School of Sciences and Mathematics

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):

Outcome 1 Having assessed these measures for several years we are transitioning away from assessment of high impact courses only as undergraduate research and will be adding other courses such as internship and field courses.

Outcome 2 With budget cuts it has not been possible to reach our targets but we will continue to assess our instruction in General Education courses.

Outcome 3 Enhanced safety efforts continue and we will strive for improvement.

Outcome 4 Pre-Professional students in the health sciences continue to have impressive acceptance rates. We will further enhance our efforts in order to increase the number of acceptances.

Outcome 5 With the re-opening of the Rita Hollings Science Center we hope to improve our outreach offerings.

Outcome 6 With the re-opening of the Rita Hollings Science Center we hope to improve our research efforts in PHYS/ASTR and BIOL.

Biology - BA/Minor

BA Biology Assessment 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):

For the BA in Biology, with the exception of student assessment of rigor (Outcome 2, Measure 2), we failed to meet any of our Core Concepts and Competencies targets for either the Foundation Sequence (Outcome 1) or Programmatic Improvement (Outcome 2). These results stand in stark contrast to 2015-2016, when all targets were met for these Outcomes. For Science Communication (Outcome 3), we met our target for Measure 2, but failed to accurately implement our assessment plan for Measure 1.

With only 2 years of data (some of which based on limited sample sizes), it is not possible to determine whether the current failure to meet these targets reflects a trend or stochastic variation; thus no curricular changes are planned until at least one more year of data can be collected. A secure website accessible to all roster faculty in the Biology Department is being developed to house these (as well as previous and future) results, to allow for more informed discussions of possible revisions to the BA curriculum over the coming years.

The implementation of Outcome 2, Measure 1 (percentile increase in overall MFT scores between the end of the Foundation Sequence and graduation) continues to be problematic: as the BA in Biology does not have a capstone course, there is no “captive audience” from which we can obtain a random sample of graduating seniors. Strategies for obtaining a larger random sample of BA Biology graduating seniors in 2017-2018 are currently being developed.

Assessment in the Biology Department has traditionally been done by a committee whose membership changes with each academic year. Such turnover in those responsible likely increases the risk of errors in implementing the assessment plan, as occurred this year with Outcome 3, Measure 1. To provide better continuity between years, the Associate Chair (currently Assessment Committee Chair) will assume the duties of the Assessment Committee.

Biology - BS

BS Biology Assessment 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):
For the BS in Biology, with the exception of student assessment of rigor (Outcome 2, Measure 2), we failed to meet any of our Core Concepts and Competencies targets for either the Foundation Sequence (Outcome 1) or Programmatic Improvement (Outcome 2). These results stand in stark contrast to 2015-2016, when nearly all targets were met for these Outcomes. (In 2015-2016, the target for Outcome 2, Measure 2 (student assessment of rigor) was not met. Although it was met in 2016-2017, the wording of this question also changed, so it is not possible to directly compare these results). For Science Communication (Outcome 3), we also failed to meet our target for Measure 2, and failed to accurately implement our assessment plan for Measure 1.

With only 2 years of data (some of which based on limited sample sizes), it is not possible to determine whether the current failure to meet these targets reflects a trend or stochastic variation; thus no curricular changes are planned until at least one more year of data can be collected. A secure website accessible to all roster faculty in the Biology Department is being developed to house these (as well as previous and future) results, to allow for more informed discussions of possible revisions to the BS curriculum over the coming years.

The implementation of Outcome 2, Measure 1 (percentile increase in overall MFT scores between the end of the Foundation Sequence and graduation) continues to be problematic: as the BS in Biology does not have a capstone course, there is no “captive audience” from which we can obtain a random sample of graduating seniors. Strategies for obtaining a larger random sample of BS Biology graduating seniors in 2017-2018 are currently being developed.

Assessment in the Biology Department has traditionally been done by a committee whose membership changes with each academic year. Such turnover in those responsible likely increases the risk of errors in implementing the assessment plan, as occurred this year with Outcome 3, Measure 1. To provide better continuity between years, the Associate Chair (currently Assessment Committee Chair) will assume the duties of the Assessment Committee.

### Marine Biology - BS

#### BS Marine Biology Assessment 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):

For the BS in Marine Biology, we failed to meet either of our Core Concepts and Competencies targets for the Foundation Sequence (Outcome 1), and while we met one of our targets for Programmatic Improvement (Outcome 2, Measure 1), these results were based on only 2 graduating seniors. We met our target for student presentation of research (Outcome 3: Science Communication, Measure 2), but failed to accurately implement the assessment plan for Outcome 2, Measure 2, or Outcome 3, Measure 1.

With only 2 years of data (some of which based on highly limited sample sizes), it is not possible to determine whether the current failure to meet these targets reflects a trend or stochastic variation; thus no curricular changes are planned until additional data can be collected. A secure website accessible to all roster faculty in the Biology Department is being developed to house these (as well as previous and future) results, to allow for more informed discussions of possible revisions to the BS Marine Biology curriculum over the coming years.

The implementation of both measure for Outcome 2 (Programmatic Improvement) continues to be problematic: as the BS in Marine Biology does not have a capstone course, there is no “captive audience” from which we can obtain a random sample of graduating seniors for either the MFT or the supplementary exam. Strategies for obtaining a larger random sample of BS Marine Biology graduating seniors in 2017-2018 are currently being developed.

Faculty teaching required courses in the Marine Biology curriculum will be recruited to review and generate questions for the supplementary exam; in future years, these questions will be added as “cohort-specific questions” to the MFT so that a separate exam does not have to be given.

Assessment in the Biology Department has traditionally been done by a committee whose membership changes with each academic year. Such turnover in those responsible likely increases the risk of errors in implementing the assessment plan, as occurred this year with Outcome 2, Measure 2, and Outcome 3, Measure 1. To provide better continuity between years, the Associate Chair (currently Assessment Committee Chair) will assume the duties of the Assessment Committee.

### 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):

Program Modifications rooted in Assessment

This summary covers improvements related to BS Chemistry, BA Chemistry and BS Biochemistry that were implemented as a result of assessment.

General Chemistry

LearnSmart Prep: To improve retention between classes and to review math concepts, the Department has implemented mandatory online reviews that are best completed prior to the start of the semester. We implemented it first in Chem 111 and noticed an improvement in ACS exam scores and improved DWF rates in the course. We then added it to Chem 112. Again, we observed an improvement. We then launched a review program for organic, making it optional. We are still continuing to add improvements to this process.

Research based Chem 112L: Implementation of a research-based lab was a planned grant activity for the College’s 2012 HHMI grant. Dr. Wendy Cory designed a 112L curriculum based on her research. This plan was a result of many years of discussion about how best to interest students in the lab program early in their career. The plan also follows national trends in STEM education—implementation of CURE (Classroom-based Undergraduate Research Experiences). After extensive reflection during a faculty retreat in August 2015 retreat, we ranked learning outcomes from the national CURE survey as to their importance in both our lower and upper level courses during our August 2016 retreat. This discussion led to increased support for the new Chem 112L format and we agreed to launch it fully in Fall 2015/Spring 2016. The lab has been running since Spring 2015 (1 section) and was fully implemented in Fall 2015. Student surveys indicate that they like the new format and are challenged by it. Students also learn about scientific writing in this course, as their final project is to turn in a ACS-style paper. This was another goal of the department—to implement more writing.

 Modifications to Honors General Chemistry: 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, 1-2-1 refers to a non-traditional sequence of one semester of general chemistry, followed by two semesters of organic chemistry, and a final semester of general chemistry. 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 (Chem 111/Chem 112/Chem 231/Chem 232). One drawback of the new sequence is that Honors students cannot take another key course in the curriculum, Chem 220, until their junior year (Chem 112 or HONS 294 is a pre-requisite). This then delays their ability to take Physical Chemistry as well, since Physical Chemistry has a Chem 220 pre-requisite. Another development since 2011 is that the MCAT has been modified to include topics in biochemistry; to be fully prepared for the MCAT biochemistry coverage, CoC students should be taking the full year of biochemistry (which requires a full year of organic as a pre-requisite). Another issue with the new sequence is that there is a substantial student attrition by HONS 294. Some of this is due to students deciding to not be a science major, but many of the Honors students are simply going back to take Chem 112 instead of the equivalent (at least in topic coverage) HONS 294. It is difficult for us to continue justifying offering HONS 294 and HONS 294L to under a dozen students when Chem 112 lectures and labs are oversubscribed.

Because of the rigor of organic chemistry and because this challenging course is now occurring in freshmen year, the Honors College has been placing only highly qualified students into the Honors chemistry sequence. Students typically have to be enrolled in calculus or beyond, have two years of high school chemistry and/or AP credit for chemistry (which they decline to enroll in the sequence). The students in HONS 191 perform at a very high level, as evidenced by standardized exam scores used in both Chem 111 and HONS 191. The average score for Chem 111 students on the ACS (American Chemical Society) standardized exam is between 90th-95th percentile whereas the HONS 191 students score in the 90th percentile nationwide. To give you an idea of the caliber of students selected to participate, both of the College’s prestigious Goldwater Scholarship recipients were graduates of our 1-2-1 sequence and opted to become biochemistry/chemistry majors BECAUSE of this sequence.

This year, we replaced HONS 191/191L and HONS 294/294L with a single 5-credit course, HONS 190 (4) -HONS 190L (1). Instead of a 1-2-1 sequence, these very capable Honors students now take an accelerated general chemistry course that covers most of the material traditionally covered in Chem 111/Chem 112, in a single 5-credit lecture/lab combination spanning one semester. We call the new Honors sequence “Super 1-2”. Such accelerated, condensed general chemistry courses are common at other universities for elite students and in fact used to be offered at CoC twenty-plus years ago. We feel that the Honors students are of sufficiently high caliber and the Honors program is sufficiently diligent with placement to make this a true Honors course, one that eliminates the slow monotonous repetition of high school chemistry most of these students have already mastered.

Organic Chemistry:

Organic Chemistry is one of the more challenging courses for both chemistry/biochemistry majors and for the many biology students who must take the course as part of their major curriculum. It has a terrible reputation and we have been working to improve the DWF rate in this course.

First, we have implemented an online review module that has thus far been optional in Chem 231 and Chem 232. Second, we have created our own peer mentor program. Running peer help through our department eliminated hours of commitment from student leaders and we were able to get chemistry/biochemistry majors to participate. Most were shying away from SI. Third, we introduced an accelerated general chemistry course that allows Honors students to take Organic Chemistry early (2nd semester of freshman year) and to take organic with all the general chemistry
topics covered. Last, we introduced a special topics class, Prep for Organic Chemistry. The course was offered either as an Express II class or in Maymester. Express II classes allow students to withdraw from Chem 231 if they are doing poorly and add in the Express class. We allowed students who did this to stay enrolled in the lab (normally they must drop both lecture and lab). We hope that this course will help end the repeated cycling of failing/withdrawing, re-enrolling and then failing and withdrawing again.

Physical Chemistry:

The department modified its curriculum (BA, BS Bioc, BS Chem) to include a new math course, Math 229. The idea for Math 229 came from many discussions at retreats about the math prep for physical chemistry. Students had complained for years that they were not prepared mathematically for PChem. The 2015-16 school year was the first year that we had a substantial number of students enrolled in Chem 341 and Chem 342 who had also taken Math 229, so we have been comparing the students’ success in physical chemistry as a function of their math preparation. Early data indicate that students with Math 229 (or the alternatively approved three-semester Calculus) scored better grades in both Chem 341 and Chem 342.

Math 229 and Physical Chemistry Scores

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Research

The Department has repeatedly noted the strong effect of research on a student’s ability to communicate, to write, and to retain chemical content knowledge (for example, better performance on the MFT). Through assessment of these effects, we have introduced a Research Rotation to try to encourage more students to pursue research while an undergraduate. We also made research courses an option to fulfill lab credit hours needed for graduation for the revamped biochemistry major.

Inorganic, Biochemistry, Analytical

As a result of a departmental retreat in 2016, there was substantial agreement that we needed to have students write more and to be exposed to current tools of research (Excel, Protein Viewers, Bioinformatics, etc.) The inorganic, biochemistry and analytical chemists all introduced new assignments or modified existing assignments to emphasize writing and computational skills.

Chemistry - BA/Minor

Assessment Report Summary

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Math 229 and Physical Chemistry Scores
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**Inorganic, Biochemistry, Analytical**

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## Chemistry - BS

### Assessment Report Summary: Chemistry - BS

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**Computer Information Systems - BS/Minor**

**Assessment Report Summary**

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**Student Learning Outcome 1:**

and

**Student Learning Outcome 2:**

Results were mixed in 2016-2017. These outcomes (which are both new outcomes established at the previous retreat) will be assessed again in 2017-2018 in the same courses. In these two courses, the pre-reqs have changed this year. So, this timing presents us with a unique opportunity to re-assess the outcomes in the same courses to determine if altering the pre-requisites on these courses introduced a negative (or positive) impact to the students.

**Student Learning Outcome 3:**

In the case of CSCI 459, under a tenure track professor, the rigor of the assessment instruments will be increased and reassessed when the course is offered again in Spring 2018. And in DSCI 320, we were unable to get a response from the instructors teaching this course which is in another department in 2016-2017. The professors were contacting during the summer. We will try to contact the professors earlier in the semester during academic year 2018 to get data.

**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):

For outcomes 1 and 2, these were satisfactorily assessed with a good variation of upper-level required courses and no recommendation for change are being made.

**For outcome 3 (ABET 4-e - Function on teams):** In 2015-16 this was evaluated for the BS-CS program rather than for the BA-CS, but nevertheless we use the findings from that report to make comparisons for 2016-17. In the summary report for the BS-CS we noted: CSCI 360: “No changes planned for this outcome at this time as the data collected showed improvement from the time of the last assessment. The new data will be used as the baseline the next time this outcome is assessed.” For the current review of the BA-CS, the course CSCI 362 (a required course in the BA-CS program) replaced CSCI 360 (an elective in the BA-CS program) for assessment. For assessment purposes, this was a good decision as CSCI 360 did not involve team work in the 2016-17 offering. Moreover had CSCI 360 been used for the 2016-17 assessment the outcome would have been only weakly satisfied.

CSCI 462: “The next time CSCI 462 is taught all efforts will be made to limit group size to 3.” This information was not made available in the assessment data provided, however both sections of CSCI 462 that were offered in 2016-17 did well with respect to this outcome, hence there is not need for changes to the course concerning the course outcomes that contribute to this program outcome.

**For outcome 4 (ABET 5 - Legal and Ethical Principles):** In 2015-16 this was evaluated for the BA-CS program and used CSCI 392 and CSCI 462 as the basis for two measures. Since CSCI 392 is not required in the BA-CS program, this measure was not used in 2016-17, and CSCI 362 was used in its place and made a noteworthy contribution to the program outcome, although almost certainly not as strongly as CSCI 392, which has legal and ethical principles as a main focus. As far as CSCI 462 is concerned, in the 2015-16 summary report we noted that “when 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." Unfortunately this was not done at all in one of the sections, but in the second section, taught by a different instructor, this was done satisfactorily through blogs. This course must continue to work to improve its handling of the course outcome for this program outcome more uniformly.

For outcome 5 (ABET 6 - Communicate Effectively): In 2015-16 this was evaluated for the BS-CS program rather than for the BA-CS, but nevertheless we use the findings from that report to make comparisons for 2016-17. In 2016-17 data from the courses CSCI 360 and CSCI 462 were used and the students performed strongly with respect to this requirement. For the current review of the BA-CS, once again CSCI 362 replaced CSCI 360 for assessment. Once again, for assessment purposes, this was a good decision as CSCI 360 did not indicate that any oral or written communications activities were required of the students in the 2016-17 offering. Moreover had just CSCI 360 and CSCI 462 been used for the 2016-17 assessment the outcome would not have been only satisfied as one of the sections of CSCI 462 only weakly satisfied this program outcome (although for unusual circumstances). The 2016-17 measures should be satisfactory for the future, and no recommendations for improvement are being made here.

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).

For a summary of findings from the 2016-17 assessment, please see the document

"Program Outcomes Assessment Report 2016-17-BSCS.pdf"

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).

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 achievement stayed the same or improved in rubrics A and B over the previous year, but this year the sample size was small (N=4). Last year there were 10 graduates. I am not sure why the up and down graduate rate, but currently the program is over 40 majors, which is a healthy number. The capstone assessment identified the biggest areas in need of improvement. These will be focused on selecting more suitable projects for the data students; however, the small sample size limits our ability to extract significant quantitative meaning from the results.

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).

Geology - 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).

Grice Marine Laboratory
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):

As a facility our goals are different from those of programs. The mission of Grice Marine Lab is to support activities of faculty, staff, and students in education, research, and outreach. Currently our support for the use of boats, the dormitory, and the Molecular Core Facility (MCF) is meeting the needs of facility users, as demonstrated by boats being available on all days they were needed; dormitory space being at full or close to full occupancy, with the ability to accommodate short term visitors; and MCF lab equipment being able to meet the current needs of users. Outreach activities are reaching thousands of local children. We have plans to improve in these areas by (1) purchasing upgraded equipment for the MCF as funds become available, (2) selling a boat that is currently part of our fleet but receives relatively little use and purchasing a new boat that will enhance the capabilities of our fleet, and (3) purchasing new microscope/video display equipment that will enhance our outreach presentation. We are also starting an online survey system that will allow us to collect data on the effectiveness of our outreach activities.

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 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.

A draft plan was developed over summer 2016 and was presented to the Department of Mathematics faculty in the fall, with a proposal to eliminate the B.A. degree program. The Department of Mathematics will formally discontinue the B.A. degree during 2017-18.

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: Actions Considered, Planned, Taken as a Result of FY 17 Assessment.

Assessment was conducted in late June and early July based on artifacts collected from Fall 2016 and Spring 2017 courses. The Department of Mathematics Assessment Committee does not meet over the summer, consequently the department will not officially consider FY 2017 assessment results until August, 2017. However, as chair I am evaluating the assessment results and preparing recommendations to align with ongoing actions taken as a result of FY 16 assessment.

As a result of the FY-2016 report, and the failure to reach 75% of students meeting or exceeding expectations, I increased emphasis on proof writing in Math 311, Advanced Calculus I and discussed with those who teach Math 340 and 430 to do the same. As a result, the percentage of students meeting or exceeding expectations from FY 2016 to FY 2017 went from 68% to 88%.

Regardless of what transpires from the Department of Mathematics Committee on Assessment meeting, I will have a similar conversation with those teaching Math 245, 323 and 470 regarding modeling and applying models, relating to measures 1.2 and 2.2, the two measures that fell below 75% for the FY 2017 report, and after the FY-2018 program assessment results are in, I will look for the impact of those conversations on improvement for those two measures.

On Wednesday, August 16, 2017, the Department of Mathematics Committee on Assessment met to discuss the results of FY 2017 assessment of the B.S. program in mathematics. The population sizes for the individual measures in the separate tracks were small, ranging from 0 to 9, with a median of 2. Small populations result in greater variation. Out of 31 individual measures spread over 5 tracks, the results in six failed to meet minimum expectations: two at the “Introductory” level and four at the “Emphasize” level (none failed at the “Reinforce” level).

These failures to meet expectations occurred for Measure 3.1/I in the Pure Track, for Measures 1.2/E and 2.2/E in the Applied Track, for Measure 3.1/I in the Statistics Track and for Measures 1.2/E and 2.2/E in the Actuarial Track. Whereas the FY 2016 failures to meet expectations occurred for Measure 2.2/E in the Pure Track, 3.2/R in the Statistics Track and 3.2/R in the Actuarial Track. Note
that none of the failed measures from FY 2016 recurred in FY 2017 for the respective tracks. This is likely the result of high levels of variation caused by small population sizes. The Committee decided to continue with the effort began last year to redesign the tracks in the B.S. program. Courses will be chosen for those redesigned tracks with an eye to providing enhancements of the student learning outcomes and better measures for those outcomes. With redesigned tracks and changes to the curriculum that populate those tracks, a new curriculum map will likely be necessary.

By continuing the FY 2016 and FY 2017 assessment plan for one more year, when FY 2018 reporting occurs, at the end the population sizes can be aggregated over the three years for each of the measures in the respective tracks, this way increasing the population sizes over a linear time period, resulting in more reliable data.

Consequently, the FY 2018 mathematics program assessment plan, due September 1, 2017, will maintain its Student Learning Outcomes, Measures and Curriculum Map in order to add another year of data to compare with the FY 16 and FY 17 reports.

Anticipating changes to the B.S. program and elimination of the B.A. program and depending on the results of the FY 18 program assessment, the FY 19 plan will likely change.

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).

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).

SLO-1: Based on the 2016-17 data, students did relatively well in the conceptual understanding part and we will continue to gather data to see if a trend develops. As in Physics, in addition to final exam, conceptual data may be also collected in in-class quizzes and homework assignments. It has been recommended to practice more conceptual questions during the lecture and review sessions.

SLO-2: Astrophysics majors did really well in computational projects and numerical problem solving. Because this is the first year of taking data for these outcomes, our intention is to continue to take data until a trend is established.

SLO-3: An average number of 6.5 students (out of 10) met the target. Because this is the first year for taking data for this outcome, we will continue to take data in order to detect trends within the program. As suggested by the department, the same faculty will be teaching this class during 2017-18 academic year.

SLO-4: Undergraduate research is one of the highlights of the department. It is obvious from the data that 100% of our students met the bench mark in this category. This is consistent with the results from the previous year, which indicates that students have developed (through undergraduate research) techniques and methodologies to collect/produce data as well as to analyze and interpret it. Our recommendation is to increase the benchmark from 80% student success to 85% student success.

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 minor, i.e. PHYS 203 Physics and Medicine and BIOL 396/PHYS 396 Biophysical Modeling of Excitable Cells, served very well the set goals and measures for this program.

We collected assessment data only for the last four years. However, the structure of the assessment measures changed in 2015. As a result, at this time we only have to data points (2015-2016 and 2016-2017) to compare with the same set of measures.
With this caveat, we notice that the class average improved for SLO1 (Conceptual Understanding). This could be the result of curricular changes we implemented based on annual recommendations.

There is a slight decline in class average for SLO2 (Problem solving skills), although the annual averages are within one standard deviation of each other, which may suggest that the fluctuation is not significant. Although we followed the recommendations from the assessment program, the stagnant average class score may indicate that with the allocated resources we reached the optimum score. It may be that a long-overdue curricular change requested by students - the addition of a separate laboratory component for this lecture - could hold the key for further improvement.

There is a slight increase in performance for SLO3 (Computational skills), with averages again within one standard deviation which may not be a statistically significant progress. Again, the same recommendation - the addition of a separate laboratory component for this lecture - could hold the key for further improvement.

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Specific Recommendations for each Student Learning Outcome (SLO)

SLO 1. Conceptual Understanding of Biophysical Processes. Based on 2016-2017 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 in 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 2016-2017 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 simulates 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.

**Meteorology - 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):

There were no students enrolled in the BA in Meteorology program in 2017-18.

**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):

Because of small number statistics, it would be unwise to draw any significant conclusions from the data. We will continue to take data until a trend is established.

**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):

SLO-1: Based on the 2016-17 data, less than half of the students failed to reach the benchmark for this outcome. It is apparent that more effort needs to be put in order to make sure all students have a solid understanding of the basic ideas of modern physics. During the faculty meeting, it was noted that collecting data in the final exam may not be a good option considering the high level of stress on students at the end of the semester. In addition to collecting data in the in-class quizzes, the department also mentioned using homework assignments as a possible way to perform our assessment of SLO-1. It has been suggested that discussing the results with faculty scheduled to teach that class, especially in the fall semester of 2018, is expected to improve the situation because he/she can come up with specific strategies to reinforce those topics (particularly special relativity) further in class.

SLO-2: Although the students did relatively well in computational projects, the numerical skills need further improvement. To improve the mathematical skills of our students, the Department continues to offer PHYS 272 (Methods of Applied Physics) and continues to collect data in the hopes of tracking student improvement in the upper level physics major courses.
SLO-3: approximately 95% of students met the benchmark. The Department will continue to emphasize technical writing in the upper division courses, such as PHYS 405 (Thermal Physics) and PHYS 409 (Electricity and Magnetism). Our recommendation is to increase the benchmark from 80% student success to 85% student success.

SLO-4: Undergraduate research is one of the highlights of the department. It is obvious from the data that approximately 85% of our students met the benchmark in this category. This is consistent with the results from the previous year, which indicates that students have developed (through undergraduate research) techniques and methodologies to collect/produce data as well as to analyze and interpret it. Our recommendation is to increase the benchmark from 80% student success to 85% student success.