Program Review Report
3.7 Academic Program Review

A thorough internal or external program review addressing all criteria in policy should be possible within a comprehensive report of ten or fewer pages. This template is provided to assist institutions in compiling the program review information, **which is to be presented to the institutional governing board prior to submission to the State Regents**. Please provide an executive summary of this review using the Program Review Executive Summary Template.

Institution Name: Oklahoma City Community College

Program Name and State Regents Code: Chemistry Associate in Science 166

List Program Options: Chemistry 401
Pre-Dentistry 402
Pre-Pharmacy 403
Pre Medicine 404

List Embedded Certificates included in this review: N/A
Click here to enter text.
Click here to enter text.
Click here to enter text.

Previous Review

Date (Year) of Last Review 2011

1. Summarize key findings from previous internal and/or external reviews of this program.

In 2011, all science programs (chemistry, physics, and biology) were under one degree program (A.S. Science). The following findings pertained primarily to what at that time was the "chemistry concentration" (including variations for chemistry, pre-dentistry, pre-medicine, and pre-pharmacy) within the science degree program.

Strengths identified in the 2011 review:

Quality faculty. Science faculty at OCCC are a diverse group who share a common interest in promoting student learning, providing quality instruction and insuring high levels of student performance. While science courses are taught by adjunct faculty, every attempt is made to ensure they hold high qualifications and support the goals of the department.

Among the chemistry faculty are two organic chemists, two biochemists, a physical chemist, and an analytical chemist. Therefore, most of the major areas of specialty within chemistry are represented. Three of the chemistry faculty also have several years of industry experience, allowing these faculty to highlight real world applications in the classroom and provide advice to students interested in chemistry based upon their firsthand knowledge of industry. One

chemistry faculty member has significant research experience at the University of Oklahoma Health Sciences Center.

Designed curricula. Unlike many institutions where faculty simply teach the textbook, faculty at OCCC have conscientiously designed the courses and curriculum. Courses are developed by first determining what knowledge and skills students are expected to acquire. Competencies or learning objectives are specified based on content significance, prerequisites for future subjects and courses, and importance to the careers students are pursuing. These objectives are then sequenced, and course materials are developed. Textbooks are selected which most closely match the course design. Finally, assessments are developed which match the specified learning objectives. All sections of each course use the same set of objectives, ensuring students in every section receive an equivalent education regardless of teaching methods utilized by individual instructors.

Strong, on-going assessment in chemistry. The Chemistry faculty have recognized the value of assessment as a tool for improving student learning and therefore take assessment very seriously. The Chemistry faculty are committed to assessing student learning outcomes, looking for ways to improve the degree to which students master the skills the Chemistry faculty see as important, and reassessing skills again to make sure changes had the intended effect.

Classroom technology. All classrooms at OCCC are equipped with computers and projectors that allow instructors to present multimedia materials and access the Internet in the classroom. The general classroom environment is also very positive. The use of tables rather than individual desks allows students more room to work. The white boards in the classrooms are generally more visible and involve less dust than chalk boards.

Lab facilities. The condition of the laboratory facilities for chemistry are excellent. OCCC has three dedicated teaching lab spaces. One is used for General Chemistry I labs, the second is shared by General Chemistry II and organic chemistry labs, and the third is dedicated for the pre-nursing chemistry lab.

Schedule and format options. Both basic and more advanced science courses are offered in the morning, afternoon, and evening. Many of the basic science courses are offered in an 8-week or 16-week format. The variety of time offerings and formats for science courses helps serve students with diverse scheduling needs.

Science Center. The Physical Science Center provides extensive services to students such as free tutoring. Physical Science lab assistants prepare lab solutions, set up lab for faculty, and maintain group lab spaces with the help of chemistry faculty. Lab assistants also monitor safety and assist when there are incidents in the lab. All of this provides a level of consistency across lab sections that are taught by many different faculty.

Active Health Professions Club. The Health Professions Club always has a large number of student members and is always among the most active clubs on campus. The Health Professions Club sponsors field trips to the OU Health Sciences Center, brings in speakers, and holds workshops on interviewing for professional schools among many other activities and service

projects. The activities of the Health Professions Club greatly enrich the college experience of its members.

Specialized curriculum patterns within each discipline. Whether a student is interested in Allied Health professions, Biology, Chemistry, Pre-Dentistry, Pre-Medicine, Pre-Nursing, Pre-Pharmacy, or Physics, program faculty have designed suggested curricular patterns for students to follow that meet the transfer requirements for further study in these areas. Even students who self-advise should have a reasonable idea of what courses they need if they follow one of the published curriculum patterns.

Expanded course offerings. Since the last program review, fourteen sections of CHEM 1123 and twenty-six sections of CHEM 1131 have been added to accommodate the needs of the Nursing Program.

Opportunities through INBRE. Since Oklahoma City Community College participates in a grant administered through the OU Health Sciences Center (The IDea Network for Biomedical Research Excellence), Oklahoma City Community College students have the opportunity to experience biomedical research at major research institutions. Data from before 2017 is not readily available, but in the summer of 2018, six students participated in the program. In the summer of 2019, five students from OCCC participated.

Faculty advising. A very large number of students taking science courses have one of the professional medical specialties as a career goal: medicine, pharmacy, dentistry, nursing, and all of the allied health professions. These academic majors are housed in the Division of Science and Mathematics.

While the College employs several dedicated general Academic Advisors, these general advisors cannot possibly remain current on employment trends, advanced programs available at transfer institutions, program admission requirements, etc. Consequently, science faculty members have taken on the responsibility of serving as Faculty Advisors for students selecting these majors. Science faculty also remain in contact with faculty and staff at various educational and medical institutions to ensure programs offered at OCCC meet the needs of students pursuing careers in the various fields of medicine.

Concerns identified in the 2011 review:

Classroom space. We are at capacity at popular times and many less popular times. Many of the new sections of CHEM 1123 that were added to meet the demands of the Nursing Program were scheduled at awkward times because those were the only times when open classrooms could be found (3:30 p.m. to 4:50 p.m. is especially difficult for parents who need to pick kids up from school, for example). Finding rooms for two pre-lab discussion periods for the Spring 2010 semester required wedging the pre-lab discussions into biology lab spaces. The use of one of the spaces will require Biological Science Center staff to break down experiment set-ups during lunch hour and replace them once the pre-lab discussion is over.

Transfer issues. While some progress has been made with transfer of our organic chemistry lecture sequence to the University of Central Oklahoma (UCO), UCO does not accept our

organic chemistry lab course. While Oklahoma State University's College of Engineering accepts our organic chemistry sequence, Oklahoma State University's Department of Chemistry still does not.

Availability of output data. Data for tracking science student success at transfer institutions and admission to professional programs seems impossible to obtain.

Availability of qualified adjuncts. We rely heavily on just a few adjuncts to teach close to the maximum allowable hours. While every attempt is made to ensure that highly qualified individuals are hired, qualifications on paper do not always translate into success in the classroom. Assessment data indicates that students taught by full-time faculty outperform those taught by adjunct faculty. During the review period an average of 74.8% of students met the performance criterion on the departmental final in sections taught by full-time faculty versus 69.6% for students in sections taught by adjunct faculty. This difference is even more apparent if the year that two new full-time faculty began teaching CHEM 1115 is excluded (the difference then becomes 78.9% for FT vs. 69.6% for adjuncts).

Since all sections of CHEM 1115 use the same syllabus, assignments (such as Mastering Chemistry), grading criteria, and lecture schedule, the difference does not appear to be caused by differences in emphasis or content. Most of our adjunct faculty have taught this course for several years so lack of experience should not have caused the observed difference. Differences in adjunct versus full-time performance can be even more pronounced in higher level courses. For instance, in CHEM 2114, Organic Chemistry I, an average of 64.1% met the performance criterion on the departmental final from Spring 2009 through FY 2010 in sections taught by full time instructors. In contrast, only an average of 32.8% of students in adjunct sections met the performance criterion on the final exam.

Results of assessments in the organic lab show similar disparities between adjunct and full-time instructors.

Physical Science Center staffing. We are short-staffed in the Physical Science Center. There are times when only one lab assistant can be scheduled to work, making it difficult for the assistant on duty to attend to the needs of chemistry labs going on in three different rooms, supervise independently-paced (IP) physics labs, schedule IP labs for students who come in to the Physical Science Center, address questions regarding computers, and have time for any kind of break. If one lab assistant must call in sick, there are times when we will have to close the Physical Science Center, causing rescheduling of IP labs. Also, a lab assistant on duty alone cannot prepare chemicals or refill bottles in labs to make sure early morning labs are adequately stocked due to safety concerns in case of an accident.

Need for enhanced tutoring services. The Physical Science Center currently relies upon student tutors exclusively. The student tutors we currently utilize are often here for only a year and then they move on. This means that tutor quality can vary considerably from year to year and is strongly dependent upon the applicant pool.

Laboratory space/capacity issues. We are very near capacity in the Chem I lab, 1C1. The only reason we can offer the number of sections of CHEM 1115 that we do is that we offer labs at

awful times (7:30 a.m. - 10:00 a.m.; 8:00 p.m. - 10:30 p.m.) that students still sign up for (out of lack of better options).

Need for an NMR spectrometer. Chemistry has been fortunate in receiving excellent major equipment items that now include a gas chromatograph, a combined gas chromatograph-mass spectrometer, and an infrared spectrometer. Due to prohibitive cost, the one major instrument missing from the organic chemistry lab is a nuclear magnetic resonance (NMR) spectrometer (~$100,000 for a refurbished instrument). The lack of an NMR spectrometer is a weakness 4-year colleges and universities can point to as evidence that organic lab experience at OCCC is not equivalent to the lab experience at their institutions.

Need for a bigger instrument room. If we do acquire an NMR spectrometer, we will need a bigger space to accommodate all of our instruments or a dedicated space just for the NMR spectrometer.

Chemistry supply budget. The chemistry supply budget has not increased in the last five years despite the addition of twenty-six additional lab sections CHEM 1131 plus an additional section of CHEM 0110.

Unresponsiveness of Human Resources. Faculty and program directors involved in posting positions and hiring lab assistants or tutors are often frustrated by how long it takes Human Resources to process requests to get jobs posted or to process paperwork needed to appoint new hires. Often there is no communication when background searches are completed. Delays of several weeks are not uncommon for position postings, leading to unfilled positions that can impact services to students and creating uncertainty for potential candidates awaiting the job postings.

2. What developments and actions have taken place since the last review?

Classroom space. We are still at capacity but have managed to schedule classes at more convenient times.

Transfer issues. Our organic courses are listed in the transfer matrix of the Course Equivalency Project (CEP) and so should transfer to all participating schools.

Availability of output data. This continues to be a problem/issue.

Availability of qualified adjuncts. Currently, we have a good cohort of adjuncts who, because we teach from the same syllabus and same course notes, are showing the same success as full time faculty. The challenge as a result of the pandemic is finding adjuncts to teach on campus. To address this, two temporary full time chemistry instructor positions were created for the Spring 2023 semester. A permanent full time instructor position has been requested.

Physical Science Center staffing. We are still under-staffed in the Physical Science Center. Due to relatively low pay, retaining good people can be difficult.

Need for enhanced tutoring services. We continue to use student tutors, but the job duties of the lab assistants were revised to allow lab assistants to do more tutoring. Recent funding changes could potentially also allow us to hire tutors who are not necessarily students.

Laboratory space/capacity issues. We are in the preliminary stages of adding SEM 1C7 as a fourth lab to accommodate more lab sections and at better times.

Need for an NMR spectrometer. We acquired an NMR instrument within the past five years. Thanks to recent advances in NMR technology, a smaller, more affordable NMR spectrometer became available.

Need for a bigger instrument room. Thanks to Dr. Bruce Bailey, now retired, our current instrument room has been streamlined and updated to allow for multiple desktop size instruments connected to a local network. We no longer need a bigger instrument room.

Chemistry supply budget. Supply budget is stagnant, but adequate to meet the current needs of the program laboratories thanks to careful budget management by the Supervisor of the Physical Science Center.

Unresponsiveness of Human Resources. The process for hiring adjunct faculty/lab assistants/tutors has improved dramatically over the past few years.

Current Review

Date (Year) of Current Review 2023

Review Criteria *(Institutions should address each criterion of OSRHE policy 3.7.5 as directed below).*

A. Centrality of the Program to the Institution's Mission:

OCCC's Mission: Student Success. Community Enrichment.

Chemistry in some form or another is required for every science or health professions major and virtually all engineering majors. As such the courses we offer in chemistry are extremely important to the success of students and the community that these majors serve.

B. Vitality of the Program:

B.1. Program Objectives and Goals:

The goal of the OCCC Chemistry Program is for AS Chemistry students to successfully move on to and graduate from Chemistry or related programs at 4-year institutions since jobs in chemistry are very rare at the AS degree level. Job opportunities are more plentiful once a student reaches the baccalaureate level (or higher). Our focus therefore is to insure our theoretical and laboratory

content is current and transferable, preparing students for more advanced courses at 4-year colleges or universities.

B.2. Quality Indicators (including Higher Learning Commission criteria and requirements):

To insure our students are gaining the knowledge and skills needed to move on to advanced chemistry courses or health professions programs, the Chemistry Program annually assesses the following student learning outcomes for CHEM 1115, CHEM 1123, CHEM 1215, CHEM 2114, CHEM 2121, and CHEM 2124:

- Successful course completers will be able to apply concepts, principles, and techniques of chemistry to solve chemically oriented problems.
- Successful course completers will be able to apply appropriate chemical laboratory techniques to acquire empirical data that can be used to solve chemical problems.
- Successful course completers will be able to correctly analyze laboratory data.
- Successful course completers will be able to write clear conclusions that they support with appropriate data and data analysis.
- Students will be able to follow written laboratory procedures to safely complete a laboratory experiment.

Outcome 1 Results

CHEM 1115 – General Chemistry I

In CHEM 1115 (General Chemistry I) we assess the performance of 500 to 600 students on an annual basis. We are interested in their general chemical knowledge – especially in areas the students will need to succeed in subsequent chemistry courses. In the 2021-2022 academic year, we assessed 611 General Chemistry I students. Prior to the pandemic, we used results on a comprehensive final exam for assessment. Since the pandemic, we have been using selected "comprehensive" questions on the last two exams that incorporate material from two or more previous units. The different methodologies we have had to employ make some direct comparisons challenging, but the success rate in FY 2022 of 54.7% was lower than the 74% success rate in 2020-2021, and also lower than the average of 72.3% from 2016 to 2020 (which includes the pandemic year), the average of 69.3% from 2011 to 2015, and the average of 72.9% from 2005 to 2010.

CHEM 1215 – General Chemistry II

We annually assess the performance of 150 to 200 General Chemisty II students. In the 2021-2022 academic year, we assessed 134 students. This was down significantly from the 224 students assessed the previous year. As with General Chemistry I, we switched from using a comprehensive final exam for assessment to using selected "comprehensive" questions on the lasts two exams in the wake of the pandemic and the forced switch to online classes.

The success rate for the selected questions this past academic year was comparable to pre-pandemic levels. Eighty-one percent (81%) of students who successfully completed CHEM 1215 in the 2020-2021 academic year earned 70% or more of the total points on the selected questions. In the 2020-2021, the success rate was 72%. In the latter half 2019-2020 (i.e. during the semester most directly impacted by COVID, our success rate had dropped to 49%. Prior to the pandemic, our success rates were above 80% going back to 2016.

CHEM 2114 – Organic Chemistry I

We annually assess 30 to 50 students in CHEM 2114 (Organic Chemistry I). In the 2021-2022 academic year, we assessed 32 students using a faculty-developed comprehensive final exam. 53% of all students assessed scored at least 70% on the exam, just slightly higher than last year (50%). If we consider only those students who successfully completed the course, the percentage of students making 70% or better on the final exam jumps to 84%. This success rate compares favorably to pre-pandemic rates for successful course completers (90% in 2018 and 2019, 80% in 2017, and 75% in 2016). The success rate had dropped below 70% during the two years most directly impacted by the pandemic and online courses.

CHEM 2124 – Organic Chemistry II

12 students from one section of CHEM 2124 offered in Spring 2022 were assessed using a faculty-developed comprehensive final exam. This year 83% of all students assessed scored at least 70% on the exam, and all of these students made a C or better in the course. This 83% success rate meets our goal and is comparable to the years before COVID-19, with an 83% success rate in the 2018-2019 academic year, and 88.5%, 89.5, 100%, 87.5%, 84.0%, and 80% in prior years going back to 2012-2013.

Use of Outcome 1 Results

CHEM 1115

Based on the assessment data from CHEM 1115, it looks as though the 2021-2022 academic year is really the year that the severe impact of COVID-19 on our CHEM 1115 students is showing up. We anticipate its impact will show up for many years to come. Since the outbreak of COVID-19 in the spring of 2020, most of our CHEM 1115 students moved to online classes. 2022 is the second year that our CHEM 1115 students studied online without close instructor supervision. Lecture instructors have observed repeatedly in all five terms of the 2022 fiscal year that the viewing rate of the most of our pre-recorded lecture videos was less than 50% of the head count of our students in each lecture section. This means that more than 50% of our online students went directly to take tests without taking the minimal step of watching lecture videos to learn course material! Unsurprisingly, this resulted in a much lower success rate on the assessment. More concerning is that many of these CHEM 1115 students managed to pass with a C. Unfortunately, they will most likely suffer due to lack of solid mastery of General Chemistry I material when they take subsequent chemistry courses. Our main conclusion

from this is that it is imperative to resume on-campus CHEM 1115 teaching to improve our students' performance. For this reason, all CHEM 1115 sections are on campus starting in during the Spring 2023. However, because of the on-going push for online courses, the Chemistry Program will be looking at ways to improve online course content. We will be exploring a hybrid model wherein lecture material can be delivered at least partly online while the hands-on laboratory skill learning takes place on campus.

CHEM 1215

There were multiple disruptions in the 2019-2020 and 2020-2021 academic years. In anticipation of the directive from Academic Affairs to move all courses to 8-week terms at Oklahoma City Community College, we re-ordered and consolidated material in CHEM 1215, cutting six units down to five while still covering the same content. We implemented this change in the Fall 2019 semester. Of course, Spring 2020 was affected by the pandemic. In the 2021 academic year, we were in 8-week terms and all the lectures were fully online, with some labs being held on campus.
After low numbers in the Spring and Summer 2020 terms and for 2021, we are finally back on target with 81% of all students, and 81% of successful course completers earning 70% or more of the points on the selected questions that are currently substituting for a comprehensive final exam. This encouraging result can indicate that students and instructors have finally adapted to the online environment and to the relatively new five-unit course structure. Given the assessment results in CHEM 1115, however, we are concerned that many students currently in CHEM 1215 may not have been truly prepared. We may see a decline in assessment results in CHEM 1215 and beyond in the next year or two as a result. For this reason, we see getting back to on-campus teaching as essential for our students' success going forward, regardless of how much students are demanding online alternatives.

CHEM 2114

Students who take CHEM 2114 are generally pursuing a career in chemistry, chemical engineering, or one of the health professions such as dentistry, medicine, or pharmacy. In each case, the safety and well-being of the public demands that such professionals master, retain, and be able to apply important concepts. Emphasizing this by setting minimum levels of competency that are acceptable in this course have led to higher performance than was observed when program assessment first began at OCCC.

The results of this year's assessment indicate that students who earn an A, B, or C in the course are mastering the course content at a high level. This mastery is supported by anecdotal evidence provided by students who earn scores on the chemistry section of the PCAT in the 90+ percentile nationwide.

One of the biggest challenges we face in this course is the fact that we lose a significant percentage of students during the semester. This is true not only at OCCC but at other colleges as well. CHEM 2114 (Organic Chemistry I) is commonly referred to as a "weed out" course by many students. Many of these students are not prepared or are not able to put in the time needed to master the concepts of this challenging course.

CHEM 2124

CHEM 2124 is the terminal course for the chemistry program. More than 80% of students that successfully completed CHEM 2124 (C or better) demonstrated a high level of competency in general and organic chemistry on the final exam. This shows that students who successfully complete the chemistry program at OCCC are demonstrating a high level of competency in general and organic chemistry topics. Thus the strategy of continually placing key material in front of students, which the chemistry program adopted many years ago, seems to have paid off.

Overall Comment and Note:

While the most recent assessment results for CHEM 1215, CHEM 2114, and CHEM 2124 were encouraging, the results for CHEM 1115 were not. The full impact of the COVID-19 pandemic and the shift to online courses in high schools may just be showing up. It will be interesting to see if the concerning results observed in CHEM 1115 start to "trickle up" to the more advanced program courses in the next year or two.
Beyond the impact of COVID-19, what we have learned from assessment in general is that students do best when we remind them frequently to study past material. We encourage this frequent reviewing by letting students know that questions from past units can appear on upcoming exams, and by reminding students of key skills as much as time allows as we present new material.

Outcomes 2, 3, and 4 – Results

Outcome 2 focuses on students' ability to follow procedures correctly in order to obtain accurate experimental results. Outcome 3 focuses on students' ability to analyze the data they collect. Outcome 4 emphasizes students' ability to communicate their conclusions clearly.

In CHEM 2121 last year, fourteen students who completed the course with a C or better completed the lab practical. All fourteen (100%) were able to collect good data and correctly analyze their collected data to confirm the identity of their synthesized product. All fourteen were also able to write conclusions that were clear, correct, and provided proper support. This is comparable to what we have seen in CHEM 2121 in prior years.

We use performance on a formal report exercise in our General Chemistry II lab as an additional measure of Outcomes 3 and 4. For this course, results are more mixed. In the 2021-2022 academic year, 79% of 141 success course completers supported their conclusions adequately (Outcome 4), but only 66% were competent in their data analysis. This means a number of students did a good job supporting conclusions that were ultimately incorrect. These numbers are comparable to what we have seen in previous years in this course, with successful support prior to the pandemic at 73% for the 2018-2019 academic year, and 77%, and 68% in the two years prior to that. When it comes to correct data analysis (Outcome 3), numbers are also comparable with the years prior to the pandemic with 66% correct data analysis in 2021-2022, 74% in 2018-2019, and 69%

in both 2017-2018 and 2016-2017. For comparison, during the summer of 2020, the first term for which labs were forced to be fully online due to the pandemic, the percentage of students who correctly analyzed their data for the formal lab exercise dropped to 39%.

Outcomes 2, 3, and 4 – Use of Results

The strong results in CHEM 2121 indicate no changes are needed to the curriculum for that course. Also, the continued emphasis we place on analyzing data and providing support for conclusions throughout our labs starting in CHEM 1115 seems to be helping students in the terminal laboratory course for our program students. With the less advanced students in General Chemistry II, we still have students who have not mastered either data analysis or conclusion writing. Over the years, we have made improvements in the formal lab exercise and a prior lab exercise that involves data analysis and conclusion writing to teach student how to analyze data effectively and communicate their conclusions. Results have been stubbornly consistent despite our efforts at improvements. The data for General Chemistry II labs do show, however, that the close supervision of on-campus laboratory is far better than an online lab format.

General Education Assessment

General Chemistry I and General Chemistry II are both considered general education courses. As such, the Chemistry Program participates in general education assessment by contributing assessment artifacts in writing (formal labs in General Chemistry II, for example), mathematics (selected test questions), and critical thinking (formal labs in General Chemistry II and CHEM 2121). Two chemistry faculty also serve as artifact evaluators on a regular basis.

B.3. Minimum Productivity Indicators:

Time Frame (e.g.: 5-year span)	Enrollment	Graduates
AS. CHEM (CHEM, PRE-DENT, PRE-PHARM, PRE-MED) Click here to enter text. Click here to enter text.	1659	14.8

B.4. Other Quantitative Measures:

b.4.a. Number and enrollment of courses taught exclusively for the major for each of the last five years:
List or attach list of courses

Number of courses taught	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
1000-Level	NA*	NA	NA	NA	NA
2000-Level	8	5	10	6	11
All Levels	8	5	10	6	11

Average class size	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
1000-Level	NA*	NA	NA	NA	NA
2000-Level	22	27	19	17	12
All Levels	22	27	19	17	12

Total enrolled	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
1000-Level	728	640	581	701	712
2000-Level	173	134	185	103	132
All Levels	901	774	766	804	844

*The 1000-level courses are required courses for Majors, but they are considered to be part of the General Education curriculum.

Courses:
CHEM-1115 – General Chemistry I and Lab
CHEM-1215 – General Chemistry II and Lab
CHEM-2114 – Organic Chemistry I
CHEM-2122 – Organic Chemistry Lab (FY 2018, FY 2019)
CHEM-2111 – Organic Chemistry I Lab (FY 2020, 2021, 2022)
CHEM-2124 – Organic Chemistry II
CHEM-2121 – Organic Chemistry II Lab (FY 2020, 2021, 2022)

b.4.b. Student credit hours by course level (i.e. 1000, 2000) generated in all major courses in the degree program for five years:

Level	Program	Degree	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
1000	**Chemistry**	AS	NA*	NA	NA	NA	NA
2000	**Chemistry**	AS	600	500	500	304	348
All levels	Chemistry	AS	600	500	500	304	348

*1000 Chemistry courses are part of the general education curriculum rather than major courses.

b.4.c. Direct instructional costs for the program during the review period:

In 2021 and 2022, our Information Technology Services department installed Zoom room technology in multiple classrooms across campus with an end goal of 70+ rooms. This hybrid/Hy-Flex technology helps us offer different course modalities and allows us to meet student and employee needs by providing the opportunity for courses and meetings to be held in-person and online simultaneously. This endeavor was achieved at a total cost of $2,393,437.41. In addition, all teaching station computers, monitors and display adapters were replaced at a total cost of $107,167.16.

The Center for Learning and Teaching developed training for this technology that began in Dec. 2021. This training is ongoing and focuses on both how to operate the technology as well as how to engage students with it in the classroom using innovative teaching strategies. We have trained 160+ faculty and staff members to date and anticipate training more in the upcoming fiscal year.

At this point, all course sections now use our Learning Management System (LMS), Moodle, and we have several third-party tools available to faculty and students that foster online engagement, including Turnitin, Ally, Poll Everywhere, and VoiceThread. These recurring costs add up to approximately $338,000 per fiscal year. Faculty are trained in these resources, and the CLT continues to work with faculty to make sure they understand best practices for how to use and implement these resources. Turnitin aids with grading and academic integrity, Ally with ensuring faculty have the tools to make their course materials Section 508 complaint, Poll Everywhere with student engagement, and VoiceThread with creating quality audio presentations and feedback for our students. Additionally, the Center for Learning and Teaching is working toward developing augmented and virtual reality resources for OCCC faculty to potentially integrate into their courses to better engage students through real-world experiences offered in a virtual environment.

b.4.d. The number of credits and credit hours generated in the program that support the general education component and other degree programs including certificates:

There are 17 General Education credit hours in the Chemistry program degrees, and 8,634 general education credit hours were earned in FY2022 by students in the Chemistry program.

b.4.e. A roster of faculty members, faculty credentials and faculty credential institution(s). Also include the number of full time equivalent faculty in the specialized courses within the curriculum:

Faculty	**Credential (i.e. MFA, PhD)**	**Institution that granted degree**
Bruce Bailey (retired Spring 2020)	PhD	Oklahoma State University

Kristy Bailey (retired Spring 2020)	PhD	Oklahoma State University
Justin T. Garrett (started Fall 2020)	PhD	University of Oklahoma
Fabiola Janiak-Spens (position terminated Spring 2018 when Biotechnology Program was cancelled)	PhD	University of Oklahoma
Kimberly Kyker (Joint appointment in Biology)	MS	University of Oklahoma Health Sciences Center
Steven Shore	PhD	University of Oklahoma
Courtney Vahlberg	PhD	Oklahoma State University
Peng Wu (started Fall 2021)	PhD	Institute of Chemistry, Chinese Academy of Sciences
Changjiang Zhu	PhD	University of Idaho
Suzanne Lapolla (temporary Instructor position Spring 2023)	MS	University of Oklahoma Health Sciences Center
Meera Rajaratnam (temporary Instructor position Spring 2023)	PhD	University of Sussex

Add more rows if needed

b.4.f. If available, information about employment or advanced studies of graduates of the program over the past five years:

Not enough graduating students from the Chemistry program responded to graduate surveys over the past 5 years to address this question.

b.4.g. If available, information about the success of students from this program who transferred to other institutions:

Not enough graduating students from the Chemistry program responded to graduate surveys over the past 5 years to address this question. While we do have access to data regarding students transferring from OCCC to area 4-year schools, we have no mechanism for determining which of those students were from the Chemistry program.

B.5. Duplication and Demand:

In cases where program titles imply duplication, programs should be carefully compared to determine the extent of the duplication and the extent to which that duplication is unnecessary. An assessment of the demand for a program takes into account the aspirations and expectations of students, faculty, administration, and the various constituents served by the program. Demand reflects the desire of people for what the program has to offer and the needs of individuals and society to be served by the program.

Address Duplication: Most colleges in the state have chemistry programs. This duplication is necessary because knowledge of chemistry is essential for so many fields. Undergraduate chemistry majors are fairly common, however many declared majors are intent on careers fields that require extended professional training (MD, DO, DDS, PharmD, etc). It is important that all institutions identify and encourage potential chemistry majors. In the case of OCCC, our population has a high proportion of first generation students and students from groups traditionally underrepresented in chemistry related fields. We represent an opportunity to broaden access to this field for those groups.

Address Demand: Demand for our courses comes from the population in the metro area (Choctaw, Edmond, Moore, Mustang, Norman, Oklahoma City, Tuttle, Yukon).

b.5.a. Describe demand from students, taking into account the profiles of applicants, enrollment, completion data, and occupational data:

We often have students requesting more organic chemistry lectures and labs at different times of the day (especially evening). However, current resources limit how many additional sections we can offer.

According to the November 2022 Monthly Labor Review publication from the U.S. Bureau of Labor Statistics, most labor gains in 2021 to 2031 are expected to be in the service sector, particularly in healthcare as the U.S. population ages. Since chemistry courses are prerequisites for admissions into nursing, pharmacy, dental, and medical schools, demand for chemistry courses at OCCC should remain strong in this period. Moreover, job growth for chemists and material scientists in the U.S. is projected to be 6% from 2021 to 2031. Job growth for chemical engineers is projected to be 14% in the same period.

b.5.b. Describe demand for students produced by the program, taking into account employer demands, demands for skills of graduates, and job placement data:

We recognize not all AS CHEM majors are seeking careers with their Associate's degree. However, the courses offered by the Chemistry program help support students on various career paths in:

- Chemical Industry
- Chemical Research
- Chemical Education
- Biochemistry
- Materials Science
- Forensic Science
- Pharmacy
- Medicine
- Dentistry

We lack job placement data for Chemistry program majors due to low graduate survey participation; however, there are relatively few job opportunities for an AS CHEM student, especially in Oklahoma. The goals of the majority of our students are more toward earning 4-year degrees and professional schools (i.e., medical school, pharmacy school, dental school and graduate schools) as opposed to career-seeking with their Associate's degree. The Chemistry program therefore focuses on meeting transfer institution demands as opposed to those of any particular set of area employers.

b.5.c. Describe demand for services or intellectual property of the program, including demands in the form of grants, contracts, or consulting:

The Chemistry Program does not have demands for services or intellectual property of the program, including demands in the form of grants, contracts, or consulting.

b.5.d. Describe indirect demands in the form of faculty and student contributions to the cultural life and well-being of the community:

The Chemistry Program does not have indirect demands in the form of faculty and student contributions to cultural life and well-being of the community.

b.5.e. The process of program review should address meeting demands for the program through alternative forms of delivery. Describe how the program has met these demands:

The Chemistry program offers on-campus, and hybrid sections each term. These sections are offered at all times of day (morning, afternoon, evening) to meet student demands. The program is working under the state guidelines, with which faculty are in accord, which require at least 75% of lab instruction for CHEM courses to occur in the face-to-face/traditional setting as opposed to online. This prohibits the offering of some courses in a completely online format, so hybrid alternatives are used wherein students complete the "lecture" aspect of the course asynchronously while coming to campus for lab exercise completion of the necessary hands-on skill set.

B.6. Effective Use of Resources:

(Resources include financial support (state funds, grants and contracts, private funds, student financial aid); library collections; facilities including laboratory and computer equipment; support services, appropriate use of technology in the instructional design and delivery processes, and the human resources of faculty and staff).

The Chemistry Program has a chair, 4 full-time faculty, and one faculty member with duties split between Chemistry and Biology. The Chair of the Chemistry program and

all the full-time Chemistry Program faculty have doctorate degrees in their respective disciplines. The faculty have a wide variety of experience, ranging from purely academic backgrounds to those with years of industry experience in addition to their academic credentials. Additional personnel in the Chemistry Program include two temporary full time Instructors, the supervisor of the Physical Science Center, and two full time Physical Science Center lab assistants.

In Fall 2022, 51% of chemistry sections were taught by full-time faculty. The remaining 49% were taught by adjunct faculty. This may not be a clear representation of the full-time/part-time ratio of instructors in the program. During Fall 2022, an unprecedented number of adjunct faculty members opted not to return to the classroom (i.e., on campus labs), resulting in requests for conversion of on campus courses to online format. Recruitment of new adjunct faculty will be a key focus of future departmental endeavors in addition to another full-time faculty member for the program. As a sign of OCCC's commitment to the Chemistry Program, two temporary Instructor positions were added for Spring 2023 to help with staffing issues. A permanent Instructor position has been requested.

The Physical Sciences Center (PSC) serves as a tutoring center for students in the Chemistry program in addition to providing a space for make-up labs and to study course material. The PSC houses several computers which can facilitate learning of lab materials as well as serving as a computer lab for all OCCC students who may need the use of a computer. The PSC staff provides tutoring services and prepares and sets up lab materials for lab courses in the program.

The PSC staff continually served students, including during the pandemic shutdown where they worked virtually to assist students. Over the past five years, thousands of students have been served by the PSC. Due to pandemic and staffing issues, the PSC has had to minimize their hours of operation, so as time moves on from the pandemic, we anticipate PSC usage will increase as hours of operation do.

Over the past two years, the PSC was severely short-staffed with only two employees working to serve the great majority of these students while still setting and preparing labs. While the open positions were posted, the pay rate was well below a living wage and applications were not received. While we suspect low wages to be the main reason that there were no applicants, we plan to start performing exit interviews with lab staff when they resign to gain a clearer understanding of their desire to leave. Additionally, some work with HR has resulted in large enough wage increases that two new lab assistants have been hired during the Summer 2022. While these wage increases are much appreciated, there are still equity questions regarding compensation for lab assistants in the SEM division vs. those in the Health Professions division, which do not, to our knowledge, require any special trainings or certifications. Our current pay range for these positions is $29,000-$31,000 (with an associate degree) at the competitive rate.

In fall of 2020 OCCC moved to an 8-week model for course delivery. Therefore, in the fall of 2020 and the spring of 2021, all chemistry courses were offered only in the 8-

week format. However, since that time, the chemistry program has had more latitude in choosing the format of course offerings. The Chemistry program has opted to offer most sections in the more traditional 16-week on-campus format while continuing to offer some sections in other formats. The Chemistry program has worked to offer as many of these sections as is possible, but is limited by lab space. It is not reasonable to have 8- and 16-week labs share a lab space since the lab exercise change-outs would have to occur multiple times a week, if not multiple times a day. This has resulted in an inability to offer some sections when there may have been a high demand for those sections. We are therefore looking at renovating an existing space to create an additional laboratory. Increased lab space options and considerations of expanding the Physical Sciences Center staff and compensation will help meet these needs.

Regarding the supply budget for the program, almost all needs are currently being met by annual budget allocations, with larger, less-frequent purchases being funded by the division or a variety of grant funds. However, as we create more lab space to meet demand, we are hopeful that budget lines will increase proportionately to adequately supply those lab spaces.

Chemistry Program-related Library Resources:

Instruction and Reference

Reference librarians (4.5 FTE) provide instruction and reference assistance to students. Students should receive an introduction to the library's resources as well as instruction on selecting and evaluating sources in the required Success in College and Life course. Additional instruction is provided to individual classes, usually with a focus on the appropriate resources for that discipline.

Librarians are available by online chat approximately 56 hours per week. Also, librarians are available in the library for in person assistance Monday-Thursday 8 AM to 9 PM and Friday 8 AM to 5 PM. Additionally, students may contact librarians via email or the library website for research assistance. Video tutorials and online LibGuides on the library's website supplement instruction by providing guidance for students who are off campus.

Print and Electronic Resources

The Science Engineering and Mathematics librarian selects and purchases science and biological related materials. Items are evaluated for content and to ensure they are appropriate for college freshman and sophomores. Most book purchases are based on reviews in Choice, and related scholarly journal reviews. Recommendations by faculty are also encouraged. The collection is weeded periodically to maintain currency. Ebooks are purchased. The pandemic caused a shift in ebook usage; prior to the pandemic ebooks were not heavily used by students.

Although course textbooks are available at the library Circulation Desk for in-library use, most students use the Day One access to their textbooks. Even so, there are students still using the Reserve collection.

Print periodicals for chemistry have been eliminated in favor of electronic access. The Masterfile Premier, Academic Search Premier and other databases available via EBSCOhost are a substantial source of relevant mass market periodicals and full text, peer-reviewed scholarly chemistry journals.

Academic Video Online, PBS, and Films on Demand, collections of academic and scholarly videos, are utilized by faculty teaching online courses as well as in the on-campus classrooms. Over 200 videos related to the field chemistry are available in Academic Video Online. PBS has over 50 videos related to chemistry, and Films on Demand has over 250 videos related to the science of chemistry.

The library also strives to support the professional development of faculty. The circulating book collection is updated with books on teaching, learning, technology in the classroom and curriculum development. The library has the Education Source database (available via EBSCOhost) to provide faculty access to periodical literature on teaching and andragogy.

During the pandemic closure and subsequent reduction in hours, library staff worked to ensure access to resources and services by mailing books to students, extending due dates, providing curbside book pickup, increasing online chat coverage, creating additional instructional videos, providing online access to course reserves and additional electronic databases, offering Zoom reference meetings with students, and laptop and webcam checkout. A wireless hotspot checkout service was added in Fall 2021.

Facility

The library offers public computers, group study rooms, digital scanners, free printing (100 pages per semester, per student), huddle stations, mobile white boards, laptop and hotspot checkout, and a designated/monitored quiet study area.

In Fall, 2022, the library installed individual use cubicles (Study Cubbies) in the designated quiet study area. Study Cubbies are reservable by all OCCC students, faculty, and staff.

In summary, the library supports this program and the faculty comprehensively and appropriately.

Recommendation(s)

A. Recommendation for the Program (3.7.7.A.4):

- ☒ Maintain the program at the current level.
- ☐ Continue the program with modifications as noted below and detailed in the comment section below.
  - ☐ Expand the program
  - ☐ Reduce program in size or scope
  - ☐ Merge or consolidate program
  - ☐ Reorganize program/curricular modifications*
- ☐ Suspend program to allow an opportunity to consider recommendations detailed in the section below*
- ☐ Delete program*

**Requires a Request for Degree Program Modification and governing board approval.*

B. Specific comments regarding recommendations:

(Provide detailed recommendations for the program as a result of this thorough review and how these recommendations will be implemented, as well as the timeline for key elements. Recommendations to suspend or modify the program should include measurable goals and a timeline for monitoring the program in one-, two-, three-, or four-year increments)

Recommendations	Implementation Plan	Target Date
Increasing the current full-time faculty positions by one or by adding full-time lecturer positions to staff high demand courses.	A. In the absence of an official mechanism for requesting a new faculty member at OCCC, the program chair and faculty will simply be vigilant in their efforts to advocate for the additional of a full-time faculty member whenever given the opportunity. B. In regards to a full-time lecturer position, the Dean of the SEM division is currently in talks with HR and higher-level administration to determine the feasibility of this position at OCCC. If allowed to proceed with the creation of this type of position, the Dean has already identified funds to support it.	A. Until accomplished. With schools budgets fluctuating every year, it will be unclear if/when funds will be available to add a full-time faculty position. B. A full-time lecturer position might be a reality by the 2023 – 2024 academic year.
More lab and classroom space will be needed to continue to meet current program demands.	Begin conversion of SEM 1C7 to a fully functional lab space. The process includes finalizing the floor plan, procuring materials, identifying appropriate contractors for installation, and coordinating all steps with Purchasing and with Facilities Maintenance.	Until accomplished – possibly by Spring 2024.
Adjunct recruitment needs enhancement. Applications for adjunct instructor positions from local, in-state positions has significantly decreased over the past several years. This, coupled with limits on adjunct faculty workloads have made adjunct recruitment a new priority for the department.	The department chair will work with the Dean and HR to modify the current advertisement plan for Chemistry Adjunct positions.	By the end of the 2022 – 2023 academic year.
Redesign the online portions of CHEM 1115.	Explore consolidation of topics and re-working of currently used online course content to improve student knowledge and skills. Improved content could be used for an online course in conjunction with an on-campus laboratory or to provide content to cover “snow days.”	By the end of Fall 2023.

Add additional rows as necessary

Department/
Program Head _____ Date: Click here to enter a date.
(Signature)

Dean _____ Date: Click here to enter a date.
(Signature)

Chief
Academic
Officer _____Date: Click here to enter a date.
(Signature)

President _____ Date: Click here to enter a date.
(Signature)