**2019-2020 Annual Program Assessment Report Guide**

Please submit your report to your department chair or program coordinator, the Associate Dean and Dean of your College, and to james.solomon@csun.edu, Director of the Office of Academic Assessment and Program Review, by **September 30, 2020**. You may, but are not required to, submit a separate report for each program, including graduate degree programs, which conducted assessment activities, or you may combine programs in a single report. **Please include this form with your report in the same file and identify your department/program in the file name. Please do not change the date on the form, and be sure to check that your report is ADA accessible.**

**College: Science and Mathematics**

**Department: Chemistry and Biochemistry**

**Program: BA/BS/MS Chemistry; BS/MS Biochemistry**

**Assessment liaison: Thomas Minehan**

1. **Please check off whichever is applicable:**

**A. \_\_√\_\_\_\_\_ Measured student work within program major/options.**

**B. \_\_√\_\_\_\_\_ Analyzed results of measurement within program major/options.**

**C. \_\_\_\_\_\_\_\_ Applied results of analysis to program review/curriculum/review/revision major/options.**

**D. \_\_\_\_\_\_\_\_\_ Participated in the 2019-20 assessment of General Education Section D: Social Sciences and U.S. History and Government student learning outcomes**

1. **Overview of Annual Assessment Project(s).** On a separate sheet,provide a brief overview of this year’s assessment activities, including:
* an explanation for why your department chose the assessment activities (measurement, analysis, application, or GE assessment) that it enacted
* if your department implemented assessment **option A**, identify which program SLOs were assessed (please identify the SLOs in full), in which classes and/or contexts, what assessment instruments were used and the methodology employed, the resulting scores, and the relation between this year’s measure of student work and that of past years: (include as an appendix any and all relevant materials that you wish to include)
* if your department implemented assessment **option B**, identify what conclusions were drawn from the analysis of measured results, what changes to the program were planned in response, and the relation between this year’s analyses and past and future assessment activities
* if your department implemented **option C**, identify the program modifications that were adopted, and the relation between program modifications and past and future assessment activities
* if your program implemented **option D**, exclusively or simultaneously with **options** **A, B, and/or C**, identify the GE learning outcomes assessed, the assessment instruments and methodology employed, and the resulting scores
* in what way(s) your assessment activities may reflect the university’s commitment to diversity in all its dimensions but especially with respect to underrepresented groups
* any other assessment-related information you wish to include: e.g. SLO revision (especially to ensure continuing alignment between program course offerings and both program and university student learning outcomes) and the creation or modification of new assessment instruments
1. **Preview of planned assessment activities for 2020-21.** Include a brief description as reflective of a continuous program of ongoing assessment.

**2. Overview of Annual Assessment Project(s).** Provide a brief overview of this year’s assessment activities.

**The following assessment activities took place this year:**

**•Measure Student Work (Option A)**

1. **Assess the effect of “innovative activities” implemented in Chem 100, Principles of Chemistry**
2. **Assess basic knowledge in biochemistry (SLO1) using standardized exam questions in course finals.**
3. **Assess students’ ability to keep a laboratory notebook in Chem 333L (Organic Chemistry I lab) and Chem 461L and Chem 462L (Biochemistry I and II labs).**
4. **Administered a signature assignment for longitudinal assessment of knowledge (SLO1) in gateway (Chem 321) and capstone (Chem 401) courses.**
5. **Assess graduate students’ scientific oral communication abilities in literature and thesis seminars, relevant to SLO2m: Organize and communicate scientific information clearly and concisely, both verbally and in writing**

**•Analyze Results of Measurement (Option B)**

1. **Analyze student performance data in Chem 100 after implementation of “innovative activities”**
2. **An analysis of student performance trends in biochemistry was undertaken.**
3. **Current student lab notebook performance was compared to previous assessments from several years ago**
4. **This year’s results for the signature assignment were reviewed.**
5. **Review evidence pertaining to SLO2m: Organize and communicate scientific information clearly and concisely, both verbally and in writing.**

**The department chose these activities so as to 1.) encourage faculty to continue doing assessment in their courses each year so as to identify trends over multiple semesters and weaknesses in student comprehension that need to be addressed at the individual course level and in the program as a whole, and 2.) move forward with our longitudinal assessment program, which has been attempting to verify value-added learning throughout the BA/BS Chemistry and BS Biochemistry programs.**

**A: Measure Student Work**

**SLO’s addressed: SLO 1: Assess basic knowledge in the following areas of chemistry: general chemistry and biochemistry, both at the individual course level and for the program as a whole.**

1. **Assess student engagement in Chemistry 100, Principles of Chemistry.**

**As is typical of GE courses in the college of Science and Mathematics, CHEM 100 is populated by both science (primarily STEM majors) and non-science majors. CHEM 100 has been identified as a gateway course for students because it is one of the top 10 classes with the highest DFW rates in the College of Science and Math and one of the 88 classes that contribute to 80% of DFUs in the first year at CSUN. Improving student success in Chem 100 is thus one of the primary goals of the Department of Chemistry and Biochemistry, in order to better serve and support our students and meet the targets of CSU’s Graduate Initiative 2025.**

**From last year’s assessment report, we analyzed data from the National Survey of Student Engagement (NSSE) of 1093 CHEM 100 students. The results showed that CHEM 100 students rated higher in the majority of learning activities at CSUN except for “*student-faculty interaction*” and “*quality of interactions*” as compared to national data. According to the multiple regression model, we learned that the “*Experiences with Faculty*” was the most impactful predictor of CHEM 100 students’ campus GPAs after controlling for student background variables. “*Experiences with Faculty*” contains two major items: *Student-Faculty Interaction* and *Effective Teaching Practices*. In light of the above results, the Department chair of Chemistry and Biochemistry and the course coordinator of Chem 100 worked with multiple parties on campus to redesign the CHEM 100 course to implement a series of innovative activities in the course in Spring 2020. These innovative activities included: (1) linking CHEM 100 students to special advising with the Graduation and Retention Advising Specialist from Dean’s office; (2) working with multiple tutoring centers and Chem 100 instructors to provide extra credit for students when they visit tutoring centers between midterm exams; (3) working with a Supplemental Instruction (SI) coordinator from the Learning Resource Center on campus and adding 3 sections of mandatory SI sections for one CHEM 100 class; (4) working with all CHEM 100 instructors to send early alert motivational messages via Canvas Insights to students; (5) implementing more active learning activities through in-class group activities or supplemental small group problem-solving sessions with peer-led facilitators; and (6) modifying course content and including all of the CHEM 100 instructors in writing the common cumulative final exam collaboratively.**

**B. Analysis of the Results of Measurement**

**f. The effects of the innovative activities implemented in CHEM 100 were assessed by student performance data collected from instructors and an end-of-semester online survey from CHEM 100 students in spring 2020.**

**For those students (N=58) who obtained 60% and lower on the first midterm exam, as compared to their counterparts (N=185), one-on-one special advising with the Graduation and Retention Advising Specialist from Dean’s office, together with visiting at least one tutoring center on campus to get extra credit points on the first exam, improved average course GPA (+0.4, half letter grade higher) and pass rate (+12%) substantially, with a smaller impact on the common final exam performance (+0.3%). The potential reasons could be that students studied harder between the first midterm exam and the second midterm exam, which might lead to better performance on the second midterm exam, or they may have studied harder to improve effort-based points in the course such as homework assignments (+4.9%), attendance, or other activities with points.**

**Compared to other students (N=143) who were taught by the same instructor, enrolling in mandatory SI sections (N=64) positively impacted student final exam scores (+1.1%), course GPA (+0.1), and pass rate (+1%); however, the impact was trivial. Surprisingly, students who enrolled in mandatory SI sections performed worse on homework assignments (-6.8%), which might be due to the fact that students completed more problems in the Mandatory SI sections with SI leaders, which may have led them to expend less effort in completing homework assignments. It is worth noting that for students who enrolled in mandatory SI sections and passed with credit (N=57), the positive impact of mandatory SI sections on student final exam scores (+2.2%), course GPA (+0.3), and pass rate (+5%) was more significant. Interestingly, enrolling in the voluntary SI section impacted students' performance substantially, with final exam scores (+3.3%), course GPA (+0.4), and pass rate (+13%) all improving. However, the sample size was small (N=16), and this result could be due to the fact that the students who enrolled in the voluntary SI section were much more motivated students.**

**CHEM 100 classes that had in-class group activities and supplemental sessions with peer-led facilitators showed a positive impact on student final exam scores (+1.3%), but not course GPA and pass rate. This may be due to the fact that all the collaborative problem-solving sessions had to change from face-to-face to online after spring break due to COVID-19. It took some time for instructors and SI leaders to learn how to implement these sessions online and students didn’t participant and engage in the collaborative sessions as the same level as the face-to-face sessions because of various reasons such as tech issues, distractions at home, and lower motivation for distance learning.**

**On average, the combinations of the innovative activities improved the average score of the CHEM 100 common final exam to 70%, and the DFW rate decreased to 20% in Spring 2020\*. Historically, the CHEM 100 averages for the common final exams have been in the 55% to 60% range, and the average DFW rate was about 40%. The differences in student performance on the common final exam and DFW rates between CHEM 100 classes taught by different instructors were also mitigated, resulting in more equitable outcomes across all CHEM 100 classes (12 classes, N=760 in Spring 2020). \* *Note: all the CHEM 100 instruction, assessments, special advising, mandatory SI sections, tutoring were changed to online after spring break due to COVID-19. Second midterm and common cumulative final exam were administered online via Canvas Quiz, which might be a confounding factor for the improved assessment results in Spring 2020.***

**Qualitative results from the end of semester survey showed that students hold very positive perceptions of the implemented innovative activities in CHEM 100. 46% of the CHEM 100 students (N= 349) responded to this survey. The average rating of all the implemented innovative activities was 4 (1 being extremely unhelpful, 5 being extremely helpful).**

* **Emerging themes for the early alert motivational messages include:**
	+ **Improved sense of belonging;**
	+ **Showed instructors’ care and understanding;**
	+ **Improved motivation and confidence;**
	+ **Increased self-reflection and study harder;**
	+ **Provided a higher awareness of future assignments and resources;**
	+ **Increased opportunities to seek more help**
* **Emerging themes for special advising include:**
	+ **Housing Insecurity**
	+ **Food Insecurity**
	+ **Loss of Financial Aid**
	+ **Working full-time (40+ hours) and full-time student**
	+ **Working 20+ hours, full-time student, and already feeling overwhelmed**
	+ **Scholarship Need**
	+ **Student wanting to change major/career path**
* **Emerging themes for the SI sections include:**
	+ **Review difficult topics in-depth**
	+ **More practice questions**
	+ **More comfortable to ask questions**
	+ **Practice exams and explanations**
	+ **SI leaders are knowledgeable and helpful**
	+ **Online learning is challenging**
* **Emerging themes for active learning activities include:**
	+ **More practice problems**
	+ **Better understanding of course topics**
	+ **Peer collaboration and learning**
	+ **Tighter bonds formed with classmates**
	+ **Sometimes students only work independently online**

**To summarize, the preliminary results show the promising effects of the combination of the implemented innovative activities in CHEM 100. Future assessment will examine the longitudinal effects of these activities and scale up the most effective activities to all CHEM 100 classes or potentially other lower-division courses such as General Chemistry I and General Chemistry II. Additionally, we also plan to examine whether these innovative activities have any impacts on closing equity gaps between student groups, especially between better-served and transitionally underserved students.**

**A: Measure Student Work**

**b. Assess basic knowledge in biochemistry (SLO1) using standardized embedded questions. Alignment with core competencies: critical thinking, quantitative literacy.**

**\*The 2003 ACS exam in biochemistry, which is utilized for the selected questions in the following assessments, has a 50th percentile national norm of 58%, which can be thought of as a general benchmark for performance in our biochemistry courses. Chem 464 is a one-semester course in biochemistry taken primarily by non-majors. In Fall 2019, 42 students in Chem 464 were administered 7 multiple-choice questions taken from the ACS standardized exam in biochemistry on their course final exam. The benchmark for success in this assessment was 4 or more questions correct out of 7 (57%), and the average score for Fall 2019 was 3.5/7 (50%). Of the 42 students who took the assessment, 18 (43%) got 4 or more questions correct out of 7. In another section of Fall 2019 Chem 464, ten questions taken from the American Chemical Society standardized exam in Biochemistry were administered to 34 students in a pre-­‐ assessment on the first day of class and in a post-assessment on their course final exam. The benchmark for success in these assessments was 60% (6 or more questions correct out of 10). In Fall 2019, the fraction of students that achieved the benchmark level was 3% in the pre-assessment and 41% in the post-assessment. The percentage of students who improved their score (by >10%) between pre-­‐and post-­‐ assessment was 75%. In spring 2020, another Chem 464 instructor gave a 5-question quiz on the first day of class and then included the same questions again on the course final exam (27 students). At the start of the semester, the students scored an average of 1.5/5 on the initial assessment, but on the final exam the average score for these questions improved to 3.3/5 (66%). This improvement parallels what was seen in previous semesters for this assessment (despite the interruption of face-to-face instruction in Spring 2020 caused by Covid-19)**

**Chem 461 is the first-semester of a two-semester biochemistry course (Chem 461 and Chem 462) taken by biochemistry majors. In Fall 2019, 37 students in Chem 461 were administered 8 multiple-choice questions taken from the ACS standardized exam in biochemistry on their course final exam. The benchmark for success in this assessment is obtaining 5 or more questions correct out of 8 (62.5%), and for Fall 2019, 19 students (51%) achieved this benchmark score; in addition, 12 students (32%) got 6 or more questions correct out of 8 (75%).**

**B. Analysis of the Results of Measurement**

**g. Comparing the data presented above for Fall 2019 Chem 464 with previous semesters, in Spring 2019, 39 students in Chem 464 were administered 8 questions taken from the ACS standardized exam in biochemistry on their course final. The benchmark for success in this assessment was 5 or more questions correct out of 8 (62.5%), and the average score in Spring 2019 was 3.9/8 (49%). Of the 39 students who took the assessment, 16 (41%) got 5 or more questions correct out of 8. In Spring 2017, 42 students in Chem 464 were administered 10 questions taken from the ACS standardized exam in biochemistry on their course final exam. The benchmark for success in this assessment was 6 or more questions correct out of 10 (60%), and 24 students (57% of the class) in Spring 2017 achieved the benchmark level or higher. The results for both Fall and Spring sections of Chem 464 show that students are performing similarly across recent semesters. Furthermore, in the cases reviewed, pre- and post-assessments show notable improvements in students understanding of the course material throughout the semester. Even further improved student performance on these assessments may be observed in the future after the introduction of more in-class active learning strategies.**

**The data presented above for Chem 461 represents a continued downward trend in student performance on this assessment year over year. For example, in Fall 2013, 83% of Chem 461 students got 5 or more questions correct on the assessment, and 55% of the class got 6 or more questions correct. In Fall 2014, again 83% of the class got 5 or more questions correct on the assessment, and 47% of the class got 6 or more questions correct. In Fall 2015, 67% of the class got 5 or more questions correct on the assessment, and 42% of the class got 6 or more questions correct. Notably, this downward trend is observed despite efforts to increase active learning in the classroom with graded in-class activities, other active learning techniques, and some “soft interventions” with struggling students following each exam**. **We will monitor this trend in future semesters as we continue to implement active learning strategies in the Chem 461 classroom. One suggestion to allow a more in-depth comparison of our students’ performance with national averages is to administer the entire ACS standardized exam in biochemistry on the last day of class, time permitting. This has been a useful comparison for general chemistry instructors and organic chemistry instructors, allowing them to gauge where our students stand with respect to others assessed across the nation in the same subject area.**

**A. Measure Student Work**

**SLO’s assessed: SLO 4: Work effectively and safely in a laboratory environment, including the ability to follow experimental chemical procedures and maintain a proper lab notebook.**

1. **Assess students’ ability to keep a laboratory notebook in Chem 333L and Chem 462L. Alignment with core competencies: written communication.**

**Chem 333L, Organic Chemistry I laboratory, is taken roughly midway through the BS/BA Chemistry and Biochemistry majors, and students in this lab have already taken two required laboratory courses as prerequisites: Chem 101L and Chem 102L, General Chemistry I and II labs. With this preparation, it is expected that students in this course should be able to properly maintain their laboratory notebook, an important skill for all practicing scientists. 16 Chem 333L lab notebooks from Chemistry and Biochemistry majors were assessed using the departmental lab notebook rubric by our lab TA’s in the fall semester of 2019. Out of a possible score of 20 points, the average score was 14.9/20 (75%). Nine students (56%) achieved the benchmark score of 15/20 or higher. No data were obtained in spring 2020 due to the COVID-19 pandemic.**

**The laboratory courses CHEM 461L (Biochemistry I Laboratory) and CHEM 462L (Biochemistry II Laboratory) have a Lab Notebook component that is part of the grade for those lab courses. CHEM 461L and CHEM 462L form a sequence of two-semester Biochemistry lab courses for our B.S. Biochemistry majors taken by the same cohort of students. The students are expected to maintain a proper Lab Notebook for recording pre-lab notes, experimental data and in-lab observations as well as notes. As part of the pre-lab preparation, students are expected to write down the purpose of the lab, sketch a flowchart of the experimental protocol, and prepare table(s) to record their experimental data based on instructions in the lab manual. The students must record all data collected during the labs in their own lab notebook, even if they may work in groups. Notebooks are randomly but regularly checked and graded throughout the course of the semester.**

**CHEM 461L in Fall 2019 had 18 students. The students received an average score of 72.2% during the first notebook check and an average score of 91.7% on the final notebook check. The students’ notebook score improved significantly during the semester.**

**CHEM 462L in Spring 2020 had 15 students. The students received an average score of 84.3% during the first notebook check and an average score of 87.3% for the final notebook check. The students’ notebook score improved only modestly as their first notebook check score started high due to the feedback this cohort of students received in the previous semester as part of CHEM 461L.**

**For reference, CHEM 462L in Spring 2019 had 8 students. The students received an average grade of 2.5 ± 0.7 out of 4.0 (62.5%) during the first notebook check and an average grade of 2.6 ± 0.7 out of 4.0 (65%) for the final notebook grade.**

**B. Analysis of the Results of Measurement**

**h. Comparison to data from previous years**

**Previously, in spring 2019 Chem 333L, 5 lab notebooks from Chemistry and Biochemistry majors were assessed using the departmental lab notebook rubric. Out of a possible score of 20 points, the average score was 15/20 (75%). Four students (80%) achieved the benchmark score of 15/20 or higher. The comparable notebook averages between semesters in Chem 333L suggests that students in general are doing a satisfactory job of properly keeping their laboratory notebook; however, as noted in previous assessment reports, the highest scores for each student were obtained for categories in which students prepared their notebook outside of the lab: abstract, TOC entry, page #s, completed table of amounts and physical properties of all reactants and solvents, procedure flowchart, etc. Significantly poorer performance is always observed in the categories “record of in-lab observations”, “notation of changes to experimental procedures”, and “conclusions and comparison of results to literature values”. An interesting point of comparison: in the 2013-2014 academic year laboratory notebooks were assessed in Chem 411, Chem 422, and Chem 433. Although these courses are taken after Chem 333L by our majors, the average scores for the notebook assessment was in the range of 15.1-16.1/20 (75.5-80.5%), which suggests that our students are not significantly improving their notebook-keeping skills as they move through the program. Indeed, instructors in those courses also noted poorer performance in the same categories mentioned above** **(“record of in-lab observations”, “notation of changes to experimental procedures”, and “conclusions and comparison of results to literature values”). Since the importance of in-lab notebook record-keeping for practicing scientists cannot be overstated, we had previously planned to amend our notebook rubric to place a greater emphasis (65% of the total points) on in-lab observations, deviations from protocol, conclusions, and post lab-reflection of the results obtained. This change has not been implemented yet, since consultation with all of the laboratory coordinators of the relevant courses has not occurred. We plan to further pursue this change in the assessment instrument in the upcoming academic year.**

**For Chem 461L, it is apparent that instructor feedback after the first notebook check leads to significantly improved student performance on the second notebook check, as well as on overall notebook performance in Chem 462L. This implies that students definitely take to heart instructor suggestions for improvement, and perhaps this strategy could be more vigorously applied by the TA’s in the organic chemistry labs (Chem 333L and Chem 334L) to improve student notebook performance there as well.**

**A. Measure Student Work**

**d. Administered a signature assignment for longitudinal assessment of knowledge (SLO1) in gateway (Chem 321) and capstone (Chem 401) courses.**

**Signature Assignment Administration, year 5: previously, twenty multiple-choice questions from all subdisciplines of chemistry (general, organic, inorganic, analytical, physical, and biochemistry) were assembled to create an assignment with the input of the department faculty (Appendix B). For the past three years this assessment has been implemented into Canvas, and given as an assignment to students in Chem 321 (Analytical Chemistry I, the gateway course for majors and minors) and Chem 401 (Inorganic Chemistry, the capstone course for majors and “unclassified” graduate students who would like to demonstrate proficiency in inorganic chemistry). Since the previous four assessments showed no significant improvement in student performance on the assignment between the gateway and capstone courses, we planned a move to using the ACS DUCK (Diagnostic of Undergraduate Chemistry Knowledge) exam for our longitudinal assessment assignment for Spring 2020. However, the pandemic prevented implementation of this change, since the ACS prohibits posting exam questions in an online format. As a result, we once again utilized our department-crafted longitudinal assessment tool in the Spring 2020 Chem321 and Chem 401 courses.**

**•Results of assessment: In spring 2019 Chem 321 (50 students), the average score was 11.74 correct out of 20 (59%) and 28 students (56% of the class) achieved the benchmark score of 12 correct out of 20. In spring 2019 Chem 401 (69 students), the average score for those who completed the assignment was 10.4 correct out of 20 (52%), and 21 students (30% of the class) achieved the benchmark score of 12 questions correct out of 20. In spring 2020, 56 students took the longitudinal assessment assignment in Chem 321. The average score was 8.8 correct out of 20 (44%) and 8 students out of 56 (14.2% of the class) achieved the benchmark score of 12 questions correct out of 20. For spring 2020, 72 students took the longitudinal assessment assignment in Chem 401. The average score was 10.5 correct out of 20 (53%) and 17 students (24%) achieved the benchmark score of 12 correct out of 20. *This past year was the first time in five years in which students in Chem 401 did significantly better in terms of class average and percentage of students achieving the benchmark score on the longitudinal assessment assignment than students in Chem 321*. This is the result that is expected, since between Chem 321 and Chem 401 students take upper division courses in analytical chemistry (Chem 422), physical chemistry (Chem 351, Chem 352), and biochemistry (Chem 464, Chem 461/462), as well as corresponding lab courses and upper division experimental courses (Chem 411, Chem 433).**

 **B. Analysis of the Results of Measurement**

**i. Analysis of the results and suggestions for improvement**

 **This is the fifth year in which this assignment has been given in gateway and capstone courses. For the four previous years, the trends in student performance between gateway and capstone have been not been what is expected, with students in Chem 321 slightly outperforming students in Chem 401. Recently this trend was attributed in part to performance-based extra-credit points offered in Chem 321, where no such incentive was offered in Chem 401. However, in spring 2020, students in Chem 401 outperformed students in Chem 321 to a significant extent on this assessment assignment. Notably, this is also the semester in which the pandemic forced a rapid transition to virtual learning from face-to-face instruction, which may have had an impact on the outcomes observed. Since the university will be in virtual learning mode for the spring semester of 2021 (thus precluding implementation of the ACS DUCK exam), we plan to administer the same longitudinal assessment assignment via canvas in Chem 321 and Chem 401 and compare the results with spring 2020 to see if this new trend holds. An in-depth analysis of student performance on these exams indicates that our students in both Chem 321 and Chem 401 are struggling with concepts not only encountered in upper division courses (questions 17-19), but also with foundational knowledge related to molecular structure, acid-base chemistry, and orbital theory (questions 4, 11, and 20).**

**A. Measure Student Work**

**e. Assess graduate students’ scientific oral communication abilities in literature and thesis seminars, relevant to SLO2m: Organize and communicate scientific information clearly and concisely, both verbally and in writing. Alignment with core competencies: oral communication, information literacy.**

**The oral presentation rubric (developed in the Department of Chemistry and Biochemistry and used to assess the literature and thesis seminars) has five categories: organization, quality of chemical / biochemical content, understanding of scientific material, delivery & use of visual aids, and ability to answer questions. Performance in each category could be rated with a score of 0-20. The rubric provided descriptions for “A” range (17-20 points), “B” range (14-16 points), “C” range (12-13 points), and “D” range (10-11 points) performance. Each semester, faculty attending the seminar, using the rubric as a guide, filled out the evaluation sheets and forwarded them to the seminar coordinator. The seminar coordinator then tabulated the results for each category and an average score for literature and thesis seminars was obtained.**

**Results for 2019-2020: Over the academic year 6 MS Chemistry or Biochemistry students presented literature seminars, with average scores 17.2/20, 16.5/20, 16.5/20, 16.8/20 and 15.7/20 for the categories of organization, quality of chemical / biochemical content, understanding of scientific material, delivery & use of visual aids, and ability to answer questions. The average total score for all 6 literature seminars was 82.7/100 (B+).**

 **Between the start of Fall 2019 and the end of Summer 2020 12 MS Chemistry or Biochemistry students presented thesis seminars, with average scores 17.6/20, 17.6/20, 17.1/20, 16.8/20 and 16.3/20 for the categories of organization, understanding of scientific content, style and delivery, use of visual aids and ability to answer questions, respectively. The average total score for the 12 other thesis seminars was 85.3/100 (A-).**

**B. Analysis of the Results of Measurement**

**j. Analysis of the Results of Measurement**

**The results indicate that, on the whole, graduate students are doing well in their oral seminars, since the average scores in most categories are in the 16-17 range. The trend has continued from previous years that the thesis seminar grades are slightly higher than the literature seminar grades. The weakest category tends to be the ability to answer questions.**

**For many years the scores in both seminars were increasing. The likely reason for the increase was thought to be more rigorous pre-talk preparation, particularly in the area of practice talks. It is now common to see students giving 3-4 practice talks in advance of their seminar date, and they invite both faculty and students from a variety of subdisciplines within the department. Up to a few years ago, students who attended the practice talks would not provide a lot of constructive feedback to their peers. However, in recent years, as they have become more familiar with critically evaluating presentations, they have participated more and the overall quality of the seminars has increased as a result. The students who continue to have low scores are those that tend not to involve their research mentors and tend to have significantly fewer practice runs in advance of their seminars. These practice sessions have clearly been extremely valuable to both the audience and the presenting student.**

**The majority of thesis seminars in the past academic year were given in Spring 2020, and of those, the majority were presented online via Zoom due to the COVID-19 pandemic. Although the students seemed to be less nervous in this format (since they could not see their audience), the average scores from these seminars, 86.3% (which includes the summer seminars, which were also presented online), is quite comparable to the typical average thesis score. Even so, the faculty will be encouraged to continue to expect more “eye contact” (i.e. looking directly into their camera at the audience) in the online presentations compared to what was seen in Spring 2020.**

**3. Preview of planned assessment activities for 2020-21.** Include a brief description as reflective of a continuous program of ongoing assessment

**In the next year, in addition to our normal department-wide assessment activities, we plan to collect additional data on our program SLO #2 (organize and communicate scientific information clearly and concisely, both verbally and in writing) and #3 (effectively utilize the scientific literature, including the use of modern electronic search and retrieval methods, to research a chemistry topic or to conduct chemical research) and compare the results from our previous assessment of these SLO’s 5 years ago. We will also continue with our longitudinal program assessment in gateway and capstone courses.**