.3%</td>
<td></td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 3: a-d</td>
<td>M (0) = minimally acceptable</td>
<td>2.05 14.3%</td>
<td>Method: 2.05 14.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Results: 1.95 19.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Discussion: 1.86 14.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mechanics: 2.43 52.4%</td>
<td></td>
</tr>
<tr>
<td>N = 21 raters for 8 students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Diversity</td>
<td>Psychology Dept. Exit Survey</td>
<td>Ratings for items on 1-4 scale</td>
<td>The Psych Department Graduate Exit Survey was not administered in Spring 2015.</td>
<td></td>
</tr>
<tr>
<td>9. Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Professional practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students 1: b-d</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Learning Outcomes for all Psych Graduate Students</td>
<td>Questions embedded in Psych 244 (Research Methods) course</td>
<td>No standard has been established.</td>
<td>The final exam for Psych 244 included eight embedded items testing the students' ability to identify the correct statistical test to use to answer various research questions. The mean number correct was 8.40 (84%) with a standard deviation of 1.13 (11.3%). The final exam also included eight items testing students' ability to read and interpret SPSS output. The mean number correct was 6.13 (76.7%) with a standard deviation of 1.38 (17.3%).</td>
<td>Data were not analyzed by program; these include results for all first year Psychology graduate students (N=30). One action for future years is collecting and analyzing these data in January, immediately following their collection. Previous results for Ed.S students for statistics was 88% correct in 2012 and 96% in 2013. For interpretation they scores 55% correct in 2012 and 56% correct in 2013. The EdS data were similar to the entire Grad student cohort for those two years. It would appear the current cohort achieved a higher percent correct for interpreting statistics. However, it should be noted that the specific items used were modified this year to align better with the approach of the current Psych 244 instructor. Thus, direct comparisons to previous should be made with caution.</td>
</tr>
</tbody>
</table>
5. Assessment activities scheduled for 2015-2016

- All of the above activities are carried out annually and will be continued in 2015-2016.
- The Psychology Department Graduate Student Exit Survey was not administered this year; it may be revised and should be administered in Spring 2016.
- An alumni and employer survey will be administered to determine program strengths and needs.
- Our SOAP has been revised to simplify and combine goals, moving from program, department, state, and national goals to a focus on the national (NASP) standards and blending in any additional goals from the other levels. The schedule of measures was updated.

6. Progress from last program review action plan

The primary action item assigned to the Ed.S. Program at the Program Review Action Plan meeting was the revision and simplification of the SOAP. This has been accomplished.

Hiring a new faculty was part of our action plan; that was completed with the arrival of Dr. Carlos Calderon in August 2014. We obtained new assessment materials last year and will be purchasing more over the next year as new editions of major instruments are published. We continue to work with the ABA faculty to incorporate as much of the BCBA coursework as feasible into our curriculum. This has been complicated by changes in the national BCBA requirements making even more coursework necessary, and changes internally in our own ABA faculty. We have added more coursework on mental health into our curriculum. Thus we are accomplishing the planned activities.

7. Update on changes indicated in the last annual report

The EdS program is minimally addressed in the Psychology Department Annual Report for 2013-14 or the more recent 2014-15 Report. It was noted that we had hired a new faculty, Dr. Carlos Calderon, who would be adding expertise and diversity to both the School Psychology program and the Psychology faculty. As a first year faculty, Dr. Calderon has met expectations; he is an excellent instructor and colleague. Students have benefitted from his experience and expertise in bilingual assessment and cultural studies.

The other annual report note was that one of the Ed.S. students, Elaine Clemings, had been awarded a Presidential Scholar. Lainie attained that honor again as a second year student. This year the school psychology faculty chose her to receive our most prestigious program award, the John Thomas Scholarship.

The only other mention of the Ed.S. program in the annual report is that each year we are admitting 10 graduate students. That is our goal. We are proud not only of the number of graduate students admitted to – and graduating from our program in three years, but the diversity and quality. Including the most recent graduates and in-coming cohort, 49% are Hispanic and 10% Asian Americans. Forty-six percent are bilingual. All 10 recent graduates had positions by the end of June, continuing our record of 100% employment. The employment data are a significant outcome and one that resonates in the community and with potential applicants to our program. All 9 of the second year cohort obtained paid internships for this year. A school psychology intern was chosen as the Psychology Department Outstanding Graduate Student.
8. Analysis of Assessment Measures

Field Evaluations – No systemic changes were indicated by the field evaluations administered last year. The field evaluations, combined with site visits by the practicum liaison and the professor to internship sites allow additional interviews with field supervisors. Information from the rating scales and site visits are regularly reviewed by the school psychology faculty and discussed with students to close the loop.

Functional Behavior Analysis and BICM Quiz - These results indicate students are doing an excellent job of mastering behavior assessment. In the original SOAP the measure used was the BICM exam; however, the state removed the BICM certification in summer 2013 so that quiz was replaced by analysis of their Functional Behavioral Analysis (FBA) case as a SOAP measure.

Intervention Case Studies – The data achieved by the students in the various classes is adequate overall. Better communication with field supervisors was implemented this year in response to lower ratings in one class. We have discussed utilizing additional ways of analyzing the data besides PND that might better depict change in cases where the baseline data are erratic.

Portfolios – No changes were made in content the past year. As noted above, we have had challenges with the university changing the electronic platforms, so for one cohort we returned to using hard copies. Future cohorts will be submitting their artifacts on Pathbrite. We have realigned the expectations for students to document domain competencies with the 2010 NASP standards.

PRAXIS II – No curricular changes were indicated or planned based on the PRAXIS data. The exam was revised and students last year took the new version next year. The revision was administered on computers; formerly this was a paper test. In addition the items were revised in accordance with current training standards. All students passed indicating our curriculum are congruent with NCSP expectations.

Department Exit Survey - The survey was not administered last spring. Previous comments was noted the survey was overly lengthy and redundant; it is suggested that the Department Graduate Committee consider revisions.

Embedded Questions - The graduate faculty decided to revise the research methods courses into a one semester course emphasizing statistics and research design and move thesis proposal writing, which has been a component of the course, to another course. It was hoped this increased emphasis on statistics would result in scores reflecting increased competency in the future. The embedded questions this year indicated competency. However, the change in curriculum did not result in improved progress on thesis or project literature reviews and methodology; we continue to work on these challenges.

Future Measures – Addition of data from psycho-educational reports that are submitted by 2nd and 3rd year students could be used for assessment of critical thinking. Specifically, reports are evaluated on ability of students to summarize and integrate assessment data, relate the information to the referral questions, and to make relevant recommendations.

Report by Marilyn Wilson, Ph.D., NCSP

School Psychology Program Coordinator
SOAP OUTCOMES

Psychology Department Learning Outcomes for all Graduate Students

1. Methodology and Technology. Students can understand and be able to use major research methods in psychology, including design, data analysis, and interpretation.
   a) Students can apply the appropriate use of various research designed for addressing different types of question and hypotheses.
   b) Students can collect data under supervised direction.
   c) Students can enter and analyze data using a computer statistical package and interpret basic descriptive and inferential statistics.
   d) Students can apply the scientific method and statistical techniques in research (e.g., thesis).

2. Critical Thinking, Logic, and Problem Solving. Students can demonstrate the skills and attitudes of critical thinking and sound decision-making in course work and independent work.
   a) Students can evaluate the logic and data of research.
   b) Students can defend arguments, compare perspectives and theories, differentiate assumptions and facts, and develop hypotheses based on research literature.

3. Communication Skills. Students can write clearly and effectively and can display effective oral communication skills.
   a) Students can produce well-organized papers and essays without grammatical errors.
   b) Students can utilize APA format correctly in papers.
   c) Students can compose and deliver an oral presentation on a psychology topic.
   d) Students can develop a presentation appropriate for submission to a scientific conference.

4. Diversity and Awareness. Students can demonstrate appreciation of diverse perspectives.
   a) Students can show an understanding of, respect for, and responsiveness to cultural and individual differences by describing the perspectives of those of other ages, abilities, gender, or ethnicities.

School Psychology Program Student Learning Outcomes / NASP Domains Coordinated with CCTC Standards

Domain 1: Data-Based Decision Making and Accountability
School psychologists have knowledge of varied models and methods of assessment and data collection for identifying strengths and needs, developing effective services and programs, and measuring progress and outcomes.

- As part of a systematic and comprehensive process of effective decision making and problem solving that permeates all aspects of service delivery, school psychologists demonstrate skills to use psychological and educational assessment, data collection strategies, and technology resources and apply results to design, implement, and evaluate response to services and programs.

Domain 2: Consultation and Collaboration
School psychologists have knowledge of varied models and strategies of consultation, collaboration, and communication applicable to individuals, families, groups, and systems and methods to promote effective implementation of services.
• As part of a systematic and comprehensive process of effective decision making and problem solving that permeates all aspects of service delivery, school psychologists demonstrate skills to consult, collaborate, and communicate with others during design, implementation, and evaluation of services and programs.

• **Domain 3: Interventions and Instructional Support to Develop Academic Skills**
  School psychologists have knowledge of biological, cultural, and social influences on academic skills; human learning, cognitive, and developmental processes; and evidence-based curricula and instructional strategies.

  School psychologists, in collaboration with others, demonstrate skills to use assessment and data-collection methods and to implement and evaluate services that support cognitive and academic skills.

• **Domain 4: Interventions and Mental Health Services to Develop Social and Life Skills**
  School psychologists have knowledge of biological, cultural, developmental, and social influences on behavior and mental health, behavioral and emotional impacts on learning and life skills, and evidence-based strategies to promote social-emotional functioning and mental health.

  School psychologists, in collaboration with others, demonstrate skills to use assessment and data-collection methods and to implement and evaluate services that support socialization, learning, and mental health.

• **CCTC Standard 8: Self esteem and Personal and Social Responsibility**
  a) Candidates assess their own self esteem
  b) Candidates demonstrate principles of building self esteem, personal and social responsibility and life long learning

• **Domain 5: School-Wide Practices to Promote Learning**
  School psychologists have knowledge of school and systems structure, organization, and theory; general and special education; technology resources; and evidence-based school practices that promote learning and mental health.

  School psychologists, in collaboration with others, demonstrate skills to develop and implement practices and strategies to create and maintain effective and supportive learning environments for children and others.

• **Domain 6: Preventive and Responsive Services**
  School psychologists have knowledge of principles and research related to resilience and risk factors in learning and mental health, services in schools and communities to support multitiered prevention, and evidence-based strategies for effective crisis response.

  School psychologists, in collaboration with others, demonstrate skills to promote services that enhance learning, mental health, safety, and physical well-being through protective and adaptive factors and to implement effective crisis preparation, response, and recovery.

• **Domain 7: Family–School Collaboration Services**
  School psychologists have knowledge of principles and research related to family systems, strengths,
needs, and culture; evidence-based strategies to support family influences on children’s learning and mental health; and strategies to develop collaboration between families and schools.

- **School psychologists, in collaboration with others, demonstrate skills to design, implement, and evaluate services that respond to culture and context and facilitate family and school partnership/interactions with community agencies for enhancement of academic and social–behavioral outcomes for children.**

- **Domain 8: Diversity in Development and Learning**
  School psychologists have knowledge of individual differences, abilities, disabilities, and other diverse student characteristics; principles and research related to diversity factors for children, families, and schools, including factors related to culture, context, and individual and role difference; and evidence-based strategies to enhance services and address potential influences related to diversity.

- **School psychologists demonstrate skills to provide professional services that promote effective functioning for individuals, families, and schools with diverse characteristics, cultures, and backgrounds and across multiple contexts, with recognition that an understanding and respect for diversity in development and learning and advocacy for social justice are foundations of all aspects of service delivery.**

- **Domain 9: Research and Program Evaluation**
  School psychologists have knowledge of research design, statistics, measurement, varied data collection and analysis techniques, and program evaluation sufficient for understanding research and interpreting data in applied settings.

- **School psychologists demonstrate skills to evaluate and apply research as a foundation for service delivery and, in collaboration with others, use various techniques and technology resources for data collection, measurement, analysis, and program evaluation to support effective practices at the individual, group, and/or systems levels.**

- **Domain 10: Legal, Ethical, and Professional Practice**
  School psychologists have knowledge of the history and foundations of school psychology; multiple service models and methods; ethical, legal, and professional standards; and other factors related to professional identity and effective practice as school psychologists.

- **School psychologists demonstrate skills to provide services consistent with ethical, legal, and professional standards; engage in responsive ethical and professional decision-making; collaborate with other professionals; and apply professional work characteristics needed for effective practice as school psychologists, including respect for human diversity and social justice, communication skills, effective interpersonal skills, responsibility, adaptability, initiative, dependability, and technology skills.**

- **CCTC Standard 16: Supervision and Mentoring**
  (a) Candidates have opportunities and experiences to demonstrate knowledge of models of supervision used to mentor pre-professionals