Assessment Report Summary
Program: School of Sciences and Mathematics

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
Based on results for FY 16, the table below shows a summary of results for this year and actions proposed for next year:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Measure</th>
<th>Target Met?</th>
<th>Improvement over last year?</th>
<th>Proposed FY17 Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Experiences</td>
<td>1.1 Yes Yes</td>
<td></td>
<td>Enhance HHMI/INBRE collaborations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2 No Yes</td>
<td></td>
<td>Encourage PIs to have students submit their work for display at poster sessions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3 No Yes</td>
<td></td>
<td>Provide a research basic skills seminar program, hold research group meetings, and to host social events for students.</td>
<td></td>
</tr>
<tr>
<td>Instruction in General Education</td>
<td>2.1 No Yes</td>
<td></td>
<td>Ask for new lines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.2 No Yes</td>
<td></td>
<td>Ask for new lines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.1 No No</td>
<td></td>
<td>Enhance safety instruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.2 No No</td>
<td></td>
<td>Enhance safety awareness in Adjuncts</td>
<td></td>
</tr>
<tr>
<td>Pre-Professional Advising</td>
<td>4.1 Yes Yes</td>
<td></td>
<td>An increased use of per-mentors will be employed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.2 No No</td>
<td></td>
<td>Initiating a post-baccalaureate program will be explored.</td>
<td></td>
</tr>
<tr>
<td>Community &amp; Public Service</td>
<td>5.1 Yes Yes</td>
<td></td>
<td>Raise target; emphasize use of web reporting by faculty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.2 Yes Yes</td>
<td></td>
<td>Raise target; enhance advertising efforts</td>
<td></td>
</tr>
<tr>
<td>Faculty Research</td>
<td>6.1 No Yes</td>
<td></td>
<td>Provide travel support to grant workshops</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.2 No No</td>
<td></td>
<td>Provide faculty released time</td>
<td></td>
</tr>
</tbody>
</table>
Biology

Biology - BA/Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Although we are meeting most of our targets for assessment, our target for Outcome 3 (communication) Measure 2 was not met – at least in this first year of data collection. In addition, analysis of subsets of our foundation sequence (Outcome 1, Measure 1) suggest areas for potential improvement.

Applied and planned changes to improve student learning: The laboratory sections of the foundation courses have recently been revised to include more active learning. No further changes have been made as the assessment results were not available until the end of the spring 2016 semester; the results of this assessment cycle will inform departmental discussions of possible further revisions to the foundation curriculum next year.

Results from previous assessment cycles have indicated areas where assessment of the program could be improved. To that end, the following changes to assessment have been made:

1. An in-class assessment of core competency has been added to one of the Biology foundation courses, Biology 211. Instructors generate questions based on a topic (ecology) covered in all Biology 211 courses and assess student performance on question on this topic.

2. Results from the standardized exam, the Major Field Test in Biology, were previously not subdivided between programs. Beginning in 2016, results for graduating seniors are subdivided between BA, BS, and Marine Biology BS students.

3. A graduating senior survey has been implemented to evaluate whether seniors found their degree program in Biology to be rigorous. Results are subdivided between BA, BS, and Marine Biology BS students.

4. An in-class assessment of scientific communication has been added to one of the Biology foundation courses, Biology 211. Instructors evaluate student performance on an assignment involving scientific communication, and those results are pooled and compared to an expected threshold of performance.

5. Participation by students in research credits and in research presentations, such as the School of Science and Math Poster Presentation Day, is tracked and tabulated to evaluate participation by students from each of the degree programs.

Biology - BS

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe
evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Although we are meeting most of our targets for assessment, the target for student assessment of rigor (Outcome 2, Measure 2) – at least in this first year of data collection – was not met. In addition, analysis of subsets of our foundation sequence (Outcome 1, Measure 1) suggest areas for potential improvement.

Applied and planned changes to improve student learning: The laboratory sections of the foundation courses have recently been revised to include more active learning. No further changes have been made as the assessment results were not available until the end of the spring 2016 semester; the results of this assessment cycle will inform departmental discussions of possible further revisions to the foundation curriculum next year.

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5. Participation by students in research credits and in research presentations, such as the School of Science and Math Poster Presentation Day, is tracked and tabulated to evaluate participation by students from each of the degree programs.

Marine Biology - BS

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Although most targets were met, with regard to programmatic improvement (Outcome 2) one measure (1) was met with a very low sample size, and the other (2) was not met (although this was the first year for this measure, and thus establishes the baseline). In addition, analysis of subsets of our foundation sequence (Outcome 1, Measure 1) suggest areas for potential improvement.

Applied and planned changes to improve student learning: The laboratory sections of the foundation
courses have recently been revised to include more active learning. In addition, a group of faculty most closely associated with the marine biology upper-level curriculum are currently reviewing possible curricular revisions to both improve the overall quality of the program and to enhance student access to the necessary courses. No further changes have been made as the assessment results were not available until the end of the spring 2016 semester; discussions of both the foundation curriculum and the upper-level marine biology curriculum will continue next year.

Results from previous assessment cycles have indicated areas where assessment of the program could be improved. To that end, the following changes to assessment have been made:

1. An in-class assessment of core competency has been added to one of the Biology foundation courses, Biology 211. Instructors generate questions based on a topic (ecology) covered in all Biology 211 courses and assess student performance on question on this topic.

2. Results from the standardized exam, the Major Field Test in Biology, were previously not subdivided between programs. Beginning in 2016, results for graduating seniors are subdivided between BA, BS, and Marine Biology BS students.

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4. An in-class assessment of scientific communication has been added to one of the Biology foundation courses, Biology 211. Instructors evaluate student performance on an assignment involving scientific communication, and those results are pooled and compared to an expected threshold of performance.

5. Participation by students in research credits and in research presentations, such as the School of Science and Math Poster Presentation Day, is tracked and tabulated to evaluate participation by students from each of the degree programs.

6. A new measure was devised by the department to evaluate programmatic improvement in the marine biology program. There is not an existing standardized exam specific to marine biology. The department tasked instructors in marine biology courses to develop exam questions. An exam based on these questions was implemented for the first time in Spring 2016.

Chemistry and Biochemistry

Biochemistry - BS

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

The BS Biochemistry program has employed the following strategies to improve student learning (for a more extensive discussion please see the attachment.)

**LearnSmart Prep** In FY15 the department introduced LearnSmart Prep assignments in Chem 111 and Chem 112. We discussed the result in our retreat in August 2015 and decided as a result of the data below to expand this program to Organic Chemistry. Based on data collected both 111 and 112 grades have improved, the DWF rate has decreased, and ACS exam scores improved. See attachment.
CHEM 112L Transition to a CURE experience (Classroom Undergraduate Research Experience)
In Spring 2015, after over a year of planning, the department offered a single section of Chem 112L with a curriculum that links to research on drug degradation in the environment. This past fall 2016, we used our trailing sections of Chem 112 to launch the CURE experience in each section of Chem 112L. Overall, 81% of the students preferred the research-based model. Probably another 10% were neutral, and only a few objected to the CURE model being used in 112L. The main criticism of the new model was reduced correlation to lecture material, and we are working on ways to improve that this term.

1-2-1 Sequence for Honors Chemistry Students and recent modifications
In Fall 2011, the Department of Chemistry and Biochemistry expanded its Honors Chemistry sequence from a traditional year-long general chemistry sequence to a four semester 1-2-1 sequence. Our HONS 191/HONS 192/HONS 293/ HONS 294 sequence has seen its first graduates and the early exposure to organic chemistry has had the desired effect of getting talented students invested into the core curriculum of chemistry (organic and beyond) earlier. Honors students in the new sequence perform better in organic chemistry than do honors students in the traditional 2-2 sequence of courses. Due to financial pressures of offering courses with low enrollments for FY17 the department gained approval to replace HONS 191/191L and HONS 294/294L with a single 5-credit course, HONS 190 (4)-HONS 190L (1).

Changes to the Biochemistry Degree
In 2013, the department overhauled the biochemistry degree and changed courses needed for graduation with a BS in Biochemistry as a result of internal assessment (primarily senior surveys) and external assessment and accreditation from the American Chemical Society. The changes included removing elective courses in biology and replacing that course with a menu of course options in chemistry, which included several new courses introduced in 2012: Chemical Biology (Chem 353), Biochemical Basis of Disease (Chem 356), and Research Methods in Biochemistry (Chem 355).

Development and Implementation of Math 229 for enhanced experience in Physical Chemistry
The “math issue” has been a frequent topic in our department for years, and we have monitored the number of times our graduates refer to the “physical chemistry math problem” in our required senior exit survey. A new MATH 229 (5 credit hours) course has been instituted.

Chemistry - BA/Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
The BA Chemistry program has employed the following strategies to improve student learning (for a more extensive discussion please see the attachment.)

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**Chemistry - BS**

**Assessment Report Summary**

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The BS Chemistry program has employed the following strategies to improve student learning (for a more extensive discussion please see the attachment.)

**LearnSmart Prep** In FY15 the department introduced LearnSmart Prep assignments in Chem 111 and Chem 112. We discussed the result in our retreat in August 2015 and decided as a result of the data below to expand this program to Organic Chemistry. Based on data collected both 111 and 112 grades have improved, the DWF rate has decreased, and ACS exam scores improved. See attachment.

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Computer Science

Computational Thinking - Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

There are no students enrolled into the Computational Thinking minor, therefore it is impossible to assess. This academic year, we are working with Dr. Quinn Burke in the Education Department on a proposal to possible have middle school Education majors complement their degrees with this Computation Thinking minor in order to be able to teaching middle school students computer science. Hopefully this initiative will lead to students in the program and assessment data in subsequent years.
Computer Information Systems - BS/Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

During the department retreat on May 9, 2016 hosted by Blackbaud, the faculty discussed the mission and outcomes in great details for the Computer Information Systems program.

Overall the assessment of all three outcomes in CSCI 392 showed adequate performance by the students. But, a more formal mechanism must be implemented next time by the instructor to ensure that all three of these outcomes are being met by all students.

Overall the assessment of all three outcomes in CSCI 462 failed to show adequate performance by the students. The mechanism of having the students address these outcomes in their SRS documentation did not meet adequate standards. Either the instructor failed to properly instruct the students on what to do, or the writing component was part of the very last deliverable. But, in either case, a change must be next time. Note that this section of CSCI 462 was a new "industry projects" piloted version of the course which in its initial format did not lend itself well to meeting this outcome. When/if the course is offered in this style again in Spring 2017, the instructor will required the students to write small papers on professional responsibilities around the start of the semester which will be discussed in class.

Computer Science - BA

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Overall the assessment of all three outcomes in CSCI 392 showed adequate performance by the students. But, a more formal mechanism must be implemented next time by the instructor to ensure that all three of these outcomes are being met by all students.

Overall the assessment of all three outcomes in CSCI 462 failed to show adequate performance by the students. The mechanism of having the students address these outcomes in their SRS documentation did not meet adequate standards. Either the instructor failed to properly instruct the students on what to do, or the writing component was part of the very last deliverable. But, in either case, a change must be next time. Note that this section of CSCI 462 was a new "industry projects" piloted version of the course which in its initial format did not lend itself well to meeting this outcome. When/if the course is offered in this style again in Spring 2017, the instructor will required the students to write small papers on professional responsibilities around the start of the semester which will be discussed in class.
Computer Science - BS

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Overall the assessment of the four outcomes in CSCI 360 showed more than satisfactory performance by the students, and for the most part strong improvement over the results from the 2013-2014 assessment cycle, which was the last time assessments in this course were made. The greater focus should be on improving results for outcomes 6 and 9.

Of these two, outcome 6 would be the easier to improve upon. The current course offering primarily uses n-tier architectures for project work; this could be supplemented by analyzing other architectural approaches after the projects are completed. Improving outcome 9 would be more difficult because the types of projects on which the students are working do not have single classes with interesting state. One option would be to design around problems where a single class that manages state is the most obvious solution. For example if the design and analysis focused on game development the class could model games where the state controls verbal responses (for example in a football game where pre-recorded audio is played based on the state of the game).

Overall the assessment of all four outcomes in CSCI 462 demonstrated adequate performance by the students, but since this was the first time a section of CSCI462 was taught as a new "industry projects" piloted version of the course, the results from 2015-16 should be used more as a benchmark for understanding how the students fared in 2016-17. The course instructor has indicated that if/when a section of the course is offered in this style again in Spring 2017, the instructor will required the students to write small papers on professional responsibilities around the start of the semester which will be discussed in class. This would factor into the assessment of outcome 6.

Computing in the Arts - BA

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

The assessment process for Academic Year 2015-2016 was conducted by several independent college faculty affiliated with the CITA program. These faculty members are from the department of Computer Science and the School of the Arts (e.g., Music, Studio Art, Dance, Theatre, and Art History programs). We have identified three areas of assessment (outcomes) for student competence, namely Computing Competency, Arts Concentration Competency, and Synthesis Competency. These three areas are subdivided into the following six areas:

* Competency in computer programming, problem solving, and modeling of process (Computing).
* Competency in applying theoretic concepts to an advanced art problem / area (Computing).

* Competency in creativity, and critical thinking skills (Arts).

* Competency specific to concentration in intuitive and analytical decision-making, history, performance, and/or theory (Arts).

* Originality, significance, contribution to knowledge, and presentation (Synthesis).

* Competency in (a) incorporating computational tools and techniques into the creative process to achieve an artistic vision; or (b) incorporating creativity, aesthetics and design into new computational techniques, innovative products, or improved problem solving and original inquiry (Synthesis).

The collected data was reviewed and analyzed extensively (as described in the report). Each student's competency was assessed via several independent faculty evaluations, across each of the above six dimensions.

The assessment showed that the program succeeds in meeting our established goals. In summary, more than 70% of all CITA students exhibited the above competencies, which was our goal for Academic Year 2015-1016 (see report for more details on how this conclusion was reached).

For the following year (2016-2017) we have increased our assessment goal to 75% of all CITA students exhibiting the above competencies. We find that this assessment process is very helpful in exploring ways to analyze, discuss, and increase the quality of our program.

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**Data Science - BS/Minor**

**Assessment Report Summary**

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Students across the board showed an improvement from the previous year. But last year had a small sample size (N=4), while this year we had over 10 graduates. A new rubric was used this year for scoring, so no direct comparison of the numbers are available. This new rubric is a lot more granular and will allow for a more in-depth quality improvement going forward.

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**Geology and Environmental Geosciences**

**Geology - BA/Minor**

**Assessment Report Summary**

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
The faculty held more than ten meetings and a retreat to discuss how our curriculum should be reorganized to better meet departmental, School, and College goals. We had long discussions concerning our introductory courses as well as our major offerings within the context of our learning outcomes and goals. These discussions led to changes in the topics covered and teaching methods to better align classes with College and departmental goals. We also implemented a series of assessment questions and exercises to check on the quality of our instruction. The changes to the approaches in which we teach and the modifications in our curriculum (discussed below) enabled us to better meet the needs of our general education students and our majors.

The obstacles we face as a department is, as usual, time. During our protracted discussions it was clear that we had many good ideas on how to improve our curriculum. Even with all the enthusiasm generated, many faculty could not find the necessary time to make all the reforms they desired. One obstacle that can’t be overcome is the lack of nearby geologic outcrops for students to visit during the course of a three-hour lab window. Another obstacle, that unfortunately seems to be systemic throughout the College, is computer technology. Problems plagued our introductory laboratory classes, as well as our advanced Remote Sensing and GIS classes. Problems with computer technology have occupied many hours of our faculty members’ time. These colleagues must continually fix and maintain the computer network instead of spending time on their class development.

The department started a lengthy discussion of Science Literacy and the role of our introductory classes in improving literacy and numeracy. These discussions catalyzed a complete review of our major curriculum. Group conversations surrounded redesigning classes and the sequences of courses. We also discussed optimum class size, workload, and scheduling. Three faculty committees were designated to examine our introductory classes, major classes, and the future of the department and the committees presented their ideas at faculty meetings. Frequent faculty meetings enabled the airing of new ideas and an opportunity to fully discuss ideas and make recommendations to each of the committees. After each faculty meeting presentation and dialogue, the committees continued to meet. Each committee took their tasks seriously and came up with many revisions to our program. Some of these changes include: more academic tracks, new core courses, modification of introductory lectures and labs, and new course offerings to meet future student needs. We also discussed how to better interact with the MES program and to deliver a geospatial certificate program. The review of the department led us to discuss assessment and assessment tools, and one department committee is now examining assessment tools and learning outcomes. In January we held a retreat to finalize the changes to the department. Below, are some of the changes that the department agreed upon at the retreat:

1) Change in the department’s mission statement and goals

2) Remove outdated courses and change the major core offerings

3) Add two new core courses

4) Set standards for the numbering of courses

5) Direct an examination of geospatial offerings

The Geology Department takes pride in the high quality of instruction that our faculty deliver to majors and non-majors alike. Through peer review, classroom observation, and pedagogical discussions, all roster faculty and adjuncts are very conscious of the fact that excellence is demanded of them in the classroom.

As a result of our discussions, the department has made a number of curricular changes that will come into effect in the next year. We are completely reorganizing our general education offerings to allow more flexibility in the lecture and more hands-on, discovery activities in the lab. These changes will help us to better fulfill the goals of the College and the department. We are also developing new courses on the history and cause of natural global changes and how global change may enhance certain geologic
hazards. We are going to offer a new course in applied aquatic geochemistry and hydrology. There is a growing need for the department to be more involved in science education, and we are exploring how we can meet the needs of in-service and pre-service classroom teachers. A subset of the department is examining the possibility of developing graduate certificate programs such as geospatial studies and natural hazards.

**Geology - BS**

**Assessment Report Summary**

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The Geology Department takes pride in the high quality of instruction that our faculty deliver to majors and non-majors alike. Through peer review, classroom observation, and pedagogical discussions, all roster faculty and adjuncts are very conscious of the fact that excellence is demanded of them in the classroom.

As a result of our discussions, the department has made a number of curricular changes that will come into effect in the next year. We are completely reorganizing our general education offerings to allow more flexibility in the lecture and more hands-on, discovery activities in the lab. These changes will help us to better fulfill the goals of the College and the department. We are also developing new courses on the history and cause of natural global changes and how global change may enhance certain geologic hazards. We are going to offer a new course in applied aquatic geochemistry and hydrology. There is a growing need for the department to be more involved in science education, and we are exploring how we can meet the needs of in-service and pre-service classroom teachers. A subset of the department is examining the possibility of developing graduate certificate programs such as geospatial studies and natural hazards.

Mathematics

Mathematics - BA

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).

Over the past few assessment cycles, there have been either no students or at most two available for assessment. We've assessed the available students, but the pressing concern is not the performance of the available sample, but instead the failure of the program to attract students.
Closing The Loop (kind of).

As a result of the previous cycles of assessment, where no students were identified in the program, and the FY 2016 assessment where only two students were identified in the program, the Departmental Assessment Committee and the Department of Mathematics decided to revisit the Bachelor of Arts degree in Mathematics and either revise the degree program with the intent of attracting more students, or to close the BA program and focus entirely on the BS program.

Over summer 2016, the Department Chair, in consultation with faculty, will develop a draft revision of the B.A. program in mathematics with the intention and design of a program that will be more attractive as a second major for those in science majors, based on the following analysis.

The B.A. program in mathematics was designed as a 36 hour mathematics major in contrast to the 46 hour B.S. program, with the intention of attracting science majors to a second major in mathematics with a reduced number of hours required for the degree. The B.A. program in its current configuration is for the most part a subset of the Pure track within the B.S. program. As a result, the primary focus is on theory courses and the primary assessment tools rely on proof writing. However, the mathematics courses taken by science majors are for the most part what would fall into the category of applied mathematics courses, such as the calculus sequence, linear algebra, differential equations, and discrete structures. Hence, reconfiguring the B.A. program as a subset of the Applied track within the B.S. program is likely to attract more science majors to a second major in mathematics through a B.A. option.

A draft plan will be developed this summer 2016 and will be presented to the Department of Mathematics faculty in the fall, with a proposal to either change the focus of the B.A. from pure to applied or to remove the B.A. degree program.

Mathematics - BS/Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
Closing The Loop

As a result of FY 2016 assessment, the Departmental Assessment Committee and the Department of Mathematics has decided to revisit all five tracks to make sure that the tracks
are serving the educational needs of our students, as indicated by the low enrollments in some courses and the resulting lack or artifacts. Although we met our targets for all but 3 of thirty one measures for the five tracks, part of our track review will focus on how to strengthen these courses to better address the student learning outcomes.

For the B.S. program SLO 1, the results fell at the 75% benchmark for Measure 1.2 in the Applied Track. Based on the results for FY 16, in FY 17 the B.S. program in mathematics, after consultation with faculty on the assessment committee, the following strategies will be attempted to improve student learning on this measure: more emphasis will be placed on the notion of the use of differential equations as a means of modeling phenomena. In discussions with faculty it was determined that too often in homework and exams, the models are already given and the students are expected to use the models to answer questions. But more emphasis and opportunities for students to construct and use differential equations needs to be provided.

For the remaining tracks the benchmark of 75% for SLO 1 was significantly exceeded.

For the B.S. program SLO 2, the results fell well above the 75% point benchmark.

For the B.S. program SLO 3, the results fell significantly below the benchmark of 75% benchmark for Measure 3.2 in both the Statistics and Actuarial Tracks. Based on the results for FY 16, in FY 17 the B.S. program in mathematics, after consultation with faculty on the assessment committee and those directly involved in the those two statistics-based tracks, the following strategies will be attempted to improve student learning on this measure: more emphasis will be placed on theory and proof writing in both the Statistics and Actuarial Tracks, in particular in the Actuarial Track. Math 295, Introduction to Abstract Mathematics, is required of all tracks but the Actuarial Track. Math 295 is the transition course to proof writing. The only exposure Actuarial Track students have to proof writing is at the introductory level in Math 203, Linear Algebra, which from the results on SLO 3 appears to be insufficient. The two pronged strategy for improving student learning as it relates to SLO 3 will be first, to increase the emphasis on proof writing in Math 430, where Measure 3.2 is assessed for both tracks, and second to consider (as track modifications are considered) modifying the Actuarial Track to include Math 207, Discrete Structures I, where the logical structures of mathematical proofs and proof by induction are introduced and assessed.

Finally, the assessment plan for the BS degree was fundamentally changed for FY2016 in order to get a better profile of how the learning outcomes are being address in each of the five tracks. We want this year to serve as a baseline for comparison and plan to keep with this plan for at least another two or three years.

Physics and Astronomy

Physics and Astronomy Program Improvement Summary and Impact Report 2014-15

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
Astronomy - BA/Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
During FY16, the current assessment year, there were no BA Astronomy students to assess in the relevant courses.

Astrophysics - BS

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
The number of evaluated students was too small to provide rigorous data and enable meaningful conclusions. It is recommended that data from future years be combined with that of the current year and past years in order to accrue a statistically meaningful sample of results.
Recommendations from previous years included (1) using a larger sample of relevant assignments to assess and (2) combining the given data with that of future years. Recommendation (1) was carried out. Recommendation (2) could only be carried out in a partial fashion since many evaluation procedures were changed, in part because of Recommendation (1).
Attached are the minutes from the May 2016 department retreat, where assessment results were discussed, as well as the minutes from previous meetings where assessment was reviewed and discussed.

Biomedical Physics - Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
There are just a couple of interdisciplinary minors at the College of Charleston and Biomedical Physics (BMPH) is one of the very challenging. At the same time, the minor prepares the students for a rewarding career in biomedical field. We believe that the core courses of this BMPH, i.e. PHYS 203 Physics and Medicine and PHYS 396 Biophysical Modeling of
Excitable Cells, served very well the set goals and measures for this program.

**Specific Recommendations for each Student Learning Outcome (SLO)**

**SLO 1. Conceptual Understanding of Biophysical Processes.** Based on 2015-2015 assessment data for BIOL 396/PHYS 396, we recommend adding more conceptual questions and practice more concept questions during the lecture and review sessions to make sure all students have a solid understanding of biophysics. To improve the results, also include concept questions within homework assignments.

Student surveys across multiple years showed that they asked for a separate 1-credit hour lab component in BIOL 396/PHYS 396 that covers only computational modeling of biophysical processes. This curriculum change, if deemed appropriate and feasible, might also improve student conceptual understanding in BIOL 396/PHYS 396 and is consistent with other upper division and demanding courses both in Physics and Biology departments.

**SLO 2. Problem Solving Skills in Biomedical Physics.** It would be helpful to have more quantitative problems that involve both calculating the actual result and the appropriate units through dimensional analysis. During 2015-2016 assessment of BIOL 396/PHYS 396, we identified that students have troubles carrying out explicit, step-by-step, calculations and dimensional analysis. Therefore, it would be recommended to continue solving more problems in class and during the review sessions. It would also be helpful for this core course (PHYS 396) if the students would come from the introductory/general physics courses with more examples of dimensional analysis.

Similar to SLO1, a potential benefic influence might have the addition of a separate 1-credit hour lab component in BIOL 396/PHYS 396 that covers only computational modeling of biophysical processes.

**SLO 3. Computational Skills in Biomedical Physics.** BIOL 396 / PHYS 396 stimulates and challenges students to go outside their comfort zone and learn how to read and implement in a computer code differential (rate) equations that mimic the activity of excitable cells. Consistent with previous years' assessments, we found that the way BIOL 396/PHYS 396 curriculum is organized and taught does not need computer science (CS) prerequisites and we were right not to require CS for this course since the focus is not on computer programming, but rather on simulating biological phenomena.

The evaluation criteria showed that the students are well-versed in connecting mathematical equations with the corresponding computer code. Regardless of whether other courses could do and without increasing the numbers of pre-requisites for this class, we recommend focusing a lecture or two on some best practice strategies in programming.

**General/Curricular Recommendations**

1. A survey conducted across multiple years showed that students who took this BIOL 396/PHYS 396 recommend introducing a separate one credit computational component to accompany the existing 3-credit lecture.
2. Aside from specific recommendation for BIOL 396/PHYS 396, we recommend carrying out the assessment on the other core course PHYS 203 Physics and Medicine. For the last three years, all assessment results regarding Biomedical Physics Minor are based only BIOL 396 /PHYS 396. Although the course is critical for the interdisciplinary nature of this minor, it remains only one data point and may not reflect the actual state of the minor.

**Caveats.** The population size of this class (n = 10) is small and, therefore, the fluctuations could be significant. For a usual 95% confidence interval in our population standard deviation (std. dev.) with n =
10, the error in estimation the std. dev. is 40%. The estimation error of std. dev. decreases somewhat, but very slowly, by increasing the population (class) size. For example, the error on std. dev. estimation is 40% for n = 10, 30% for n = 20, and 20% for n = 47. Therefore, for upper-division classes with a typical enrolment below 20 students the error in estimating the std. dev. from the population scores is higher than 30%.

Meteorology - Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
There were no students in appropriate courses enrolled in the meteorology minor program to assess in 2015-16.

Physics - BA/Minor

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
We always get very few students in our Physics BA. Because of small number statistics, it would be unwise to introduce large changes into our existing assessment plans. Our recommendation is to gather more data over the next year to determine whether or not these results are a statistical aberration or whether they indicate a trend that should be addressed. However, in consultation with the department, we may consider raising the benchmark to a better standard if the performance is already met.

Physics - BS

Assessment Report Summary

7. Summary of Assessment Results with Focus on Program Improvement: Describe evidence-based changes that have taken place within the last few assessment cycles because of assessment. Statements must be supported by evidence from the assessment report(s).
Over the past cycle, our department has implemented the following changes based on the evidence from previous assessment reports:

1. As part of our senior research class (PHYS 419), our Department has given the Physics Major Field
Test to our students in order to obtain further feedback on the strengths and weaknesses of our curriculum. We have continued to collect this data to aid in our program.

2. In order to improve the computational skills of our students, we have implemented more computational assignments throughout our curriculum, particularly in PHYS 230, PHYS 403, PHYS 405, and PHYS 409. In each of these courses, new computational skills are developed and assessed.

3. In order to improve the mathematical skills of our students (along with their applications to physics), the Department has introduced a new course - PHYS 272: Methods of Applied Physics. We are currently collecting data in the hopes of tracking student improvement in the upper level physics major courses.

4. In order to improve our students' scores on the GRE physics exam (for students interested in graduate school), our Department has introduced a Special Topics course which serves as a GRE physics preparatory course.

We will further discuss our findings with the department. In those cases in which the performance targets are met, we will consider raising the benchmark to a better standard.