Self-Study Report for the Chemistry Program

Southeastern Oklahoma State University

Durant, Oklahoma 74701

Bachelor of Science - Chemistry

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Chapter I: Department Overview

The Department of Chemistry, Computer, and Physical Sciences (CCPS) oversees three Bachelor's degree programs: A Bachelor of Science degree in Chemistry with four options; a Bachelor of Science degree in Computer Information Systems with two options; and a Bachelor of Science degree in Computer Science with two options. Additionally, CCPS offers chemistry, computer science, and physical science courses in the General Education program and support courses for the Elementary Education program and the Master of Education program in Curriculum and Instruction with an emphasis in Science Education. The focus of this program review is the Bachelor of Science degree in Chemistry. The Chemistry program has a core which is common to all four options and specified required courses and elective courses for each option in the Chemistry major. Many of our students are in the Chemistry-Medical Sciences option which is an interdisciplinary Biology-Chemistry double major.

Our program serves students primarily in the South-East Oklahoma and North Texas regions. It is one of the few public four-year institutions in the area. The closest regional public four-regional institution is East Central University, near 80 miles to the North in Ada, Oklahoma. The next closest regional public four-regional institution, Cameron University, in Lawton, Oklahoma.

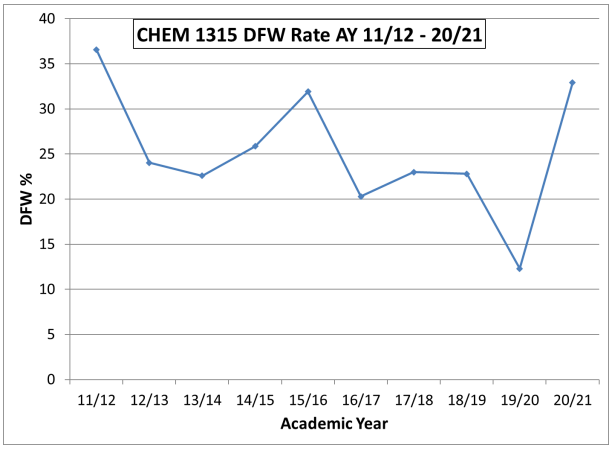
The Chemistry degree plan checklists are shown in Appendix II. The four options include: a 40-hour Chemistry major; a 76-hour interdisciplinary Biology-Chemistry double major (Medical Sciences); a 60-hour Professional Chemist major-minor; and a 58-hour Biochemical Technology (major-minor). The chemistry core for all degree options includes 15 hours consisting of General Chemistry II (CHEM-1415), Organic Chemistry I (CHEM-3053), Organic I Laboratory

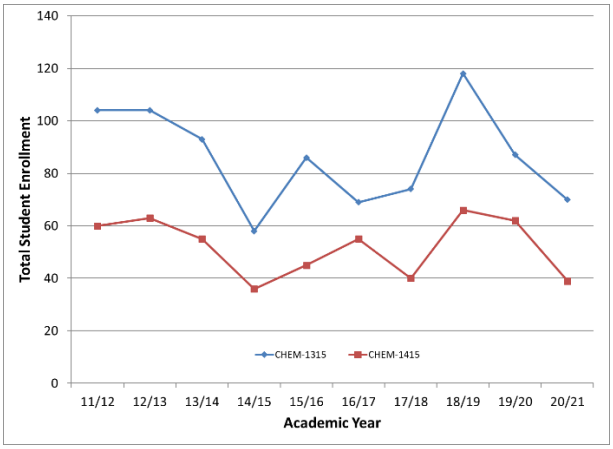
(CHEM-3062), and Chemical Analysis (CHEM-3425). As opposed to our sister regional institutions, most of our Chemistry degree options do not require Physical Chemistry and the associated higher level math to be successful in P-Chem. The Professional Chemist track does have the Physical Chemistry I required and a minimum of Calculus I and II and is the recommended path for students intending to pursue chemistry graduate school. Over the past 10 years, less than 5% of our majors have chosen the Professional Chemist track. The Chemistry-Medical Science is a unique interdisciplinary double major among the regional colleges in Oklahoma being a true balance between chemistry and biology. This track has proven most successful in preparing our students for professional programs in the health sciences field and frequently makes our graduates very competitive applicants. These Pre-Professional students are getting well beyond the required minimum courses to apply in both biology and chemistry.

The majority of our incoming majors are declared as Pre-Professionals, but many choose an alternative path after encountering difficulties in their fundamental science courses. The average Science ACT score of students enrolled in our General Chemistry I is less than a 22 for students enrolled in the previous 10 years. The STEM Benchmark Score is a 26 for students taking calculus, chemistry, biology, physics, and engineering courses. This Benchmark Score represents a 50% chance of obtaining a B or higher in that subject area.

Recognizing the roadblocks many of our students faced, CCPS took a number of steps to increase student success in the past 10 years. These included standardizing the course content covered in General Chemistry I and II so that all students had equal background going into their second-year chemistry courses and rotating faculty teaching assignments. In addition, CCPS provided in-department tutors to support freshman-level chemistry courses. Faculty were encouraged to explore different avenues that might lead to increased student success. These

included the use of student response systems (clickers), lecture capture, scheduled review days, supplemental study materials, tutorial videos for homework, and student-peer mentors for selected sections. The combined results yielded a significant increase in our student success rate as directly measured by the DFW rates in General Chemistry I and II and by growth in the number of majors as the overall undergraduate enrollment of the institution has been in decline. The exception to this trend was the transition to online learning with the COVID-19 epidemic, which yielded higher DFW rates and decreased enrollments in 20/21.





The last time the Chemistry program underwent a program review was in 2010. Because of repetitive administrative changes and a campus-wide budget crisis followed by COVID-19, this program review has been postponed multiple times. We will focus on data and changes over the past five years even though it has been 12 years since our last review. The Chemistry component of the department typically includes five chemists: an organic chemist, inorganic chemist, biochemist, physical chemist, and analytical chemist with all of the chemistry faculty sharing the responsibility of the freshman-level chemistry courses and service courses for the department (see Table 1).

In the past five years, the department underwent several changes. Two chemistry faculty left the department – Dr. Mo Chehbouni resigned in 2017 to take a teaching position at a different institution and Dr. Loide Wasmund retired in 2019. The CV of the current chemistry and other physical science faculty are listed in Appendix I.

Table 2 shows the departmental budget for Chemistry, Computer, and Physical Sciences. This image is not a true reflection of the Chemistry program since these numbers include the Computer Science and Computer Information Systems faculty and adjuncts. The Computer Science component pays faculty at a higher salary in general due to demand in the field and CS/CIS have had multiple turn overs in the past five years with new hires staying only a short time at the institution. The non-professional salaries include monies for our student workers and departmental secretary. We have adequate funds to pay student workers as teaching assistants. Our problem over the past five years is the lack of students wanting to work for the department. The supplies budget has fluctuated considerably each year. Between 2010 and 2016, our department's budget allocation for non-personnel services was decreased each year systematically when campus-wide budget issues became pressing. This departmental budget item includes travel, supplies and operating expenses, and property, furniture, and equipment. In 2017, CCPS received regents approval to add a $10/credit hour academic service fee for all Chemistry, Physics, and Physical Sciences courses. This led to a significant increase in the available budget in FY 2018 and allowed the department to purchase some technology upgrades for the classrooms and new lab equipment. However, a change in Southeastern's President and Vice-President of Business Affairs changed the student fee structure so that tuition was increased and individual course fees were eliminated. This reduced our operational working budget for the Chemistry program by more than 40% between FY18 and FY19. Monies for faculty travel were

minimized. For most years, travel has been $2,000 or less for the entire department of CCPS, the chair chose to use the available funds to send one faculty member to a national conference or provide the institution match funds for travel. Our on-campus Organized Research program has some travel grant opportunities for professional development and supports faculty attending conferences. However, the Organized Research program will cover no more than 70% of the cost to attend the conference and has a budget cap of $1,700. CCPS used its travel monies to cover the 30% balance for multiple faculty that received the Organized Research travel grants in the previous five years.

The while the operating budget for the Chemistry program is lower than desired, the critical need is facility renovation. The Science building was originally constructed in 1924. The Science building renovated in 1967 with the addition of the North wing which houses all of the laboratories except the Biochemistry lab. These 1967 laboratories have had only the required minimal maintenance to keep operational and need updating both in terms of cosmetics and functionality.

We have updated the instructional technology in some of the classrooms in the Science building. All of the teaching classrooms have SmartBoard technology. Two classrooms have newer LCD touchscreen SmartBoards. All of the other classrooms have older SmartBoards that work in tandem with a LCD Projector to create the visual image. Unfortunately, the LCD projectors are lacking in resolution and brightness. In general, the technology in these classrooms have been pieced together room-by-room and there is a lack of consistency across the classrooms. A faculty member needs to "re-train" for the technology in each room. Not all faculty have chosen to utilize SmartBoard technology. The university's definition of a *Smart Classroom* is very dated. This became much too clear during COVID-19 when faculty were forced to adopt to

some form of blended or remote learning experience and encountered significant technical difficulties making the format work for themselves and the students. The university did provide every faculty with a Zoom account with the onset of COVID-19. However, most faculty had minimal training with Zoom prior to the epidemic and faced a step learning curve. COVID funds provided each classroom with a crude video system – typically consisting of a low resolution web camera and a microphone.

Table 3 shows the results of the recent faculty survey. A few critical things should be pointed out about this data prior to its discussion: 1. It includes input from both Chemistry/Physical Science faculty and well as the Computer Science/Computer Information Systems faculty (who are housed in the new General Classroom Building – the newest structure on our campus); and 2. This survey was given in February 2020, prior to the COVID pandemic influencing our way of education. The faculty rating for the physical environment is a mixed picture varying from Below Average to Outstanding (see Table 3A). We doubt any chemist would rate the physical environment of the Science Building as Outstanding. The rating of the Instructional Technology and Instructional Technology Support again is a mixed. The Equipment Available for Teaching and Equipment Available for Research are slightly below Average. The largest concern for the faculty is the "Overall level of funding available to faculty in the department for scholarly/creative activities and professional development" – receiving the lowest score of an item in the survey (see Table 3E). Unfortunately, faculty teaching loads and the budget required to support faculty development are controlled beyond the department level. The university budget crisis in 2016 forced all departments to minimize the number of course offerings and maximize enrollment in each section. Table 3B. shows that most faculty feel our current mix of Face-to-Face, 100% Online, Blended, and Synchronous Interactive Distance Education courses

is about right in all types. However, student preference continues to push towards 100% Online – asynchronous delivery. In General Physical Sciences (PSCI-1114), the current student demand is 2:1 in favor of 100% Online over Face-to-Face delivery. This will continue to be a struggle for our science program in the future. The Free Response Questions in Table 3G also echoed the need to improve laboratory facilities. On the faculty survey, 6/8 faculty thought that they have all they need to do their job well most of the time or more higher (see Table 3F.)

Except for the COVID-19 semesters, most of our classes are face-to-face in format for the Chemistry major. We have used a few adjunct faculty to teach online upper lecture courses in chemistry only during a lack of available faculty in the department. We explored the use of blended format chemistry courses that have both an online and face-to-face component but results showed significantly lower levels of student success, so these attempts were abandoned. Most of our chemistry courses have a laboratory component. Therefore, we don't wish to move towards more online courses offerings for major courses in Chemistry. The accommodations made for COVID-19 with online learning only re-enforced our convictions towards this with significantly reduced student success in every measure.

In general, the climate of the department needs improvement. The faculty survey indicates the "level of collegiality" between faculty averaged 3.38/5.00 with two of eight indicating poor or below average (see Table 3A). In the open-format questions in the faculty survey expressed concerns about DFW rates and student course evaluations being used as part of a faculty's annual evaluation (see Table 3G). The current CCPS chair shares a number of course indicators including DFW rates, student performance on ACS exams, and cumulative student course evaluation scores with all faculty so that the faculty can learn from each other to improve their instructional strategies. The chair's goal is to look at trends in this data based on multiple

semesters and incorporate the results as a key performance indicator as a component of a faculty's annual evaluation. This is a significant deviation from what has been done in the past in our department as well as what most other departments on campus do for annual evaluations. Another concern expressed repeatedly was the desired for more professional development opportunities and support to do research. In years prior to 2016, the department would have an annual Holiday Party. Participation decreased in part due to the number of faculty commuting to Southeastern from more than 60 miles daily. Several faculty in the department commute from North Texas and as far as the DFW Metroplex daily. The occasional potluck luncheon has been eliminated with the COVID-19 pandemic. There is some level of disconnection between the Physical Science faculty and the Computer Science/Computer Information System faculty, which are housed in a separate building. Some faculty may not see each other more than a few times a semester. The 12-credit hour teaching load, which is a university-wide standard, is more like 15-20 contact hours since most faculty teach more than one laboratory component (2 or 4 hours) weekly, and the upper-level courses are usually prepared by that instructor each week. Between being in the classroom/laboratory and preparing for class or laboratory, it is difficult to fit in service on committees and commit to adequate time research.

Overall, the Chemistry program is above average. We do well in teaching our students overall. The Chemistry program successfully prepares students for professional school, as demonstrated in our annual Program Outcome Assessment Reports. Of the fifty-eight chemistry graduates between 16/17 and 20/21, nine were admitted into chemistry or related graduate programs, and twenty-two were admitted into professional programs (medical, optometry, dental, pharmacy, and veterinary doctoral programs). Several of our other chemistry graduates have chosen alternative certification as a pathway to public education, with seven becoming a high school

science teachers. Most faculty rate the level of Communication between Faculty and Students higher at 4.0/5.0 (see Table 3A).

Chapter II: Implementation of Recommendations from Previous Program Review

Because of the administrative turnover, campus budget restrictions, and COVID-19, there was a larger time (12 years) than normal since our last program review. The following recommendations are from our 2009-2010 program review.

1. **Continue to pursue an American Chemical Society Certified degree option.**

   The attainment of an ACS-Approved Program would be a major accomplishment for the Chemistry program at Southeastern. In 2010, we contacted the ACS Committee on Professional Training (CPT) to explore what program modifications would need to be considered to apply to the CPT-approved degree program. The six key requirements we recognized for the ACS-CPT approval were: 1. The chemistry program should be administered by a chemistry department organized as an independent unit with control of an adequate budget. *The department of CCPS is a unique blended department that has oversight over all physical sciences in addition to computer science with a single combined budget*; 2. The chemistry core must include a minimum of 28 credit hours and should include analytical, inorganic, organic, calculus-based physical chemistry, and biochemistry. *While most of our majors take most of the required core, less than 10% take physical chemistry and that percentage is trending lower*; 3. A minimum of four full-time chemistry faculty. *Requirement meet*; 4. At least 75% of the faculty must have doctoral degrees. *Requirement meet*; 5. Under no circumstances should the teaching load exceed 15 contact hours per week in any semester and significantly lower loads are strongly recommended. *Most of our faculty exceed 15 contact hours at least one semester a year, if not both semesters – especially those faculty that teach lower- and upper-level*

chemistry courses with a 4-hour laboratory component; 6. The number of students supervised by a faculty or teaching assistant in the laboratory shall not exceed 24.

Requirement meet.

In 2013, the CCPS chair met with then Vice-President of Academic Affairs Dr. Douglas McMillian to discuss the program modifications that would have to be considered to proceed with a CPT application for the Chemistry program. Taking into consideration that the current program was lacking in three of the six requirements and the implementation of these requirements would require a major restructuring of the department of CCPS to make Chemistry an independent unit as well as significantly reduce the teaching loads to reduce the number of contact hours – the pursuit of the ACS certified degree option was suspended. This decision is impacted by the fact that more than 70% of our chemistry majors are declared Pre-Professionals (Pre-Med, Pre-Dental, etc.) and have little interest in the calculus-based physical chemistry course. The most recent guidelines from the CPT are from the Spring 2015, and there have been changes allowing options with more flexibility of course requirements. However, the teaching loads at the institution are not subject to reduction under the current administration, and this recommendation will continue to be tabled. The Professional Chemist option does meet the curriculum guidelines for the CPT-approved program and remains the recommended path for students seeking chemistry graduate school.

2. **Revise course offerings and degree requirements to better align with the ACS Certified degree option.**

   The department addressed this recommendation in two ways. Several courses were renamed to provide better alignment. First, the Thermodynamics lab (CHEM-4462) was

renamed Physical Chemistry I Laboratory. The prior name resulted from a joint laboratory course that served both chemistry and physics majors. The physics program at Southeastern was eliminated in 2009. Biochemistry (CHEM-4115) and Metabolism (CHEM-4193) were renamed as Biochemistry I and Biochemistry II. Radioactivity and Nuclear Measurement (CHEM-3612) was renamed and re-designed as Introduction to Nuclear Chemistry.

3. **Add more 2000-level courses and half-courses.**

   Two new 2000-level chemistry courses were created. These include Introduction to Research (CHEM-2212) and Chemical Literature (CHEM-2311). Introduction to Research has been offered annually and draws a decent enrollment. Chemical Literature has been offered twice but at much lower enrollments. The last offering of CHEM-2311 in 2017 was canceled due to zero enrollment.

4. **Advertise both on and off campus of the success stories of both biotechnology and chemistry program students.**

   The Biotechnology program was eliminated in 2011 due to a failure to meet the required number of graduates and majors for a new program. It was re-created as the Chemistry-Biochemical Technology option. The CCPS chair recruits from all the surrounding junior colleges. Prior to COVID-19, the CCPS chair worked with Southeastern recruiters and would attend recruitment events at the junior colleges and then give a presentation within the target department for science majors and Pre-Professionals. In addition, a recruitment PowerPoint file has been created that is available to all faculty that outlines the programs in CCPS, overviews our strengths and opportunities, and highlights student success stories with one-page profiles of each student. The chair shows this presentation

to several recruitment groups each semester including Honors Day, SE Live, and the SE Curriculum Contest. In addition, CCPS spearheaded the creation of a STEM Day @ SE to specifically target the recruitment of science majors in 2019. For the STEM Day event, the department had more than twenty chemistry alumni create a 1–2 minute selfies video describing what they majored in at Southeastern, post-undergraduate studies (if any), career path including current, and why a new students should consider chemistry. These selfies videos were combined into a single video and shown as part of the programing of STEM Day. Unfortunately, STEM Day was cancelled for the last two years due to COVID-19. The individual alumni videos have been used in some freshman-level chemistry courses to demonstrate our graduates' success and encourage students to pursue chemistry. Lastly, we placed an LCD TV in the Science building hallway that loops the department PowerPoint featuring the graduate success pages for current students to view.

5. **Up-dating the old chemistry inventory system**

   The chemical inventory system was updated to Verete by VIM Enterprises in 2015. This is a web-based system that allows real-time inventory and searching features. All new chemicals are uploaded into Verete software inventory and empty containers are removed by the stockroom manager – Bradley Corbett. Current room chemical inventories are updated each year and are available on-demand.

6. **Improve temperature control in offices, repair damage in the Science Building, etc.**

   Temperature control has been a continuous issue in the Science building. The air circulation does not yield consistent temperature control with the current house HVAC in the building. To complicate this issue, the campus switched to a central circulating loop

that brings cool or hot coolant to heat exchangers to heat/cool all buildings around twenty years ago. The science building is the closest building to the central plant – however, it is the last building on the loop. In addition, the temperature control is maintained outside the science building. In the summer, the system works by freezing water in large freezer units and then circulating chilled water from these units across campus. At 2:00-3:00 pm, circulation stops, and the freezers are allowed to refreeze for the evening until the next morning. Temperatures rapidly rise in afternoons in the summer and fall afternoons in the Science building. In February 2021, Oklahoma was impacted by an unusually hard freeze that took temperatures to below 0 °F for several days, which also knocked out the power to campus, causing substantial freeze damage several buildings. The air handling unit on the second floor of the Science building suffered unrepairable damage and is scheduled to be replaced in the future. A temporary unit has been placed outside the building to provide cooling/heating to the second floor but this unit eliminates the use of the central stairwell because of the ductwork installed. Students and faculty that need to go between floors must walk the entire length of the Science building to the North stairwell. An unrelated complication occurred when the only evaluator in the Science building when out of service in September 2021 and remained out of service for over 10 months. Hopefully, the air handler can be replaced in the next one-two years, but the critical issue of poor temperature control in the Science building will remain.

7. **Upgrade and renovate teaching laboratories and equipment.**

The department has requested laboratory renovations in its annual budget request for the past ten years. The financial situation of the institution has prevented most routine maintenance. All major renovations have been tabled until recent years. The teaching

laboratories in the Science building were constructed in 1967. In many labs, the hoods have greatly decomposed. Power is inadequate for many uses – for example, if more than two hotplates are used in the freshman or organic chemistry laboratories, the electrical breaker will trip. The organic chemistry laboratory performs all of its experiments in open bench space with limits what students can do and certainly exposes students and faculty to volatile chemicals. Current Southeastern President Newson recognized the need for renovation of the organic laboratory and set aside $600k from the university surplus reserves for its renovation in 2020. However, COVID-19 struck and the above-mentioned freeze damage postponing the start of the organic laboratory renovation. Southeastern was recently the recipient of $6.8M in ARPA funding which will be used to provide renovation and expansion of the Science and Biology buildings. CCPS has requested the complete renovation of the Organic laboratory and hood replacement for all laboratories to include modern fume hoods with functional made-up air to help with the HVAC in the Science building and increase the electrical as needed in laboratories. A new Agilent 8454 diode-array UV/Vis spectrometer was purchased in 2017. A Thermo Nicolet iS20 FT-IR was purchased in 2021. The software and computers have been in updated for the Agilent 5975 GC-MS and the Anasazi 90 MHz FT-NMR in 2022.

8. **Transform S237 into a chemical waste-handling and storage area.**

This room conversation has never been addressed. S-237 is currently a small faculty bathroom and is less than 80 ft^2. It is an interior room with minimal ventilation. The department's chemical storage issues and waste-handling will not be addressed by this small addition. It has been requested to utilize part of the $6.8M in ARPA funds to create

a chemical stockroom annex that would be attached but external to the Science building. This would allow the relocation of the current stockroom, located in S-234, having no firewalls and only makeshift ventilation, to a code-designed structure for chemical storage and distribution. This recommendation had been the requested in several prior program reviews, was recommended for funding, and went to the level of meeting with architectural teams, drawing up plans, and getting bids, only to have the project terminated on two separate occasions between 1995 and 2005. We are hopeful the current funding can finally address this issue.

9. **Reallocate laboratory and storage space to make better use of facilities.**

   S-224, -226, and -235 were renovated in 2010 with funding from an NSF grant written by Drs. Paiva and Smith. These laboratory areas are dedicated research spaces shared among the faculty. Other laboratories exist in the department that can be used on alternating semesters for research. A prior upper-level physics laboratory (S-128) which is adjacent to the freshman chemistry laboratories in S-122/124 has been converted from a classroom into a general storage area for departmental equipment.

Chapter III: Review of the Chemistry Program

The Chemistry program has a core requirement that are required for each of the four options within the Chemistry major. The four options include: a 40-hour Chemistry major; a 76-hour interdisciplinary Biology-Chemistry double major (Medical Sciences); a 60-hour Professional Chemist major-minor; and a 58-hour Biochemical Technology major-minor. The chemistry core for all degree options includes 15 hours consisting of General Chemistry II (CHEM-1415), Organic Chemistry I (CHEM-3053), Organic I Laboratory (CHEM-3062), and Chemical Analysis (CHEM-3425). The Chemistry degree plan checklists are shown in Appendix II.

The program productivity is summarized in Table 4. Until only the last two years we have been 25-30% greater than the university average for number of majors for each program. The Student Credit Hour (SCH) production was higher by 40-50% over the university average but is driven by the fact that all three freshman level chemistry courses count as General Education courses (see Table 4A). Unfortunately, our data collection in Academic Affairs and the Registrar's Office did not track our major options so only the total number of chemistry majors and graduates in show for all but the last year. Our number of students and SCH has gone down significantly in the past two years. This was in part driven by COVID-19 and was preceded by a downward turn in students taking General Chemistry I & II, as discussed in Chapter I in 19/20 and 20/21. We believe this is due to multiple factors. First, the institution made a strategic decision to partner with Academic Partnerships (AP) and offered programing in a 100% online format consisting of 7-week courses with seven semesters each year. Students that are recruited by AP pay a reduced tuition and fee structure compared to traditional students that enroll at the Southeastern campus. In 2016 this partnership was limited to only graduate programs. In the Fall 16 the total graduate enrollment was 607 which grew to 2,421students in the Fall 21 with

over 90% of that enrollment being with AP. Due to the success in terms of enrollment for the graduate programs, this AP format was broadened to include 12 undergraduate majors. Even though our university's enrollment is steadily increasing and we are experiencing a financial windfall, the number of students on-campus taking face-to-face courses has tremendously decreased. The most popular undergraduate degree conferred in 20/21 was a Bachelor of Science in Liberal Arts and Applied Studies is which a program based on a composite of 7-week AP courses. In Fall 21, only two years after the introduction of AP undergraduate programs at Southeastern – Academic Partnership designated undergraduates already represent 13.2 % of the undergraduate student body. These AP students have a completely virtual presence and never step foot on our campus. They are not part of the recruitment pool for the Chemistry program.

Then of course COVID-19 hit and our enrollment took a hit as student success decreased for existing students. For example, the DFW rate for CHEM-1315 averaged 19.7% for years 16/17 to 19/20 and then suddenly jumped to 32.9% in 20/21. This was followed by a significant decrease in the number students entering Organic Chemistry I in Fall 21 – however, this data is not presented in the timeline of this review. During COVID-19, some professors worked with the institution's Center for Instructional Development and Technology and made virtual labs with limited success. The chemistry faculty do not feel virtual is a substitution for many hands-on experiences needed to be successful in the chemistry major. In addition, chemistry chose to move their course delivery for the scheduled face-to-face courses to a synchronous Zoom delivery format. Student participation in the synchronous Zoom was below average at best to poor, depending on the course. Given the option students choose to take a 100% online asynchronous format, and some students switched majors. Table 4C illustrates this problem clearly, showing the university average enrollment trend for General Educations courses

decreasing from a 138.8 headcounts in 16/17 to 66.6 in 20/21, while the online 16-week headcounts increased from 59.9 to 87.4 headcounts and the 7-week online increased from 34.1 to 91.1 headcounts in the same time period. Some of the chemistry taught during 20/21 were delivered as 100% online for one semester.

Table 5 shows the demographics of the student in Chemistry program from 16/17 to 20/21. The data in this table were condensed for our major options since the institution did not begin tracking major options until 20/21, so zero are assigned to all Chemistry-options for the year 2016. Only the total representing all four chemistry major options is shown. The data shows a 38.8% reduction in number of chemistry majors which actually tracks better than the university average. The male-to-female ratio is consistent near 55% male and tracks with the university average. The largest three ethnic groups are Native American (16.5%/16.2%), Caucasian (43.0%/45.9%), and two or more (26.4%/23.0%), all of which remain almost unchanged over the past five years. The alarming trend in this data set is in the number of Freshman among our majors which decreased from 46.3% in 16/17 to only 9.5% in 20/21. This is due in part to a new enterprise resource planning software known as Colleague Self Service at our institution. This new platform manages student enrollment, scheduling, catalogs, etc. The rollout of this new platform has been anything but smooth and has introduced challenges for students and faculty alike. A major issue we encounter is the difficulty in having a student change their declared major. Currently, a student's major is declared when they enroll. To change this, a student must navigate through 4 levels of the Colleague Self Service software and complete a manual form which is then submitted electronically to the Registrar's Office. The Registrar's Office must manually change the student's declared major. We routinely ask students to update their major during advisement, which frequently doesn't occur. Another somewhat surprising trend was the

decrease in the average age of our major from 24.3 in 16/17 to 21.7 in 20/21. We feel this can only be explained by students switching majors after their freshman or sophomore years, and the numbers represented are artificial. We still have a small number of non-traditional chemistry majors. Next, the average ACT of our majors slightly decreased from 22.7 in 16/17 to 22.3 in 20/21. While not a huge difference, this reflects the larger percentage of upper-level students (Juniors and Seniors), which should be pushing the average ACT score for our major much higher. The last comparison is the percentage of transfer students, which decreased from 23.1% to 12.2% over the five years reviewed. This is certainly not a positive trend, but our access to recruit physically at junior colleges was eliminated in 2020 with the onset of COVID-19. We are hopeful this will return to pre-COVID levels and help with the growth in the major headcount.

The retention of chemistry majors (coming back the following year) from Fall 2016 to Fall 2017 was 59.4%, which is almost identical to the university average of 59.1%. The retention decreased significantly from Fall 2019 to Fall 2020 at 48.7% and again from Fall 2020 to Fall 2021 at 45.9%. We think there are a number of factors that contribute to this decrease in retention. First, COVID-19 lowered student preparedness leading to many students switch to majors requiring the least critical thinking skills and overall effort. Secondly, the new Colleague Self Service does not allow students to easily change their major yielding student listed as chemistry majors with no intention of finishing a chemistry degree. The department hasn't done anything to increase retention directly, but faculty are always modifying their courses to facilitate learning. This was especially true during COVID-19. One trend that we did observe is that the Biology department had a very similar reduction in retention to 44.6% from Fall 2020 to Fall 2021 and that most of the other chemistry programs at regional colleges in Oklahoma have reported a similar and even higher reductions in retention.

Table 6 shows the results from the survey of current students taken in February 2020, when the program review was originally scheduled to be conducted. There were only 13 chemistry majors that responded, with only one senior student responding (Table 6A). Overall, the students rated the learning environment and face-to-face instruction in the major from average to outstanding, and those ratings were higher rating than face-to-face instruction outside the department by a good margin (see Table 6B). When asked their opinion regarding the availability of different modes of course delivery in the department, four students indicated no need to change, four students indicated more face-to-face courses, and five students indicated more online courses should be offered. It is difficult to conclude this since Chemistry hasn't been offered any online courses in the past four years, so "more face-to-face" shouldn't be a consideration. It is possible that the students are responding to courses in general offered at Southeastern. Over 68% of the students rated above average or outstanding for academic advising provided by faculty in the major, level of communication between students and faculty, and ability to interact with major faculty outside the classroom. The rigor of courses in the chemistry major was rated over 68% above average or outstanding with no responses to poor or below average. The overall level of satisfaction with your academic experience in the chemistry major was 15.4% average, 53.9% above average, and 23.1% outstanding (Table 6C). Table 6D shows that 46% of our responding chemistry majors spend between 1-10 hours weekly studying or doing homework outside the classroom. This is disappointingly high percentage and is a reflection of why some students struggle or fail. Almost 70% of our students work 11 hours or more weekly and 30% work more than 21 hours weekly. Over 90% of the chemistry students agree or strongly agree that faculty treat students in chemistry with respect and fairness, provide appropriate feedback in courses, and assign grades based on the quality of work and performance by students (see Table 6E). If

given a “do-over”, 67% of the students indicated they would enroll in the same Department/Degree Program at Southeastern, while 33% indicated they would enroll in the same Department/Degree Program at another institution. 83% indicated they would recommend attending Southeastern to a friend or family member. Overall the ratings indicate that the current chemistry students are satisfied with the chemistry program and faculty.

Table 7 summarizes the alumni survey results from 29 alumni respondents. The overall results indicate that alumni think the chemistry program did a good job, with over 70% choosing fairly well or very well for the field of study (see Table 7A). Eighty-seven percent agreed or strongly agreed that they acquired a lasting knowledge of key facts in their field of study (Table 7B). Over 75% agreed or strongly agreed that Southeastern prepared them to get the employment opportunity they wanted after graduation and to be successful in their current career. Over 83% ranked the learning environment in the chemistry major as above average or outstanding and gave higher rankings for face-to-face instruction in the major compared to face-to-face outside the major (Table 7C). Most indicated that faculty concern for students in the major was above average (16.7%) or outstanding (62.5%), which was considerably higher than concern by non-departmental faculty. Almost 46% of the alumni choose “not applicable” as their response to department faculty assistance in finding employment. We attribute this to the fact that over 50% of our graduates either directly enter a graduate or professional program and are not directly seeking employment. Of the alumni that completed the survey, 41.7% enrolled in a professional school and 16.7% in graduate school (Table 7D). Only 8.3% of the alumni indicated they were employed in their field of study within the first year of graduation. When asked if allowed a “do-over”, 54.2% of the alumni indicated they would enroll in the same Department/Degree Program again at Southeastern, while 12.5% would choose the same degree program at a

different institution. When asked about how long did it take to earn your degree, 91.7% of the alumni indicated "About what I expected." Table 7F polls the factors that determine the time for the alumni to earn their degree at Southeastern. Family obligations were indicated as a factor of major importance for 33.3% of the alumni and were the strongest contributing factor. Only 12.5% indicated that poor advising was a major factor, but 25.0% indicated that course availability played a role. Chemistry advisors are asked to map out a plan for graduation with students after their first year. However, students sometimes deviate from this path and choose to drop or add courses of their liking. The biggest conflict is the fact that we offer the first semester courses in the Fall and second course in the Spring for two-semester sequences like General Chemistry, Organic Chemistry, and Biochemistry. It is further complicated by the fact that the three courses are all pre-requisite and must be taken in sequence. If a student misses a course or has to drop, they must wait a year to get back in the course sequence. The department tries to make the class schedules with a minimum amount of conflict classes within the chemistry program and also with the biology and mathematics programs which students frequently have to take. However it is impossible to have no class conflicts between the various programs with face-to-face courses. This is also compounded by the fact that many of our upper-level electives are on a once every two-year rotation due to low enrollment, including Inorganic Chemistry II, Instrumental Analysis, Advanced Laboratory, Physical Chemistry I and II, as well as others. Our enrollment and faculty load simply does not allow these courses to be offered each semester or even each year. We are increasingly allowing students to take research for credit or arranged directed reading to allow students to finish their degree when only a few hours short.

Many of our students will choose to do a summer research experience either on- or off-campus. The annual chemistry program assessment reports show the amount of activity, see Appendix III.

Some students choose in-state research experiences at comprehensive institutions, while others seek to travel and find experiences abroad. At least one student did a summer research experience in Germany recently and another went to Greece, while 2 are at TAMU-College Station this summer. Our chemistry majors have presented at Oklahoma Research Day, Research Day at the Capitol, as well other conferences and meetings.

Many of our students engage in other activities both on and off campus. Two such organizations are the American Chemical Society student chapter which has remained very active, and the Pre-Health Association (formerly known as the Pre-Med Club). Through these groups, students have become involved in community service. For example, the Pre-Health Association helped with a local Relay for Life event in the community. The ACS has put on demonstrations for public schools and for on-campus events like Homecoming and recruitment days at Southeastern. Many of our students volunteered for a two-day event called Remote Area Medical, which was held on our campus in 2017 and 2019 and provided medical, dental, and optometry services to more than 800 individuals each year over two-day event.

Our students are successful after they graduate. Our historic graduate success was partially shown in our alumni survey in Table 7. More recently, of our fifty-eight chemistry graduates in the previous five years – six entered graduate programs in chemistry or a field related to chemistry, fifteen entered medical school, six entered pharmacy school, and one entered an optometry school. In total, 28 of the 58 graduates went on further their education in a graduate or professional programs. We have not been able to track more than 25% of our graduates, and their status is unknown. Southeastern does not issue an institution email that remains active after graduation. The chemistry faculty are not particularly active social media users and have not established links on the currently popular platforms that students use.

The department of Chemistry, Computer, and Physical Sciences provides seven general education courses in the physical sciences area. These include Concept in Chemistry-CHEM 1004, Basic Chemistry I – CHEM 1114, General Chemistry I – CHEM 1315, General Physics I – PHYS 1114, General Physical Science – PSCI 1114, Earth Science – PSCI 1214, and General Astronomy – PSCI 1414. Only CHEM-1315 is required for our chemistry majors, but many non-majors also take CHEM-1315. A few students have taken our non-majors CHEM-1004, CHEM-1114, or even PSCI-1114 and then decided to become a chemistry major. Table 8 show the enrollment of students in these seven general education courses along with the number of majors and non-majors enrolled. A high percentage of our chemistry majors take PHYS 1114.

Student Learning Outcomes for the Chemistry program are set as follows.

A student completing B.S. degree in Chemistry shall be able to:

1. Demonstrate knowledge of chemical concepts, laws, theories, and the ability to use process skills in chemistry through observation, measurement, classification, inference, interpretation, and experimentation (including controlling variables, graphing, and communication).
2. Show competence in cognitive analysis of chemical information, recognition of organizing principles in information, and proficiency in library and computer skills in obtaining information and analyzing data.
3. Demonstrate skill in the synthesis of information by preparing and presenting reports, proposing plans or sets of operations, and/or making derivations of abstract relations.

4. Exhibit intellectual honesty, open- mindedness, and objectivity in the accumulation and interpretation of information and form value judgments on ethical issues in the conduct of chemistry and the applications of chemistry in society.
5. Show interpersonal skills that promote the accomplishment of team goals in small groups.
6. Show the ability to anticipate, recognize, and respond appropriately to laboratory hazards or hazardous conditions, and take appropriate safety precautions.

We access these learning objectives annually in the Program Outcomes Assessment Reports (POAR). The last four POARs are in Appendix III. The report for AY1617 is not available due to the university terminating its contract with TaskStream. Overall the students do reasonably well in our assessments. Many chemistry courses utilize ACS national exams as their final exam to have comparative nationally normed data for our students. The assessment targets vary based on the level of the course. We typically set a target of 30-40% of the students scoring greater than the national average and a secondary target of 60-70% or greater scoring within one standard deviation unit of the national average. We more frequently approach or exceed the secondary target.

Table 9 shows the average GPA of students in various classes and the %DFW in the class. The GPA and %DFW of the physical science general education courses show some variation by year and by the specific course (see Table 9A). The non-general education courses offered by physical sciences are shown in Table 9B. The DFW rates are highest for Organic I and II (CHEM 3053 & 3153) and more recently Chemical Analysis (CHEM 3425) for our chemistry major courses. However in both sets of the aforementioned examples, the student's average GPA in the course was substantially lower than the other chemistry courses which contributes to

the expectation of a higher DFW rate. Surprisingly these two examples have the strongest ACS exam performances historically. Many of the weaker students abandon the chemistry major after organic and never proceed to the higher-level courses so the post-organic courses typically display stronger student success.

Chapter IV: Faculty

The department has faculty with a wide breath of expertise to teach the courses in the chemistry major. The chemistry faculty consist of: Dr. Srimal Garusinghe, an Assistant Professor trained in inorganic chemistry; Dr. Steve McKim, an Associate Professor trained in physical chemistry; Dr. Nancy Paiva, an Associate Professor training in biochemical engineering; Dr. Tim Smith, a Professor trained in analytical chemistry. Dr. Loide Wasmund served as the department's organic chemistry for 30 years and retired in 2019. Dr. Jonathan Zhang was hired as an Assistant Professor to replace Dr. Wasmund and taught at Southeastern for 3 ½ years before he resigned in December 2021. A search for an organic chemist to replace Dr. Zhang was conducted in the Spring and Summer of 2022 and failed to hire a replacement organic chemist. We will conduct a new search again in the Fall 2022 with hopes of filling this position. Dr. Garusinghe replaced Dr. Mohammad Chehbouni, our previous inorganic chemist who left Southeastern in the May 2017 after ten years with the institution. In addition to our chemists, the department has two other faculty in Physical Sciences. These are Dr. Caleb Smith, an Assistant Professor trained in environmental science with a focus on science education and Mr. Alex Spahn, an Instructor and trained in classical physics and astrophysics. A copy of all the faculty curriculum vitae are shown in Appendix III.

As shown in Table 10, the instructional load is high in Physical Sciences. The average student credit hour (SCH) load for the full-time chemist in the department was 515.6 versus the university average of 303.1. Several faculty members have taught voluntary overloads for additional pay. Most of our faculty have seen a decrease in the SCH through the last five years, in especially 20-21. As mentioned earlier there has been an overall reduction in the number of

high school graduates entering Southeastern and wanting traditional face-to-face classes and the department was also affected by COVID-19.

Student evaluations are given for each class. Each year, faculty do a faculty plan, a self-evaluation, and received an annual faculty evaluation report from the department chair. The results of the student evaluations are part of the annual faculty evaluation report. The annual faculty evaluation process is a time that both faculty and chairs can examine and reflect on some overall themes that are indicated in the student evaluations and perhaps make appropriate changes to improve a course. Southeastern adopted a new online course evaluation system in Fall 2020 called Campus Labs / Anthology. Unfortunately, we are working our way through ensuring that students actually do the survey in online format. In addition, this student evaluation consists of more than 50 generic questions that may not reflect the type of activities done in a chemistry course. The current survey has only nineteen questions dealing with the Instructor and nine others asking specifically about the course. Other questions focus on topics like student progress, financial aid, etc. The response rate for CCPS in the Fall 21 was a respectable 61.6% but the interpretation of the data is since being mastered. For four of the five years (16/17 – 19/20) being reviewed we utilized an in-house survey given directly to our chemistry students. A copy of this in-house survey previously used is shown in Appendix IV. Data from this student survey was compiled each semester separating similar cohort courses. For example, all of the CHEM-1xxx courses were compared versus all of the CHEM-2xxx to CHEM-4xxx level courses were compared. For example, in the Fall 2019 in the CHEM-1xxx (including CHEM-1004, CHEM-1114, CHEM-1214, CHEM-1315, and CHEM-1415) the chemistry unit average was 4.38/5.00 for “Overall, I would rate this as a valuable course,” 4.34/5.00 for “Overall, I would rate the teaching ability of the instructor as excellent,” and

4.35/5.00 for "I would take another course from this instructor," (see Appendix IV). This data is shared with all faculty in the department so faculty can individually see their strengths and weaknesses in comparison to their peer faculty. This data is available each semester from the Fall 16 up to Spring 20 when COVID-19 forced our courses to an online format and no face-to-face surveys were administered. The negative aspect our in-house survey is that we only have norm data with our department. We have no institutional or national data to compare for this question set. We are developing a procedure to use selected questions for the new Anthology student surveys to draw similar comparisons and have normalized institutional and national data to support the survey results. A drawback is that the new student course survey can only ask a limited number of unique/specific questions that directly relate to the chemistry program.

We offer only a few online courses in Physical Science – none of those are chemistry courses currently. All instructors that teach those online courses have gone through Quality Matters training. It is likely in the future we will have to adapt some of our chemistry support courses, like CHEM-1004, to an online format to match the new Nursing RN-to-BSN program being developed at Southeastern and scheduled to pilot in 2024 as a 100% online program.

Besides teaching, the faculty are actively in scholarly activity and service. Table 11 summarizes scholarly activity and service. The lack of peer-reviewed publications from chemistry faculty in the past five years is an apparent weakness. There have been a fair number of faculty presentations at conferences and good number of student presentations. Presentations at conferences effectively ended in 2020 with COVID-19 as did almost all research activities both in-house and external. Some faculty have received internal grants from Southeastern through the Organized Research Fund and others have external grants ranging from a few thousand to more than fifty thousand dollars. One of the noted concerns in the CCPS faculty survey was the lack

of faculty development opportunities and this should be made a higher priority in the future. Several faculty serve on university committees and have memberships in professional societies. Beside service to the profession and the university, several faculty are higher involved in community service and engagement (see Table 12).

Chapter V: Self-Study Recommendations

Overall, we believe the chemistry program is rated Good. The chemistry program has faculty positions that cover a diverse range of disciplines to provide a variety of classes for the program. The immediate need is the replacement of Dr. Zhang, our former organic chemist, with a tenure-track faculty member. The alumni survey indicates our graduates are satisfied with their educational experience overall. The student survey in general indicates are positive for the learning environment and the field of study. Many of our graduates have been successful in getting admitted into professional programs and graduate programs or being employed within the degree field. Our major concern is the decreasing enrollment in the major. However, this trend is NOT unique to our program at Southeastern and there is a decrease in undergraduate enrollment in all of the regional universities in Oklahoma. The department may need to consider new strategies to recruit high school students and to make the chemistry program more attractive to this target group.

SELF-STUDY RECOMMENDATIONS:

1. Hire a replacement organic chemist to replace Dr. Zhang. An organic chemist is critical to the core of any chemistry program and is an essential support courses for most Pre-Professional program. We hope to begin a new job search in the fall. This is not a new position so no additional cost.
2. Extensively renovate the Science Building including the general chemistry labs, organic labs, and other labs using the available ARPA funds. Laboratory renovation is expensive but is a necessity for a modern and safe laboratory environment. Initial cost estimates

have been generated that would suggest the total cost of renovation of the Science building including the labs will exceed $8 million.

3. Continuing to update the technology in all classrooms to facilitate learning and lecture capture (maybe this is included in 2. above) in such a way that it seamlessly integrates with Canvas, both online and face-to-face, considering the experiences with the COVID-19 pandemic.
4. Update the technology in all faculty offices (new computers and printers) to go along with item 3. Several of the CCPS faculty have PCs that are up to 10 years old and need updating. The university no longer has a plan to replace all faculty computers on a three-year cycle as it had previously.
5. Repair, update, and/or purchase new research equipment to replace obsolete and/or poorly functioning instrumentation. Potential instrumentation would include the LC-MS, XRF, and high resolution scanning UV/Vis. Some of our equipment still operates on Windows 95 based operating systems. The LC-MS is beyond its service life is no longer supported by the manufacturer.
6. Work on increasing the majors pool to pre-COVID levels. The Science building renovation will aid this to some extent, but a more aggressive recruitment strategy that should be developed. Continue to promote chemistry tracks as providing required foundational classes for a variety of biomedical professional career paths (MD/DO, physician's assistant, pharmacy, dental, nursing, etc.). This could include expanding the promotion of chemistry degrees as links to new industries and needs in the state and service region (engineering fields, $30 billion dollar Texas Instrument chip manufacturing plant being built 40 miles from campus, biomedical research and disease

diagnostics, etc.). Costs may include creation of promotional materials for distribution to high schools and nearby 2-yr colleges and travel funds for faculty to visit schools if visits are once again allowed. Some state programs may help fund educational programs or STEM camps to allow area high-school students to come to campus to explore chemistry and other physical sciences as a career, but the department may need to provide some supplies or staff.

7. Improve coordination of Advising Center and Honors or other Freshman/Transfer adviser efforts with the Chemistry degree requirements. Many prospective chemistry majors are still being advised to only take general education classes for 1-2 years before attempting introductory chemistry courses or to begin the mathematics support courses, and are unaware of the limitations on the order and the semesters in which they can take certain courses. Consider requesting that all declared chemistry majors also be co-advised by chemistry faculty before beginning classes. Cost would be essentially zero, and just require external advisers to refer students and ensure that they complete the visit to their Chemistry advisor. This would also help make the students aware of departmental scholarships and other opportunities available only to declared Chemistry majors.
8. Encourage the participation of faculty in research, and the incorporation of research into upper- and lower-level lab classes. Several federal and statewide programs are offering workshops and funding to support these efforts, and the department made some initial steps toward expanding research options with the approval of the Introduction to Research course, but department involvement in research has been trending lower, especially with the recent loss of a tenure-track organic chemist. While many students believe they are headed to non-research careers, having more open-ended research style

project labs integrated into classes or one-on-one with faculty may improve or help evaluate their critical thinking skills. External funding is available from competitive in-state programs like NIH-OK-INBRE and NSF-OK-EPSCoR for both independent and collaborative research projects, and the on-campus SE Sponsored Research funding should be able to supply up to $1700 for some chemicals or supplies for new smaller projects linked to creating new teaching labs and research.

Table 1. Faculty Demographics (all faculty and adjuncts- past 5 years, current faculty listed first) in the Chemistry Department Programs.

Name	Current rank	Teaching Field(s)	Terminal degree and field (list additional degrees if related to teaching assignment in a field outside of terminal degree)	Years at Southeastern	Course delivery mode experience (Y/N)		Number of professional development courses and trainings attended; and certificates earned.	
					Face-to-face	Distance	> 5 yrs. ago	Within last 5 years
Garusinghe, Srimal	Asst. Prof.	Chemistry, Physical Science	Ph.D., Chemistry	4	Y	N	NA	6
McKim, Steve	Assoc. Prof.	Chemistry, Physical Science	Ph.D. Chemistry	27	Y	Y	NA	8
Paiva, Nancy	Assoc. Prof.	Chemistry, Physical Science	Ph.D. Biochemical Engineering	20	Y			
Smith, Caleb	Asst. Prof.	Science Education, Physical Science	Ph.D. Environmental Science-Science Education	3	Y	Y	NA	6
Smith, Tim	Prof.	Chemistry, Physical Science	Ph.D. Chemistry	27	Y	Y	+20	6
Spahn, Alex	Instructor	Physical Science	M.S. Physics	5	Y	Y		
Wasmund, Loide*	Professor – retired in 2019	Chemistry, Physical Science	Ph.D. Chemistry	29*	Y	N	NA	NA
Zhang, Jonathan	Asst. Prof.	Chemistry, Physical Science	Ph.D. Chemistry	3.5 - resigned in Fall 21	Y	Y	NA	NA
* Dr. Wasmund retired in 2019, but returned in the Spring 22 as an adjunct for Organic Chemistry and Lab.								

Table 2. CCPS Departmental Allocations by Budget Category from FY2017 to FY2021*

*Note – this budget contains both the Chemistry/Physical Sciences and the Computer Science/Computer Information Systems.

BUDGET CATEGORIES	FY2017	FY2018	FY2019	FY2020	FY2021
Teaching Salaries	$794,709.00	$772,374.00	$836,867.00	$865,367.00	$810,075.00
Professional Salaries	$42,426.00	$7,000.00	$7,000.00	$43,426.00	$43,091.00
Non-Professional Salaries	$39,299.00	$74,725.00	$74,725.00	$40,299.00	$31,449.00
Fringe Benefits	$344,527.35	$337,553.00	$372,536.00	$370,146.00	$348,633.00
Professional Services	-	-	-	-	-
TOTAL PERSONNEL SERVICES	$1,220,961.35	$1,191,652.00	$1,291,128.00	$1,319,238.00	$1,233,248.00
Travel	$2,067.00	$942.00	$1,093.00	$944.00	$1,940.00
Supplies and Other Operating Expenses	$39,453.00	$52,168.00	$33,169.00	$40,329.00	$33,460.00
Academic Partnerships	-	-	-	-	-
Transfers and Other Disbursement	-	-	-	-	-
Property, Furniture, and Equipment	$4,598.00	$4,600.00	$4,600.00	-	$6,890.00
TOTAL NON-PERSONNEL SERVICES	$46,118.00	$57,710.00	$83,862.00	$41,273.00	$42,290.00
TOTAL ALLOCATION	$1,267,09.35	$1,249,362.00	$1,329,990.00	$1,360,511.00	$1,275,538.00

Table 3. Faculty Survey findings within Chemistry/Physical Sciences in CCPS

3A. Rate the quality of the following with your department

	Poor (1)	Below Average (2)	Average (3)	Above Average (4)	Outstanding (5)	Mean
Face-to-Face Learning Environment	0	1	1	2	4	4.13
Online Learning Environment	0	0	3	2	3	4.00
Scholarship of Faculty	0	2	3	1	2	3.38
Instruction in Face-to-Face Courses	0	0	1	5	2	4.13
Instruction in Online Courses	0	1	2	3	1	3.57
Physical Work Environment	0	2	1	2	2	3.57
Library Resources for Scholarly/Creative Activities of Faculty	1	1	1	2	0	2.80
Library Resources for Students in Your Courses	0	1	2	2	1	3.50
Instructional Technology Available for Faculty Use	0	1	3	2	2	3.63
Instructional Technology Support for Faculty	0	2	2	2	2	3.50
Equipment Available for Teaching	1	1	3	2	1	3.13
Equipment Available for Research	1	0	5	1	0	2.86
Level of Collegiality of Faculty	1	1	2	2	2	3.38
Level of Communication Between Faculty and Students	0	0	3	2	3	4.00
Breadth of Curriculum	0	2	1	3	2	3.63
Depth of Curriculum	0	1	3	2	2	3.63
Faculty Concern for Students	0	0	3	1	4	4.13
Rigor of Courses Offered by the Department	0	0	4	3	1	3.63
Rigor of Courses Offered by Other Departments	0	1	2	1	1	3.40
Overall level of funding available to faculty in the department for scholarly/creative activities and professional development	1	5	1	1	0	2.25
Overall level of interaction between departmental faculty and students outside of regular class/laboratory activities	0	1	3	2	2	3.63
Overall quality of academic advising provided by the department	0	0	2	3	3	4.13
Overall quality of academic advising provided by Southeastern	0	1	6	1	0	3.00
Overall quality of academic programs offered by the department	0	0	1	6	1	4.00
Overall quality of academic programs offered by Southeastern	0	1	6	0	1	3.13

3B. Rate the overall mix of the following modes of delivery used by departmental faculty.

	Too Much	About Right	Too Little	Does Not Apply
Face-to-Face	0	8	0	0
100% Online	1	6	0	1
Blended (uses both F2F and Online delivery)	0	4	0	4
SIDE (Synchronous Interactive Distance Education)	0	2	1	5

3C. Rate the following questions about the Department of Chemistry, Computer, and Physical Sciences

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
There are opportunities for meaningful faculty development.	0	1	6	1	0
The department has used the results of the Program Outcomes Assessment Reports to make meaningful changes to program requirements in the last 5 years	1	4	2	1	0

3D. Why does the department complete Program Outcomes Assessment? Rank the level of importance for each.

	Highly Important	Important	Neither Important or Unimportant	Unimportant
To Improve Student Learning	4	3	1	0
To Improve the Overall Quality of the Program	4	3	1	0
To Fulfill OSRHE/RUSO Requirements	3	5	0	0
To Fulfill Specialty Accreditation Requirements	2	3	1	0
To Fulfill Regional Accreditation (Higher Learning Commission) Requirements	4	3	1	0

3E. Rate the following.

	Poor (1)	Below Average (2)	Average (3)	Above Average (4)	Outstanding (5)	Mean
Rate the overall level of funding available to faculty in the department for scholarly/creative activities and professional development.	1	5	1	1	0	2.25
Rate the overall level of interaction between departmental faculty and students outside of regular class/laboratory activities.	0	1	3	2	2	3.63
Rate the overall quality of academic advising provided by your Academic Deparment of Major.	0	0	2	3	3	4.13
Rate the overall quality of academic advising provided by Southeastern Overall.	0	1	6	1	0	3.00

3F. Rate the following.

	Never	Some of the time	About 50% of the time	Most of the time	Always
Faculty in the department treat students with respect and fairness	0	0	0	3	6
I have what I need to do my job well.	0	1	1	4	2

3G. Free Response Questions from Faculty Survey

List up to three things in your department that should not be changed.

- We need to maintain long, rigorous hands-on lab experiences, despite student complaints.
- Major and minor programs
- The scholarship provided to the students
- class sizes
- Rigor
- maintain face-to-face classes; cheating is rampant in some online classes, and students still fail
- face-2-face courses
- The amount of online and face-to-face courses
- advising/mentoring between majors and academic advisors
- Course sequences
- encourage students to visit with a major advisor early and often; advising center still makes many errors and lets students continue to use them much too long
- students' faculty interaction

List up to three things that you would change in your department.

- our chair makes 95% of the spending decisions; faculty should get more say or an allotment for things to improve their labs or classrooms.
- Hire more faculty to reduce teaching overload
- The DFW (Drop, Fail, Withdraw) rate should not be used as a component to evaluate the performance of a faculty during the annual faculty evaluation. A higher DFW rate will be classified as an instructor "Need a lot of improvement on teaching" whereas a lower DFW rate being "a good instructor". In order to be a good instructor, some of our faculty (including myself) have to give a grade that the student doesn't earn it.
- Faculty should be given more time for research
- classroom and laboratory renovation
- Adding another full-time instructor
- Some teaching labs are in serious need of repairs, both for cosmetic and safety reasons.
- Fewer department wide meetings, use email to deliver information more
- Faculty in our area are demanded by our department chair to take shifts to stay in the department up to 3:00pm on every Friday afternoon in order to help students who show up without an appointment. The demand is not reasonable because it is not enforced by most of the departments campus-wide to my knowledge. In addition, students should learn how to make an appointment with a faculty during the off-office hours.
- More opportunities for faculty professional development
- annual operational budget (supplies and equipment)
- Stop relying on student evaluations of instructors's knowledge and course content; if a student gets a low grade in a course they refused to do work in, it is not the instructor's fault
- Give senior adjunct instructors a chance to teach full-load (e.g., 4 or 5 classes) so we don't have to hire so many new and inexperienced adjunct instructors to cover so many different sections of the same course. Our department prefers not to provide the opportunity because we don't want to pay the benefits of the senior adjunct out of our department's budget if he/she is given the full teaching load.
- support for faculty development (start up packages, funding for travel, funding for research)

Provide any other comments that you would like to share.

- As a colleague at another institute says, the administrative approach in our department suffers from "too much stick, not enough carrot". We are frequently threatened with punishments or yelled at when an administrator thinks something is wrong, especially if a student "reports" their version of reality and the problem does not exist, but there is no incentive offered for doing a good job or working outside of the normal work day at events or when things go well. In talking to people from other departments, they are very surprised or concerned by what they hear goes on in our department.
- In recent years, I learned that the influence of depression and anxiety has grown rapidly on the younger generation which include my students as well. Due to the health issues, some of my students' grades have dropped and some even quit school. I would recommend our school to consult with some expert(s) so we can help students to alleviate the negative influence of depression and anxiety.
- Our stockroom and laboratories have been in need of renovation for +20 years. In adequate power in the labs. Lack of space. Proper storage chemical storage areas. Proper ventilation/hoods for organic labs. These have all been discussed in detail in the past and plans have been draw up three times to

address with expansions and renovation. Each time the cost came back well beyond the expectation and funding has been diverted to other projects on campus.

- I love SE, I love my department, I love my students and what I do. We need another full-time faculty member.

Table 4. Productivity in the Chemistry Program in Department of CCPS.

A. Enrollment and Graduation Trends- Primary Majors

	Num. of students (majors)					Num. Graduates					SCH				
	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21
University Average	87.7	89.7	91.4	93.3	97.8	16.8	15.9	15.7	15.4	19.3	1752.0	1834.9	1878.8	1929.3	1901.6
Chemistry(total)	121	121	113	140	74	16	14	10	12	6	2761	2607	2444	2983	1616
Chem-option 1 (40 hr major)	NA	NA	NA	NA	53	2	2	1	1	3	NA	NA	NA	NA	1202
Chem-option 2 (Biochemical Technology major-minor)	NA	NA	NA	NA	3	0	2	0	0	0	NA	NA	NA	NA	48
Chem-option 3 (Professional Chemist major-minor)	NA	NA	NA	NA	1	1	0	0	1	0	NA	NA	NA	NA	12
Chem-option 4 (Medical Science double major)	NA	NA	NA	NA	17	13	10	9	10	3	NA	NA	NA	NA	354

B. Enrollment and Graduation Trends- Secondary Majors (Double majors not included above)

	Num. of students					Num. Graduates					SCH				
	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21
University Average	4.2	3.5	3.6	3.4	1.9	3.0	1.8	2.7	2.1	1.8	92.2	78.3	80.8	74.9	13.4
Chemistry(total)	10	5	6	4	4	12	4	8	9	NA	179	133	99	89	17
Chem-option 1 (40 hr major)						1									
Chem-option 2 (Biochemical Technology major-minor)															
Chem-option 3 (Professional Chemist major-minor)															
Chem-option 4 (Medical Science double major)						11	4	8	9						

C. Enrollment Trends by Mode of Delivery- by Gen. Ed. And Departmental Prefixes (Headcount)

	Face-to-Face					Online- full semester					Online- 7-week					Hybrid/IETV/SIDE				
General Education	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21
University Average	138.8	132.7	127.5	114.5	66.6	59.9	56.3	47.5	54.3	87.4	34.1	33.6	54.1	61.3	91.1	31.3	23.2	13.6	18.5	19.0
CHEM 1004	40	54	49	40	39					18										
CHEM 1114	34	31	21	23	7					16										
CHEM 1315	69	74	118	87	9					61										
PHYS 1114	48	60	45	63	22					23										
PSCI 1114	248	265	233	203	42	27	30			122	45	33	80	100	149					
PSCI 1214		24	40	33	13					20										
PSCI 1414	13	28									7	6	39	39	36					
All Other Courses																				
University Average (UG)	21.7	20.8	19.3	18.9	14.7	33.2	30.2	26.6	25.8	24.8	31.2	32.1	39.9	46.1	41.2	20.6	22.5	19.2	19.6	17.7
CHEM 1214	10	13	6	6	4															
CHEM 1415	59	40	66	55	32										7					
CHEM 2113	12		9	14	11		11													
CHEM 2212		2	2																	
CHEM 2311																				
CHEM 3053	31	32	27	32	36					29										
CHEM 3062	31	29	28	30	29															
CHEM 3153	20	27	21	28	24															
CHEM 3162	19	25	21	29	25															
CHEM 3425	20	12	10	19	12					14										
CHEM 3525	3	3		3																
CHEM 3612	11		3																	
CHEM 4115	20	16	20	9	18					7										
CHEM 4124	6			3																
CHEM 4193	14	8	15	5	10					19										
CHEM 4314	2	5	6	2	2															
CHEM 4333				2																
CHEM 4553	3		1		2															
CHEM 4562		7	11																	
CHEM 4653			1		1															
CHEM 4662	3		1		2															
CHEM 4951	8	12	8	9	6					3										
CHEM 4960	4	1	3	3	2															

CHEM 4970					3															
CHEM 4971																				
CHEM 4972																				
CHEM 4973																				
CHEM 4990	11	4	7	4	7										1					
CHEM 5970					2															
CHEM 5973																				
PHYS 1214	15	15	19	22	9															
SCIE 3123	57	24	19	36														26		30
SCIE 3224	30						28	50	62	46										
SCIE 4903																				
SCIE 4970																				
SCIE 5403												4	12	3	6					
SCIE 5903													7	9	5					

Table 5. Student Demographics in the Chemistry Department Programs: A Comparison Between Current Students and Those Five Years Ago.

Program	Year	Number	Females	Males	Asian	African American	Hispanic	Native American	Hawaiian Pacific Islander	Caucasian	2 or more	Freshman	Sophomore	Junior	Senior	Graduate Student	Average Age	ACT Composite	% Transfer
University Average	2016	195.6	54.6	45.8	2.7	7.2	7.4	15.4	1.2	53.9	18.1	27.5	16.8	24.5	31.9	3.2	24.8	20.7	36.6
	2021	101.1	30.5	25.0	2.3	4.9	6.6	8.8	1.0	28.6	11.1	13.5	10.7	11.7	22.6	1.7	25.3	20.9	23.4
Chemistry Total (all options)	2016	121	66	55	3	3	9	20	2	52	32	56	15	21	26	3	24.3	22.7	23.1
	2021	74	42	32	0	1	10	12	0	34	17	7	15	25	27	0	21.7	22.3	12.2
Chemistry Minor	2016	12	6	6			1	1		9	1	2		3	6	1	24.7	27.3	75.0
	2021	3	2	1			1	1		1		1			2		26.7	22.0	0.0

Table 6. Current Student Survey for Chemistry Majors in Department of CCPS (n=13)

6A. Demographics of Student Pool

13 students responded in 2019 survey	Freshman	Sophomore	Junior	Senior	Graduate	Non-degree Seeking
What is your student classification?	38.5%	23.1%	30.8%	7.7%	0.0%	9.0%

6B. Rate the overall quality of the following.

	POOR	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE	OUTSTANDING	N/A
Overall Learning Environment In Your Major	0.0%	0.0%	23.2%	61.6%	15.4%	0.0%
Overall Learning Environment At Southeastern	7.7%	0.0%	38.5%	30.8%	23.1%	0.0%
Face-to-Face Instruction In Your Major	0.0%	0.0%	30.8%	30.8%	38.5%	0.0%
Face-to Face Instruction Outside Your Major	15.4%	7.7%	30.8%	30.8%	7.7%	7.7%
Online Instruction In Your Major	30.8%	7.7%	0.0%	7.7%	7.7%	46.2%
Online Instruction Outside Your Major	23.1%	7.7%	23.1%	7.7%	7.7%	30.8%
Overall Concern For Students By Faculty Teaching In Your Major	7.7%	7.7%	15.4%	38.5%	30.8%	0.0%
Overall Concern For Students By Faculty Teaching Outside Your Major	23.1%	7.7%	15.4%	30.8%	15.4%	7.7%
Assistance In Finding Employment By Faculty And Staff In Your Major Department	7.7%	7.7%	23.1%	30.8%	15.4%	15.4%
Assistance In Continuing My Education By Faculty And Staff In Your Major Department	7.7%	7.7%	15.4%	30.8%	30.8%	7.7%
Faculty Providing Letters Of Reference/Recommendation	7.7%	0.0%	38.5%	23.1%	23.1%	7.7%
Breadth (Variety) Of Courses Offered In Your Major	0.0%	7.7%	30.8%	38.5%	23.1%	0.0%
Depth of Courses Offered In Your Major	0.0%	0.0%	27.3%	45.5%	27.3%	0.0%
Academic Advising Provided By Faculty And Staff In Your Major Department	0.0%	0.0%	30.8%	30.8%	30.8%	7.7%
Academic Advising Provided By The Academic Advising And Outreach Center	23.1%	0.0%	30.8%	15.4%	15.4%	15.4%
Level Of Communication Between Students And Major Departmental Faculty	7.7%	7.7%	30.8%	23.1%	30.8%	0.0%
Ability To Interact With Major Department Faculty Outside The Classroom/Laboratory	7.7%	0.0%	23.1%	30.8%	38.5%	0.0%
Rigor Of Courses In Your Major	0.0%	0.0%	30.8%	38.5%	30.8%	0.0%
Rigor Of Courses Outside Your Major	7.7%	7.7%	38.5%	38.5%	0.0%	7.7%

6C. Rate your overall level of satisfaction with your academic experience for the following areas.

	POOR	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE	OUTSTANDING	N/A
Your Major Field Of Study	0.0%	7.7%	15.4%	53.9%	23.1%	0.0%
Your Minor Field Of Study	0.0%	7.7%	23.1%	30.8%	0.0%	38.5%
General Education Courses	7.7%	15.4%	46.2%	23.1%	0.0%	7.7%
Overall Experience At Southeastern	15.4%	70.0%	15.4%	53.9%	7.7%	7.7%
Intership/Practicum Opportunities	15.4%	7.7%	15.4%	30.8%	0.0%	30.8%
Fieldwork/Creative Activities/Research Opportunities	15.4%	0.0%	38.5%	15.4%	0.0%	30.8%

6D. On average each week, how many hours do you spend completing the following activities?

	0 hours	1-10 hours	11-20 hours	21-30 hours	31-40 hours	Greater than 40 hours
In the classroom/laboratory	0.0%	7.7%	61.5%	30.8%	0.0%	0.0%
Studying/homework outside the classroom	0.0%	46.2%	46.2%	0.0%	0.0%	7.7%
Participating in Collegiate Sports	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Participating in extra-curricular activities on campus	15.4%	76.9%	0.0%	7.7%	0.0%	0.0%
On-campus work	69.2%	23.1%	0.0%	7.7%	0.0%	0.0%
Off-campus work	30.8%	7.7%	38.5%	23.1%	0.0%	0.0%
Participating in community activities such as church, civic/service clubs and school	38.5%	53.9%	7.7%	0.0%	0.0%	0.0%
Family Obligations	23.1%	53.9%	23.1%	0.0%	0.0%	0.0%

6E. Rate your level of agreement with the following statements regarding departmental activities.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Faculty treat students in the department with respect and fairness.	30.8%	61.5%	7.7%	0.0%	0.0%
Faculty provide a syllabus at the beginning of each course.	61.5%	38.5%	0.0%	0.0%	0.0%
Faculty provide appropriate feedback on assignments in face-to-face courses (e.g., quizzes, tests, papers, presentations).	38.5%	61.5%	0.0%	0.0%	0.0%
Faculty provide appropriate feedback on assignments in online courses (e.g., quizzes, tests, papers, presentation).	38.5%	30.8%	23.1%	7.7%	0.0%
Faculty assign grades based on the quality of work and performance by students.	46.2%	46.2%	0.0%	7.7%	0.0%
Students have the ability to evaluate the quality of instruction at the end of each course.	53.9%	46.2%	0.0%	0.0%	0.0%

6F. List the top three things that you like about your major field of study and would not change.

- friendliness, fun, and groundbreaking
- Labs, Study groups, tutoring
- Variety of courses, rigor of courses, faculty members
- The information, laboratories, and the professors.
- The professors at SE actually care about the subject that they teach, and they genuinely care for their students. There are many opportunities to get help in the Chemistry and Biology departments.
- The attitude of the faculty toward their students. The well thought our course material to prepare students for upper level courses. The opportunities that Southeastern offers to help students in STEM fields
- High level of difficulty. Similar interests and expectations with peers. Faculty and and staff involvement and interest in student success.
- The teacher, environment, and the work
- The push to work above the national average. The openness with students that professors have. The willingness to help students when they need it.

6G. Please list the top three things that you would change about your major field of study.

- can't think of any
- Less difficulty, More review, NO ACS test and instead a Comprehensive final.
- My field of study.
- The rigor of the course, how the classes are supposed to be taken, and my major itself.
- More online classes in biology and chemistry More summer classes in biology and chemistry.
- Updated Chemistry lab equipment
- Either not having professor evaluations by students at the end of the semester, or allow them to have more weight. Nothing else really.

Table 7. Alumni Survey for Chemistry Graduates in Department of CCPS (n=29)

7A. How did each of the following prepare you to enter the work force or continue your education upon graduation?

	Not At All	Not Very Well	Adequately	Fairly Well	Very Well
Major Field of Study	4.2%	4.2%	12.5%	16.7%	54.2%
Minor Field of Study	4.2%	0.0%	16.7%	16.7%	29.2%
General Education Courses	4.2%	4.2%	50.0%	20.8%	20.8%
Overall Educational Experience at Southeastern	0.0%	0.0%	12.5%	37.5%	50.0%

7B. Rate your level of agreement as to whether your degree and experience at Southeastern prepared you for the following activities.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Acquiring a lasting knowledge of key facts and concepts in your field of study	37.5%	50.0%	12.5%	0.0%	0.0%
Acquiring job or work-related skills	33.3%	37.5%	20.8%	4.2%	0.0%
Getting the opportunity you wanted after graduation such as employment or additional education	41.7%	33.3%	16.7%	8.3%	0.0%
Being successful in your current position	50.0%	25.0%	16.7%	4.2%	0.0%
Responding to new career opportunities	25.0%	33.3%	16.7%	4.2%	0.0%
Assuming leadership responsibilities	33.3%	45.8%	4.2%	12.5%	0.0%
Contributing to your community	25.0%	54.2%	12.5%	4.2%	0.0%
Deepening your commitment to personal development	25.0%	45.8%	25.0%	0.0%	0.0%
Continuing to learn in your field of study	29.2%	41.7%	16.7%	4.2%	4.2%
Continuing to learn outside your field of study	29.2%	45.8%	25.0%	0.0%	0.0%

7C. Rate the overall quality of the following.

	Poor	Below Average	Average	Above Average	Outstanding	N/A
Overall Learning Environment in Major	0.0%	0.0%	16.7%	33.3%	50.0%	0.0%
Overall Learning Environment at Southeastern	0.0%	0.0%	29.2%	29.2%	41.7%	0.0%
Face-to-Face Instruction in Major	0.0%	0.0%	12.5%	29.2%	58.3%	0.0%
Face-to-Face Instruction Outside the Major	0.0%	0.0%	29.2%	45.8%	20.8%	4.2%
Online Instruction in Major	4.2%	4.2%	25.0%	16.7%	4.2%	45.8%
Online Instruction Outside the Major	0.0%	12.5%	37.5%	16.7%	8.3%	25.0%
Overall Concern for Students by Departmental Faculty	0.0%	0.0%	16.7%	16.7%	62.5%	4.2%
Overall Concern for Students by Non-Departmental Faculty	0.0%	12.5%	16.7%	12.5%	45.8%	12.5%
Assistance in Finding Employment by Departmental Faculty and Staff	0.0%	16.7%	16.7%	8.3%	12.5%	45.8%
Assistance in Continuing My Education by Departmental Faculty and Staff	0.0%	12.5%	20.8%	12.5%	33.3%	20.8%

7D. Which of the following best describes your activity within the first year after graduating from Southeastern?

Employed in my field of study	8.33%
Employed but not in my field of study (college degree required)	20.83%
Employed but not in my field of study (no college degree required)	8.33%
Enrolled in a graduate program	16.67%
Enrolled in a professional school (e.g., Law, Medical, Optometry, Pharmacy, Physical Therapy)	41.67%
Enlisted in a branch of the military	0.00%
Volunteered time (e.g., joined Peace Corps, helped at church, assisted with disaster relieve, participated in Meals on Wheels)	0.00%
Unemployed	4.17%
Prefer not to respond	0.00%

7E. If you were allowed a "do-over," which of the following best reflects your choice?

I would enroll in this Department/Degree Program again at Southeastern.	54.17%
I would enroll in a different Department/Degree Program at Southeastern.	16.67%
I would enroll in the same Department/Degree Program but at another institution.	12.50%
I would enroll in a different Department/Degree Program but at another institution.	8.33%
I would do something other than attend a college/university.	8.33%

7F. How important were the following factors in determining the time it took for you to earn your degree?

	Major Importance	Minor Importance	Not Importance
Changed major more than 1 time	12.50%	8.33%	79.17%
Completed additional majors, options, minors, or coursework	25.00%	37.50%	37.50%
Couldn't get the courses I needed when I needed them	25.00%	33.33%	41.67%
Poor advising	12.50%	8.33%	79.17%
Took extra time to improve my GPA	8.33%	8.33%	83.33%
Participated in internship(s)/practicums	4.17%	29.17%	66.67%
Extracurricular activities	20.83%	25.00%	54.17%
Work/employment	29.17%	29.17%	41.67%
Family obligations	33.33%	16.67%	50.00%
Illiness or accident	8.33%	4.17%	87.50%
Other	0.00%	9.09%	90.09%

7G. Please list the top three things that you liked about your major field of study and would not change.

- OChem lab experiences, Calculations in Chem courses, Face to face courses
- My professors were great in the way they taught, their passion for the topic, and were very hands on. I had a couple professors who were not passionate or cared if we really understood what they were teaching so it made me appreciate my other professors even more. I appreciated the one-on-one learning if it was requested. I really enjoyed lab for all of my classes. It was great to put into action what we were learning in the classroom and having the availability of different lab exercises was amazing.
- Meeting new people, the teachers, and most of the classes
- Lab experience, extra-curricular research opportunities, One-on-one time with instructors
- The labs were great, instructors were great, environment was great.
- Professors were engaging, Professors had extra curricular activities where you could apply knowledge from the class, Professors genuinely seemed to care about your success
- Advanced courses offered helped me tremendously in professional school (Chem Instrumentation and Analytical Chem), Hands on with cadavers for Anatomy, Research jobs/TA positions available for student workers
- Small class size, Sense of community with my class for all four years, access to instructors
- Interesting subjects, Laboratory skills gained, Overall experience working with others
- Staff approachable and knowledgeable, AISES, Cadavers
- Is applicable in many cities Usually pays well Keeps me on my toes
- Small lab size, accessibility to staff/advisor, courses offered
- Faculty, Hands-on lab experiences, Class sizes
- Great appreciation of medical sciences, Excellent advising in both departments, The teaching of Dr Diane Dixon
- The welcoming and top tier faculty and staff in the biology and chemistry department fostered a good learning environment with highly educated individuals

7H. Please list the top three things that you would change about your major field of study.

- No having Dr. Pavai (Biochem) as a professor. More industry related labs. More emphasis on internships during the summer.
- I would have liked the amount of time and quality of advice from my assigned mentor to have been higher. I knew he had favorites which was unprofessional because I think those he didn't have as favorites didn't receive the advice, information, or opportunities for after graduation success. I am very successful in my job but it isn't the path I was pursuing and it's not using my degree. A mentor should never agree to write a reference letter to a professional school if it is not going to be 100% positive and assisting the student to be accepted. We can learn everything, go above and beyond in undergrad and have a decent gpa but if our own professors are cutting our legs from under us then all of the hard work and hours spent we've put in to be successful mean nothing.
- I wish I knew what job opportunities there were for my degree without continuing my education. I'm doing very well and successful and without a degree I couldn't do this well BUT I could have done an easier degree and spent less money and have the same job. Need a freshman class that goes over what can be done realistically with a four year degree in that field. I do not regret my chemistry degree, just wish I knew more about what jobs were available before I graduated.
- More classes-nanotech or pathology related more instrumentation- better equipment to practice and be trained on which would improve employment chances
- Chem facility, Medical Laboratory Scientist 3:1 program available, I don't have a third
- Honestly, nothing. I had a fantastic time at Southeastern.
- Take the courses in a different order
- Tell advisors outside the biology department how important it is to get into P1 THE FIRST SEMESTER.
- hard to find a job with a degree because all of the spots require certifications from vo-techs and are being filled by people with no degree. -most of the jobs hiring in that field are very dull and boring -have to move to a big city to find decent work
- newer lab equipment
- More options for upper level chemistry classes, More opportunities to take biostatistics, The teaching of Dr Nancy Paiva
- Lack of variety in courses pigeon holes you into only being able to take a small amount of major focused courses

7I. Please provide any additional comments about your experience at Southeastern.

- Overall, I loved my experience at SE! Getting the hardest and most time consuming degree at SE was very rewarding and something I will never forget but I will also never forget being a True Blue Ambassador, being Miss Indian Southeastern, helping grow the Native American presence on campus, attending football and basketball games, etc. but I'm most grateful that it always feels like home when I'm back on campus.
- My entire time at SOSU was great. From Greek life, to school events, to classes it was all great. We need a parking garage though! It's amazing how much the school continues to grow, make me proud to have been a part of SOSU.
- The extra curricular activities with the various biology and chemistry professors were the best part of southeastern.
- I wish that new students would meet with the appropriate advisors for their majors. A lot of new students end up in the advising center with people who don't know what they need, or what the right plans are to get them started for things like the 3 + 1 program until it's too late. I even had a friend who had to stay an extra year because her first year they basically had her in nursing classes instead of the pre-med track.
- I absolutely loved my time at Southeastern. Everyone at Southeastern was supportive of me in my academic career. They helped me go from high school dropout to medical school student. I would do it all over again if the same wonderful people were there.
- I wouldn't trade my time at SE for anything. I only wish I would've taken time to enjoy it more and worry less.
- I think an overemphasis on being average is given. SE should focus more on what it is good at and further improve those areas.
-

Table 8. List of General Education Courses offered by Chemistry and Physical Sciences.

General Education Course	Num. of Majors enrolled					Num. of Non-majors enrolled				
	16-17	17-18	18-19	19-20	20-21	16-17	17-18	18-19	19-20	20-21
University Average	11.1	10.3	12.9	13.7	12.4	147.9	150.0	147.4	141.9	140.5
CHEM 1004	1	4		4	1	39	50	49	36	56
CHEM 1114						34	31	21	23	23
CHEM 1315	22	24	30	33	9	47	50	88	54	61
PHYS 1114	10	10	12	15	6	38	50	33	48	39
PSCI 1114		4	3	2	1	320	324	310	301	312
PSCI 1214			1			51	24	39	33	33
PSCI 1414			1			20	34	38	39	36

Table 9A. List of Student Results in the Chemistry Department for General Education.

	16-17		17-18		18-19		19-20		20-21	
General Education	Ave. GPA	% DFW	Ave. GPA	% DFW	Ave. GPA	% DFW	Ave. GPA	% DFW	Ave. GPA	% DFW
University Average	2.78	23.3	2.76	24.6	2.72	25.4	2.94	21.3	2.65	28.2
CHEM 1004	2.46	15.0	2.86	14.8	2.61	20.4	2.75	15.0	2.88	19.3
CHEM 1114	2.44	29.4	2.50	16.1	3.05	19.0	2.62	21.7	2.48	17.4
CHEM 1315	3.19	20.3	2.77	23.0	2.65	22.9	3.07	12.6	2.68	32.9
PHYS 1114	2.80	22.9	2.37	41.7	2.47	35.6	2.52	31.7	2.15	44.4
PSCI 1114	2.66	24.1	2.64	22.6	2.66	18.8	2.79	18.8	2.71	23.0
PSCI 1214	2.73	17.6	3.10	16.7	2.32	25.0	2.68	15.2	2.10	39.4
PSCI 1414	3.16	5.0	2.11	44.1	2.55	23.1	2.75	28.2	2.48	22.2

Table 9B. List of Student Results in the Chemistry Department for All Other Courses.

	16-17		17-18		18-19		19-20		20-21	
All Other Course	Ave. GPA	% DFW	Ave. GPA	% DFW	Ave. GPA	% DFW	Ave. GPA	% DFW	Ave. GPA	% DFW
University Average	3.13	13.5	3.16	13.0	3.12	13.6	3.25	11.7	3.07	14.7
CHEM 1214	2.67	10.2	2.77	12.5	2.89	7.6	3.37	3.6	2.89	12.8
CHEM 1415	3.13	10.2	2.77	12.5	2.89	7.6	3.37	3.6	2.89	12.8
CHEM 2113	3.18	8.3	3.10	9.1	3.29	22.2	3.45	7.1	2.82	9.1
CHEM 2212			4.00	0.0	4.00	0.0				
CHEM 3053	2.64	19.4	2.92	21.9	2.60	25.9	2.90	9.4	2.72	10.3
CHEM 3062	3.14	6.5	3.48	6.9	3.35	7.1	3.57	10.0	3.31	3.4
CHEM 3153	2.94	10.0	3.04	7.4	2.67	23.8	3.33	14.3	2.50	4.2
CHEM 3162	3.53	0.0	3.50	12.0	3.22	23.8	3.16	17.2	2.88	0.0
CHEM 3425	3.05	5.0	3.09	8.3	3.44	20.0	2.42	26.3	2.64	21.4
CHEM 3525	3.00	0.0	2.67	0.0			2.33	33.3		
CHEM 3612	3.27	9.1			2.33	0.0			3.14	0.0
CHEM 4115	3.40	0.0	3.33	6.3	3.00	5.0	3.56	0.0	2.83	5.3
CHEM 4124	4.00	0.0					3.00	0.0		
CHEM 4193	3.14	0.0	3.38	0.0	3.00	6.7	3.25	0.0	2.30	10.0
CHEM 4314	3.50	0.0	3.40	0.0	3.33	16.7	3.00	0.0	2.30	10.0
CHEM 4333			3.00	0.0			3.50	0.0		
CHEM 4553			3.33	0.0		4.00	0.0		3.50	0.0
CHEM 4562			3.71	0.0	3.45	9.1				
CHEM 4653					4.00	0.0			4.00	0.0
CHEM 4662	4.00	0.0			4.00	0.0			3.50	0.0
CHEM 4951	3.50	0.0	3.42	8.3	3.38	12.5	3.89	0.0	4.00	0.0
CHEM 4960	4.00	0.0	4.00	0.0	4.00	0.0	3.67	0.0	4.00	0.0
CHEM 4970									4.00	0.0
CHEM 4990	4.00	0.0	4.00	0.0	4.00	0.0	4.00	0.0	3.67	0.0
CHEM 5970									4.00	0.0
PHYS 1214	2.87	6.7	2.87	0.0	3.13	21.1	3.20	9.1	2.57	44.4
SCIE 3123	3.68	1.8	3.64	8.3	3.65	4.4	3.71	0.0	3.70	0.0
SCIE 3224	3.44	13.3	3.56	7.1	3.15	14.0	2.84	9.7	2.43	15.2
SCIE 5403			4.00	0.0	4.00	8.3	4.00	0.0	4.00	0.0
SCIE 5903					4.00	0.0	3.44	11.1	3.80	0.0

Table 10A. Instructional Load for Chemistry Departmental Faculty

Fulltime Faculty

Instructor Name	16-17	17-18	18-19	19-20	20-21	Total SCH	Average SCH
University Average (UG)	308.8	294.4	300.3	300.7	311.2	1515.3	303.1
University Average (GR)	110.7	175.6	275.7	338.3	400.9	1301.2	260.2
Undergraduate							
AVARD M	288					288	288.0
BRITTON J	638					638	638.0
CHEHBOUNI M	515					515	515.0
DIXON D	8	20	24	8	8	68	13.6
GARUSINGHE S			557	411	371	1339	446.3
LUDRICK B	123	72	135			330	110.0
MCKIM S	635	685	468	547	426	2761	552.2
PAIVA N	528	536	514	406	383	2367	473.4
SMITH CA				528	522	1050	525.0
SMITH T	505	432	498	365	519	2319	463.8
SPAHN A	332	544	668	876	676	3096	619.2
WASMUND L	695	644	523			1862	620.7
ZHANG J			449	602	563	1614	538.0
Graduate:							
LUDRICK B		12	57	27		96	32.0
PAIVA N					5	21	10.5
RICE S						15	15.0
SMITH CA				9	33	42	21.0

Table 10B. Instructional Load for Chemistry Departmental Faculty

Adjunct Faculty

Instructor Name	16-17	17-18	18-19	19-20	20-21	Total SCH	Average SCH
University Average (UG)	308.8	294.4	300.3	300.7	311.2	1515.3	303.1
Undergraduate							
BRITTON J		22	96			118	59.0
CHANDLER L		256				256	256.0
CHEHBOUNI M		159				159	159.0
LIGHTSEY C	63	112	104			279	93.0

Table 11. Scholarly, Creative and Service Activities of faculty in the Department of CCPS - Chemistry

Item	2016	2017	2018	2019	2020
Number of Publications (Peer-Reviewed)	0	0	0	0	0
Other Publications- Not Peer Reviewed	0	0	0	0	0
Number of Presentations	0	1	0	2	1
Number of Student Presentations	2	7	4	3	1
Number of Internal Grants	1	1	3	2	1
Dollar Value of Internal Grants	$1000	$1250	$4344	$3300	1000$
Number of External Grants	6	5	4	4	4
Dollar Value of External Grants	$79,000	$83,000	$48,000	$49,000	$157,000
Number of Memberships in Professional Societies	10	9	10	9	9
Number of offices, editorships, governing boards	2	2	2	2	2
Number of Committees on in Professional Societies	0	0	0	0	0
Number of University Committees	3	7	7	11	12
Professional Development Workshops Presented	2	0	1	0	1
Professional Development Workshops Participated In	4	3	3	5	10
Articles Reviewed for Journals	0	1	0	0	0
Chapters/Textbooks Reviewed	0	1	1	0	0
University Recruitment Activities	8	10	12	10	9

Table 12. Community Service and Engagement of Departmental Faculty

Item	2016	2017	2018	2019	2020
Number of Civic Engagement Projects in program/courses	2	3	3	2	1
Describe Key examples: provided snacks and meals for Rural Access Medical doctors and volunteers for two events held at Southeastern in 2016 and 2018 (other 120 volunteers); coordinated food drive collection within department; hosted Science Olympiad Invitational Tournament; gave astronomy presentations at Rotary International and Kiwanis International local meetings; held an eclipse observation for the public (over 500 people attended).					
Number of Community Service Activities in program/courses	1	2	2	2	2
Describe Key examples: tested community water samples for possible BTEX contamination; volunteer works at Rural Access Medical; participation in local blood drives					
Number of Faculty Community Service Activities	10	11	10	13	7
Describe Key examples: Served as SE ACS Chapter Faculty Mentor; Earth Day community clean-up projects; judged local school science fairs; participated with ACS student chapter at local school demonstrations; volunteer youth sports coach; local high school and district wide education committees; Eagle Scout project mentor; Event Supervisor for Science Olympiad competitions;					
Number of Leadership Roles in Faculty Community Service Activities	2	2	2	4	4
Describe Key examples: member of BOD for local youth sports association; member of BOD for Wesley Center (SE campus ministry); tournament coordinator for the Science Olympiad Invitational tournament (coordinates and oversee +30 competitive events); coordinated the Operation Orange event at SE (Pre-Medical School recruitment for high school students)					

APPENDIX I

Vitae

CURRICULUM VITAE

Gamage S. P. Garusinghe, Ph.D.
Southeastern Oklahoma State University 425
W. University Blvd. Durant, Oklahoma 74701
Office: Science Building – S203
580.745.2664,
Fax: 580.745.7494
sgarusinghe@se.edu

EDUCATION

2013	Ph.D.	Chemistry	University of Maine, Orono, ME
2000	B.S.	Chemistry (Special)	University of Ruhuna, Sri Lanka

ACADEMIC EXPERIENCE

2018-Present	Assistant Professor of Chemistry, SEOSU
2015-2018	Research Associate, University of Maine, ME
2013-2015	Postdoctoral Research Associate, University of Maine, ME
2010-2013	Graduate Research Assistant
2012	Lecturer, Department of Chemistry University of Maine
2005-2010	Teaching Assistant, Department of Chemistry University of Maine
2002-2005	Lecturer, University of Ruhuna, Sri Lanka,
2000-2002	Assistant Lecturer, University of Ruhuna, Sri Lanka,

RESEARCH INTERESTS

Kinetic analysis of metal-assisted thiolate-disulfide exchange

AWARDS AND HONORS

2021	Nominated for Faculty Senate Recognition Award for Excellence in Teaching, SE Oklahoma State University
2020	Nominated for Faculty Senate Recognition Award for Excellence in Teaching, SE Oklahoma State University
2007, 2009-2010	Outstanding TA Award in General Chemistry, University of Maine
2005-2009	Graduate Teaching Assistantship, Dept. of Chemistry, University of Maine

PROFESSIONAL MEMBERSHIPS

2008-Present	American Chemical Society

SERVICES

2021	Member, Faculty Senate, SE Oklahoma State University
2021	Member, Faculty Appellate Committee, SE Oklahoma State University

COURSES TAUGHT

PSCI 1114	General Physical Sciences
CHEM 1114	Basic Chemistry I
CHEM 1315	General Chemistry I
CHEM 1415	General Chemistry II
CHEM 2113	Inorganic Chemistry-1
CHEM 3612	Introduction to Radioactivity
CHEM 4333	Inorganic Chemistry-II
CHEM 4990	Chemistry Research

PUBLICATIONS

Garusinghe, Gamage S. P., Bessey, S. Max; Bruce, Alice E.; Bruce, Mitchell R. M. "The influence of gold(I) on the mechanism of thiolate, disulfide exchange" Dalton Transactions 2016, 45(28), 11261-11266.

Gamage S.P. Garusinghe, S. Max Bessey, Chelsea Boyd, Mostapha Aghamoosa, Brian G. Frederick, Mitchell R. M. Bruce, Alice E. Bruce. "Identification of dimethyl sulfide in dimethyl sulfoxide and implications for metal-thiolate disulfide exchange reactions" RSC Advances 2015, 5(51), 40603-40606.

Gamage S.P. Garusinghe, S. Max Bessey, Mostapha Aghamoosa, Meaghan McKinnon, Alice E. Bruce, Mitchell R. M. Bruce."Disulfide Competition for Phosphine Gold(I) Thiolates: Phosphine Oxide Formation vs. Thiolate Disulfide Exchange" Inorganics 2015, 3, 40-54.

Max Bessey, S.; Aghamoosa, Mostapha; Gamage S.P. Garusinghe; Chandrasoma, Asela; Bruce, Alice E.; Bruce, Mitchell R. M. "The synthesis of triethylphosphine gold(I) 4- nitrobenzenethiolate and solvent dependent visible absorption spectra of 4- nitrobenzenethiolate" Inorganica Chimica Acta 2010, 363(1), 279-282.

Hema M.K.K. Pathirana, P.R.T Cumarathunga, G.S.P Garusinghe, K. Nishantha Kumara, S. Wanniarachchi, C.Wanninayake, (2005). "Quality of water of tsunami-affected wells after cleaning and chlorination" 244D, Proc. Sri Lanka Assoc. Advmt. Sci. 61st Annual Sessions, pp. 127-128 (Published as proceedings)

S. Garusinghe, S. Wanniarachchi, K. Nishantha Kumara, C.Wanninayake, Hema M.K.K. Pathirana & P.R.T Cumarathunga. (2005) "Impact of Tsunami on Well Water in Unawatuna Area Workshop on the Tsunami and Post- Tsunami Recovery in the Southern Region of Sri Lanka." 2005, University of Ruhuna. pp. 19-20 (Published as proceedings)

S. Garusinghe, M. Edusooriya, (2004) "Production of coconut shell based charcoal and enhancement of its adsorptive properties." 243D, Proc. Sri Lanka Assoc. Advmt. Sci. 60th Annual Sessions, pp. 131-132 (Published as proceedings)

PRESENTATIONS (presenter underlined)

Humaidy, Dhirgam; **Garusinghe, Gamage**; Bruce, Alice; Bruce, Mitchell. "Synthesis and reactivity of gold (I) tetrathiomolybdate complexes" Abstracts of Papers, 256th ACS National Meeting & Exposition, Boston, MA, United States, August 19-23, 2018. (Poster)

Pokhrel, Shyam; **Garusinghe, Gamage S**.; Bruce, Alice E.; Bruce, Mitchell R. "Kinetics of gold(I) assisted thiolate-disulfide exchange in aqueous media" Abstracts of Papers, 256th ACS National Meeting & Exposition, Boston, MA, United States, August 19-23, 2018. (Poster)

Garusinghe, Gamage S.; Bruce, Alice E.; Bruce, Mitchell R. "Metal-assisted (Zn, Au) thiolate- disulfide exchange: Explorations of the mechanism using 2D NMR" Abstracts of Papers, 251st ACS National Meeting & Exposition, San Diego, CA, United States, March 13-17, 2016. (Oral)

Garusinghe, Gamage S.; Bruce, Alice E.; Bruce, Mitchell R. "Kinetic and mechanistic investigations on metal-assisted (Zn, Au) thiolate-disulfide exchange" Abstracts of Papers, 251st ACS National Meeting & Exposition, San Diego, CA, United States, March 13-17, 2016. (Poster)

Veillette, Kyle A.; **Garusinghe, Gamage S**.; Bruce, Alice E.; Bruce, Mitchell R. "Synthesis, characterization and electrochemical investigation of ferrocenyl gold (I) thiolate complexes" Abstracts of Papers, 41st Northeast Regional Meeting of the American Chemical Society, Binghamton, NY, United States, October 5-8 2016. (Poster)

K. A. Veillette, M. R. Bruce, A. E. Bruce, **G. S. Garusinghe**, A. Farberg. "The synthesis, characterization and electrochemical study of DPPF(AuSC6H4NO2)2". Abstracts of Papers, Northeast Regional Meeting of the American Chemical Society, Ithaca, NY, United States, June 10-13, 2015. (Poster)

Bruce, Alice E.; **Garusinghe, Gamage**; Aghamoosa, Mostapha; Bruce, Mitchell R. "Formation of phosphine oxide during gold(I) mediated thiol-disulfide exchange reactions" Abstracts of Papers, 243rd ACS National Meeting & Exposition, San Diego, CA, United States, March 25-29, 2012.(Poster)

Garusinghe, Gamage S. P.; Bruce, Alice E.; Bruce, Mitchell R. "Solvent effects on metal-assisted thiolate-disulfide exchange (M=Zn, Au)." Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, United States, March 21-25, 2010. (Oral)

Garusinghe, Gamage S. P.; Bruce, Alice E.; Bruce, Mitchell R. "Metal-assisted thiolate-disulfide interactions & exchange." The 12th Annual University of Maine Graduate Research Expo Presentation. Wells Conference Center, Orono, ME, United States, April 16, 2010. (Oral)

Garusinghe, G. S. P.; Bessey, S. Max; Bruce, Alice E.; Bruce, Mitchell R. M. "Interactions Between Metal Thiolate, R3PAuSC6H4NO2 (R=Ph and Et) and Bis(4- nitrophenyl) Disulfide." Abstracts, 36th Northeast Regional Meeting of the American Chemical Society, Hartford, CT, United States, October 7-10, 2009. (Oral)

Aghamoosa, Mostapha; **Garusinghe, Gamage S. P**.; Bruce, Alice E.; Bruce, Mitchell R. "Effect of solvent on the rate of gold(I)-assisted thiolate-disulfide exchange." Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, United States, March 21-25, 2010. (Poster)

Garusinghe, G. S. P.; Edusooriya, M. "Production of coconut shell based charcoal and enhancement of its adsorptive properties." 243D, Proc. Sri Lanka Assoc. Advmt. Sci. 60th Annual Sessions, 2004, 131-132 pp. (Oral)

CURRICULUM VITA

David Stephen McKim, Ph.D.

Associate Professor of Chemistry

Department of Chemistry, Computer, and Physical Sciences

Southeastern Oklahoma State University

425 W. University Boulevard

Durant, OK 74701

Office: Science Building - S215

Office: 580.745.2648 • Fax: 580.745.7494

smckim@se.edu

Education

1993 **Doctor of Philosophy** *Major:* Physical Chemistry University of Arkansas, Fayetteville, AR

Dissertation Title: *^{129}Xe NMR Study Of Xenon Transport Through The Gramicidin Channel* under the direction of Dr. James F. Hinton.

1987 **Bachelor of Science** *Double Major:* Chemistry & French University of Central Arkansas, Conway, AR

Academic and Related Non-Academic Experience

2000-Present	**Associate Professor of Chemistry**	Southeastern Oklahoma State University, Durant, OK
1995-2000	**Assistant Professor of Chemistry**	Southeastern Oklahoma State University, Durant, OK
2002-2003	**Director, SOSU Summer Science Academy**	Southeastern Oklahoma State University, Durant, OK
2001-2003	**Instructor, RISE Program (MBRS/NIH)**	Southeastern Oklahoma State University, Durant, OK
1996-2000	**Teacher of Introductory and Advanced Chemistry, Upward Bound Region VI Math/Science**	Southeastern Oklahoma State University, Durant, OK
1995	**Teacher of Chemistry, Headlands Indian Health Careers Program**	University of Oklahoma, Norman, OK
1993-1995	**Assistant Professor of Chemistry (sabbatical replacement)**	Wheaton College, Wheaton, IL

1991-1992	**Teacher of Stanley H. Kaplan MCAT Preparatory Courses**	Learning to Learn Center, Fayetteville, AR
1991-1993	**Research Assistant**	University of Arkansas, Fayetteville, AR
1988-1992	**Teaching Assistant**	University of Arkansas, Fayetteville, AR
1984-1987	**Lab Assistant**	University of Central Arkansas, Conway, AR

Professional Interests

Academic Specialty

•Physical Chemistry

Research Interests

•Biofuels
•Solution thermodynamics
•Multinuclear NMR spectroscopy
•Transport processes
•Kinetics of acid-catalyzed isomerizations
•Photochemistry of small tryptophan-containing peptides

Selected Committees and Special Assignments

University

2003-2013, 2017-Present	Member, Graduate Education Council
2017-Present	Member, Curriculum Committee
1996-1998, 2000-2003, 2019-Present	Member, Academic Appeals Committee
2008	Participant, Freshman Convocation
1996-1997, 2000-2001, 2006-2007	Proctor, Junior mid-level assessment exams
1996, 1999, 2002-2012	Interviewer, Honors Day
1996-Present	Writer and Grader of Physical Science Exam, Curriculum Contest
2001-2006	Faculty participant at Sneak Preview

2001-2002	Member, Faculty Senate (served on the Personnel Policies and University Affairs Committees)
1999	Member, Student Personnel and Policies Committee
1998	Member, School of Science and Technology NCA Self-Study Review Committee
1997	Advisor, Freshman Enrollment Clinic
1996	Member, ad hoc Committee formed to examine possible uses for the Water Lab
1996	Member, ad hoc Committee on CLEP Exams

Departmental

2018-Present	General Education Officer
2016-Present	Supervisor, Chemical Concepts Lab
2007-Present	Supervisor, Basic Chemistry Labs
1995-Present	Supervisor, General Chemistry Labs
2000-Present	Supervisor, Physical Chemistry I Lab (formally called Thermodynamics Lab)
1996-Present	Advisor, chemistry, medical technology (discontinued), pre-medical, pre-veterinary (since *2004*), pre-dental, and pre-dental hygiene (since *2019*)
1997-Present	Member, Faculty Chemical Stock and Safety Review Committee (chair since *2014*)
1999	Member, Self-Study Report Committee
1995-Present	Participant, Fall, Spring, and Summer General Enrollments
1995	Member, ad hoc Committee whose purpose was to design a course involving both organic and biochemistry

State

2002, 2004, 2006, 2016-Present	Member, Course Equivalency Matrices Committee (Physical Science)

Awards and Honors

Member of the following honor societies: Phi Beta Kappa, Phi Kappa Phi, Alpha Chi, and Phi Sigma Iota (National Foreign Language Honor Society)

2008-2010, 2015, 2018, 2019, 2021	Nominee, Faculty Senate Recognition Award for Teaching in the School of Arts and Sciences
1998	Best New Local Section, Younger Chemists Committee, awarded by the national office of the American Chemical Society (ACS)
1989	W.A. Cordes Teaching Award for Organic Chemistry Laboratory, University of Arkansas
1987	University Scholar, University of Central Arkansas
1986	Foreign Language Award (German, French, and Spanish), University of Central Arkansas
1984	Freshman Chemistry Award, University of Central Arkansas
1984	Lettered, Varsity Tennis, University of Central Arkansas

Professional Memberships

American Chemical Society (ACS, National and Oklahoma sections)

Effective Teaching

Courses Developed at SOSU:

•Physical Chemistry I Lab

Courses Taught at SOSU:

•Chemical Concepts and Laboratory
•Concepts in Science and Laboratory
•General Physical Science and Laboratory
•Basic Chemistry I and Laboratory
•Basic Chemistry II and Laboratory
•General Chemistry I and Laboratory
•General Chemistry II and Laboratory
•Physical Chemistry I
•Physical Chemistry II
•Physical Chemistry I Laboratory
•Special Studies (Physical Chemistry II)

Courses Taught at SOSU:

•Biochemistry II
•Senior Seminar
•Directed Reading
•Research

Courses Taught at Wheaton College:

•Introduction To Chemistry
•Applications Of Chemistry (lecture and laboratory)
•Chemistry And Society: Drugs
•General Chemistry I (lecture and laboratory)
•Biochemistry (lecture and laboratory)
•Advanced Biochemistry

Publications

Refereed Journal Articles

2001 McKim, David S. & Cox, S. ^{133}Cs NMR Spectroscopic Investigation Of The Interaction of $^{133}Cs^{+}$ With Monovalent Cations In Aqueous Solution. Journal of Solution Chemistry, **2001**, *30(9)*, 771-779.

1997 McKim, S., Hinton, J.F., & Deghenghi, R. NMR Analysis Of The Ultraviolet Photolytic Behavior Of Several Tryptophan-Rich Growth Hormone Releasing Peptides. Biospectroscopy, **1997**, *3*, 317-323.

1994 McKim, S. & Hinton, J.F. Evidence Of Xenon Transport Through The Gramicidin Channel: A ^{129}Xe NMR Study. Biochimica et Biophysica Acta, **1994**, *1193*, 186-198.

1993 McKim, S. & Hinton, J.F. Direct Observation Of Differential UV Photolytic Degradation Among The Tryptophan Residues Of Gramicidin A In Sodium Dodecyl Sulfate Micelles., Biochimica et Biophysica Acta, **1993**, *1153*, 315-321.

1993 McKim, S. & Hinton, J.F. ^{129}Xe NMR Spectroscopic Investigation Of The Interaction Of Xenon With Ions In Aqueous Solution. Journal of Magnetic Resonance Series A, **1993**, *104*, 268-272.

1995 Addendum: I assisted in the preparation of the following journal article but performed no experimentation: Brace, N.O. Thermal Alkylation Of Ambidentate Lactams With 2-(perfluoroalkyl)-1-iodoalkanes. The Effect Of Reaction Conditions And Ring Size On The Synthesis Of 2-(Perfluoroalkyl)ethanols And The Mechanism Of Reaction. Journal of Organic Chemistry, **1995**, *60(7)*, 2059-2071.

Published Abstracts and Other Publications of Non-Refereed Journal Articles

1993 McKim, David S. ^{129}Xe NMR Study Of Xenon Transport Through The Gramicidin Channel, **1993**, Doctoral Dissertation, University of Arkansas.

Other Professional Activities

Presentations

March 19, 2018 "Comparison of growth and energy content of Spriodela polyrhiza and Lemna minor, two potential biofuel sources", Ryan M. Robinson, Payton S. Whitehead, Patrick W. Sharp, Steve McKim, Nancy L. Paiva, Spring 2018 ACS National Meeting, New Orleans, LA.

September 22, 2017 "Comparison of Growth and Energy Content of Spriodela polyrhiza and Lemna minor, Two Potential Biofuel Sources", Ryan M. Robinson, P. Sharp, D.S. McKim, and N.L. Paiva, Fall 2017 AISES National Meeting, Denver, CO.

April 25, 2013 "Investigation of the Potential for Biofuels and Other Uses for Duckweed in Oklahoma", BrainStorm, Southeastern Oklahoma State University, Durant, OK.

April 18, 2012 "Filamentous Freshwater Biomass as a Bioenergy Source", BrainStorm, Southeastern Oklahoma State University, Durant, OK.

March 3, 2001 "It's in the Bag - Baggie Chemistry", The Oklahoma American Chemical Society Pentasectional Meeting, Bartlesville, OK.

March 1, 1997 "NMR Analysis Of The Ultraviolet Photolytic Behavior Of Several Tryptophan-Rich Growth Hormone Releasing Peptides", The Oklahoma American Chemical Society Pentasectional Meeting, Lawton, OK.

March 14-18, 1993 "^{129}Xe NMR Spectroscopic Investigation Of The Interaction Of Xenon With Ions In Aqueous Solution", The 34th ENC Experimental Nuclear Magnetic Resonance Conference, St. Louis, MO.

February 9-13, 1992 "Evidence Of Xenon Transport Through The Gramicidin Channel: A ^{129}Xe NMR Study", The Biophysical Society and the American Society for Biochemistry and Molecular Biology Meeting, Houston, TX.

Grants and Contracts

2016 "ChemSTARS-Chemical Science, Technology and Research Scholars" a $649,964 grant recently submitted by Dr. Nancy Paiva (on which I serve as Co-PI) to the National Science Foundation. The grant was not successful.

2010 "Evaluation of filamentous freshwater algae as a bioenergy source" a $24,984.00 grant awarded to Dr. Nancy Paiva (on which I served as Co-PI) by Oklahoma EPSCoR.

2002 "21st Century Connections: Adventures In Robotics, Telecommunications, Computer-Interfacing, Graphics, and Logic", a $73,198.00 grant for the SOSU Summer Science Academy awarded by the Oklahoma State Regents for Higher Education.

1998 "Thermodynamics Of Cation Transport Through Vesicle-Incorporated Cyclodextrin Artificial Ion Channels", a $9,690.00 grant awarded by Southeastern Oklahoma State University.

1998 "Determination Of The Binding Constants Of Monovalent Cations To The Cavities Of Cyclodextrins Via Nuclear Magnetic Resonance Spectroscopy", a $1,142.85 grant awarded by Southeastern Oklahoma State University.

1997 "^{129}Xe NMR Spectroscopy As A Useful Probe Of The Thermodynamics Of Aqueous Solution Structure", a $1,469.00 grant awarded by Southeastern Oklahoma State University.

Current Research

2010-Present Determination of the appropriateness of algae and other flora as a viable source of biodiesel fuel (collaboration with Dr. Nancy Paiva).

Professional Service

Service on Departmental/School/University Committees

2019 Member, Science Education Search Committee

2018 Member, Physics Search Committee

2017-2018 Chair, Inorganic and Organic Chemistry Search Committees

2017-2020 Assistant, Science Olympiad

1997-Present Secretary/Recorder, Faculty Chemical Stock and Safety Review Committee (chair since *2014*)

Service as a Proposal Reviewer for Granting Agency

1998-Present Organized Research Grants, Southeastern Oklahoma State University

Service to a Professional Society or Organization

2005-2009	Chair, Election Committee, American Chemical Society, Oklahoma Local Section
2001	Chair, American Chemical Society, Oklahoma Local Section
1997-2000	Vice-President, Younger Chemists Committee/American Chemical Society, Oklahoma Local Section

Other Professional Service

2021	External Program Reviewer for the Department of Chemistry, Physics and Engineering at Cameron University (Lawton, OK). I was asked by the Department to review and write a report on the suitability of the General Education assessment instruments employed in the Department. The review was started on Friday, April 2, 2021. I submitted the General Education assessment report to the Department of Institutional Research, Assessment, and Accountability at Cameron University on Wednesday, April 21, 2021.
2017-2018	Judge, 4th Grade Science Fair, Durant Intermediate School, Durant, OK
2016	External Program Reviewer for the Chemistry Department in the School of Mathematical and Natural Sciences at the University of Arkansas at Monticello (UAM). A site visit was conducted by me on Friday, February 26, 2016 as part of the Chemistry Program Review. I met with the entire chemistry faculty (save one lab instructor) and some of the biology faculty, mathematics faculty, and physics faculty. I also met with a handful of students, Dr. Morris Bramlett, the Dean of the School of Mathematical and Natural Sciences, and Dr. Peggy Doss, the Interim Transitional Leader for Academic Affairs. I submitted the Program Review Report to Drs. Bramlett and Doss on Tuesday, March 15, 2016
2011	Attendee, SC11 Supercomputing Conference in Seattle, Washington, November 12-15, 2011. The information gleaned from this conference will possibly be used in the future to start up a computational chemistry course within our department
1999-2005	Judge, Science Fair, Washington Irving Elementary School, Durant, OK
2002	Judge, Science Fair, Victory Life Academy, Durant, OK
2000-2001	Judge, Science Fair, Grant Junior High School, Grant, OK
1996-2000	Judge, Oklahoma Junior Academy of Sciences State Science Fair, Ada, OK
1996	Judge, North Texas American Chemical Society sectional meeting, Denton, TX

1997-1998	Supervisor of one undergraduate who worked on using ^{133}Cs NMR as a probe of aqueous solution structure, Southeastern Oklahoma State University
1994	Supervisor of four undergraduates for the Pew Scholars Program, Wheaton College. Research consisted of investigating how the presence of various antioxidants hindered the UV photolytic and X-ray radiolytic damage to indole derivatives in aqueous solution. The results were presented and received favorably at a poster session held at Northwestern University in Evanston, Illinois
1994	Supervisor of two undergraduates, Wheaton College. The students were studying the kinetics of the acid-catalyzed isomerization of α-ionone to β-ionone. The project used several different acids and solvents. The rate constants of the isomerization were obtained by use of gas chromatography

CURRICULUM VITAE

NANCY L. PAIVA, PH.D.

Associate Professor of Chemistry
Department of Chemistry, Computer, and Physical Sciences
Medical Center of Southeastern Oklahoma Endowed Professor in Biomedical Sciences
Southeastern Oklahoma State University
425 W. University Blvd., Science 216
Durant, OK 74701-0609
Office Phone: (580) 745-2324 FAX: (580) 745-7494
npaiva@se.edu

EDUCATION

1988 **Ph.D.** - Biochemical Engineering — Massachusetts Institute of Technology, Cambridge, Massachusetts

Thesis title: Biosynthesis of Rapamycin by *Streptomyces hygroscopicus*.
Ph.D. advisor: Prof. A.L. Demain, Dept. of Applied Biological Sciences/Biology

1981 **B.S.** - Chemistry — Harvey Mudd College, Claremont, California

Senior thesis topic: Characterization of two forms of acetylcholine esterase from torpedo fish (*Torpedo californica*).

ACADEMIC AND RELATED NON-ACADEMIC EXPERIENCE

2006-present	Associate Professor of Chemistry	Southeastern Oklahoma State University, Department of Chemistry, Computer, and Physical Sciences, Durant, OK
2002-2006	Assistant Professor of Chemistry	Southeastern Oklahoma State University
1996-2002	Associate Staff Scientist	The Samuel Roberts Noble Foundation, Inc., Plant Biology Division, Ardmore, Oklahoma
1990-1996	Assistant Staff Scientist	The Samuel Roberts Noble Foundation, Inc.
1989-1990	Postdoctoral Fellow	The Samuel Roberts Noble Foundation, Inc.
1987-1989	Postdoctoral Research Associate	Plant Biotechnology Institute, NRC-Canada, Saskatoon, Saskatchewan, Canada
1981-1987	Graduate Research Assistant Graduate Teaching Assistant	Massachusetts Institute of Technology, Cambridge, Massachusetts Department of Applied Biological Sciences (Department of Nutrition & Food Sciences)

1982-1987	MacGregor Dormitory Graduate Resident (social and academic counseling of undergraduates)	Massachusetts Institute of Technology, Cambridge, Massachusetts, Dean of Students Office
1980-1981	Women's Proctor (peer counseling of undergraduates)	Harvey Mudd College, Claremont, California, Dean of Students office

PROFESSIONAL INTERESTS

Academic Specialty

Biochemistry
Molecular Biology
Natural Products Chemistry

Research Interests

Investigation and genetic manipulation of the biosynthesis of natural products in an undergraduate teaching and research environment.
Assessing the role of natural products in producing and consuming organisms.
Structural characterization and identification of organic molecules.
Biofuels production.
Industrial microbiology.
Developing laboratory and industry internships for undergraduates.

SELECTED COMMITTEES AND SPECIAL ASSIGNMENTS

At Southeastern Oklahoma State University

2017-present	Organized Research and Program Review Committee (appointed for August 2017 to August 2019; renewed August 2019)
2005-present	Faculty Advisor for the Southeastern Oklahoma State University Chapter of the American Chemical Society (ACS) Student Members (formerly Student Affiliates)
2014-present	Faculty Co-Advisor for the Southeastern Oklahoma State University Chapter of the American Indian Science & Engineering Society (AISES)
2002-present	Campus representative for Southeastern Oklahoma State University to the National Aeronautics and Space Administration (NASA) Oklahoma Space Grant Consortium (OSGC) (Lead office is now at OSU, Stillwater campus)
2009-present	Campus representative for Southeastern Oklahoma State University to the statewide NIH-OK-INBRE committee (Lead office is at OUHSC, OKC campus)
2002-present	Faculty Chemical Stock and Safety Review Committee
2012-2015	Retention and Graduation Action Team member
2011-2015	Campus representative for Southeastern Oklahoma State University to the statewide OK NSF EPSCoR Broader Impacts Committee (Lead office is at OSU, Stillwater campus); outreach project coordinator

2009-2012 Director of Biotechnology major-minor program (separate program terminated, and modified degree plan re-introduced as a Chemistry major-minor degree plan)
2005-2006 President's 2010 Funding Strategic Goal Team

At Samuel Roberts Noble Foundation

1990-2002 Plant Biology Division Safety and Radiation Usage Committees
1990-2002 Numerous divisional and interdivisional staff search committees
1998-2000 Greenhouse Oversight Committee Meeting (interdivisional committee)
1995-1998 Forage Biotechnology/Plant Biology interface group

AWARDS AND HONORS

2006- present Medical Center of Southeastern Oklahoma Endowed Professorship in Biomedical Sciences
2007- present Outstanding Chapter Award (2015-2016), Commendable (2012-2013), and Honorable mention (2007, 2009 -2012, and 2017) for American Chemical Society student chapter activities (as chapter co-advisor/advisor)
2004-2005, 2011-2012 & 2012-2013 Southeastern Oklahoma State University Faculty Senate Faculty Recognition Award for Excellence in Scholarship and Research, School of Arts and Sciences

PROFESSIONAL MEMBERSHIPS

American Chemical Society (ACS professional member)
American Association for the Advancement of Science (AAAS)
American Society for Microbiology (ASM)
American Society of Plant Biologists (formerly Physiologists)
Council for Undergraduate Research (CUR)
Phytochemical Society of North America
American Indian Science and Engineering Society (AISES) (professional, non-voting member to serve as undergraduate chapter mentor)

EFFECTIVE TEACHING

Courses Developed at SOSU:

Molecular Genetics lecture and laboratory (CHEM/BIOL 4124), 6.5 semesters since 2003 (course created primarily for Biotechnology/Biochemical Technology major-minors, but used as an upper-level elective)
Chemical Concepts (CHEM1004), 15 Spring/Fall semesters and 2 Summer semesters continuously, then 3 year gap until resuming in Fall 2020 with new format (1-semester course created primarily for pre-nursing candidates and non-science majors; also covers General Education requirement for 1 credit of Physical Science; allowed removal of non-Chemistry majors from CHEM 1315 sections)
Introduction to Research (now CHEM2212); new offering since Spring 2016 courselist; formerly offered as CHEM4972: Special Studies: Introduction to Research. Offered Spring 2014 and Summer 2014, using NSF OK EPSCoR external grant support, and Spring 2015, 2017, 2018 and Summer 2015 as Arranged courses.
Advanced Protein Techniques (CHEM 4972), 2 semesters (newly created course in 2005, using NSF-MRI equipment grant)

Biofuels Technology (as arranged course under CHEM 4972), 1 semester (newly created course, using research grant-funded materials)

Bio-Active Natural Products (as arranged course/special studies under CHEM 4972 & CHEM 5972.88), 1 semester (newly created course, using research materials and mainly review articles, with doing searching current literature for reports)

Courses Taught at SOSU (in addition to above developed courses):

Biochemistry (I) lecture and laboratory (CHEM 4115): made major changes to course structure and laboratory in and since 2002, particularly use of protein purification and analysis instrumentation in laboratory, using NSF-MRI equipment grant and supplies from several other research grants), 17 semesters through 2020

General Chemistry I lecture and laboratory (CHEM 1315), 8 semesters (4 semesters Fall 2003 to Spring 2004, Fall 2016 to Fall 2019)

General Chemistry II lecture and laboratory (CHEM 1415), 5 semesters (Spring 2015, 2017, 2018, 2019, 2020)

Organic Chemistry/Biochemistry (CHEM2014, for Science Ed.): 1 semester (Fall 2014)

Chemical Literature (CHEM2311): Spring 2016

General Physical Sciences lecture (PSCI 1114), 16 semesters/multiple sections (General Education course for non-science majors)

Biochemistry II/Metabolism (CHEM/BIOL 4193), 15 semesters

Senior Seminar (CHEM 4951), 3 semesters (including Fall 2020)

*Research Experience for Credit (CHEM 4990), over 45 students, 1 to 8 per term including summers

*Directed Reading (CHEM 4960), multiple topics and students, (usually CHEM minors)

*Special Studies (CHEM 4970), multiple topics

*=*the latter 3 courses are generally taught for no teaching load credit or pay*

Honors Program Courses Taught at SOSU:

SCIE4521 Scientific Thought (Spring 2008 & 2009)

Honors contracts with students in CHEM 4115 Biochemistry (Fall 2006 and 2013) and CHEM4193 Biochemistry II (Spring 2014), CHEM1004 (2015 for 1 Freshman), and under revised Honors program criteria CHEM4990 (Fall 2018 for 2 Juniors).

Graduate Program Courses Taught at SOSU:

Molecular Genetics lecture and laboratory (BIOL 5124 in Fall 2010, and CHEM/BIOL 4124 in Fall 2003 for graduate credit for multiple graduate students). Biochemistry I lecture and lab (CHEM 4115/5975 in Fall 2011 for 1 student, in Fall 2014 for 1 student, and in Fall 2015 for 2 students) Biochemistry II (CHEM4193 as CHEM5973) for 2 graduate students.

Courses Taught at MIT:

Industrial Microbiology laboratory (2 semesters: 1983, 1984)

Biochemical Techniques laboratory (1 semester: 1986)

Curricular Changes Initiated at SOSU:

Initiated request for and received approval from state regents for modifications to Biotechnology major-minor program, changing Organic Chemistry II from a requirement to one of several possible technology-related electives, which increased degree plan completion.

Worked with students and program managers to get research credits for internships at local industrial laboratories and regional research laboratories.

In addition to other new courses developed at SOSU, initiated drive to split the single introductory chemistry course into multiple tracks (now 3) to separate nurses requiring only 1 semester (in CHEM1004 Chemical Concepts) or other students requiring only 2 smesters (in Basic Chemistry I&II) from chemistry majors and minors in General Chemistry I&II. I have been told by observers at SE that this greatly improved retention of students in their respective courses. Due to high success rate of CHEM 1004 students in ECU@SE Nursing program, Dean of Science at ECU was recently requesting that ECU Chemistry develop a similar course.

Initiated development of an Introduction to Research (CHEM2212) course aimed at lower-level students, which after 2 CHEM 4972 workshops funded by OK-NSF-EPSCoR was added to the catalog offerings in 2016. I have also been investigating the incorporation of open-ended, research style labs into core lab courses, in line with OK-INBRE statewide goals and national trends (continuing process). I have had Biochemistry I lab and Molecular Genetics students work with the purification and DNA sequence analysis of my research samples (16S ITS rRNA sequences), but would like to see more research-style labs integrated into Gen Chem II.

PATENTS

"Genetic Manipulation Of Condensed Tannins", R.A. Dixon, N.L. Paiva, D. Xie, and S. Sharma, provisional patent application submitted July 2002; issued in foreign countries beginning in 2008; US Pat. #7622638 Issue Date: November 24, 2009.

"Transgenic Plants Modified to Contain Resveratrol Glucoside and Uses Thereof ", N.L. Paiva and J.D. Hipskind, US Pat. #6,974,895, final patent application submitted January 2000; issued December 13, 2005.

"Isoflavone Reductase Promoter", R.A.Dixon, N.L.Paiva, A.Oommen, Pat. #5,750,399, issued May 12, 1998.

PUBLICATIONS (peer-reviewed journal articles and book chapters)

Paiva, N.L. (2010) Chapter 14: Plant Cell Culture. (book chapter) In: Manual of Industrial Microbiology and Biotechnology, 3rd edition, R.H.Baltz, J.E.Davies and A.L.Demain, eds., ASM Press, Washington DC, pp.115-131.

Kineman, B.D., Brummer, E.C., Paiva, N.L., Birt, D.F. (2010) Resveratrol from transgenic alfalfa for prevention of aberrant crypt foci in mice. Nutrition and Cancer **62**: 351-361.

Kineman, B.D., Au A., Paiva, N.L., Kaiser, M.S., Brummer, E.C., Birt, D.F. (2007) Transgenic alfalfa that accumulates piceid (trans-resveratrol-3-O-beta-D-glucopyranoside) requires the presence of beta-glucosidase to inhibit the formation of aberrant crypt foci in the colon of CF-1 mice. Nutrition and Cancer **58**: 66-74.

Aziz, N., Paiva N.L., May G.D., Dixon R.A. (2005) Transcriptome analysis of alfalfa glandular trichomes. Planta **221**: 28-38. [E-publication, Dec 2, 2004, DOI: 10.1007/s00425-004-1424-1]

Xie, D.-Y., Jackson, L.A., Cooper, J.D., Ferreira, D., and Paiva, N.L. (2004) Molecular and Biochemical Analysis of Two cDNA Clones Encoding Dihydroflavonol-4-Reductase from *Medicago truncatula*. Plant Physiology **134**: 979-994.

Xie, D., Sharma, S.B., Paiva, N.L., Ferreira, D., Dixon, R.A. (2003) Role of anthocyanidin reductase, encoded by BANYULS in plant flavonoid biosynthesis. Science **299**: 396-399.

Cooper, J.D., Qiu, F. and Paiva, N.L. (2002) Biotransformation of an exogenously supplied isoflavonoid by transgenic tobacco cells expressing alfalfa isoflavone reductase, Plant Cell Reports **20**: 876-884.

Baggett, B.R., Cooper, J.D., Hogan, E.T., Carper, J., Paiva, N.L., and Smith, J.T. (2002) Profiling isoflavonoids found in legume root extracts using capillary electrophoresis. Electrophoresis **23**: 1642-1651.

Paiva, N.L. (2002). Engineering Resveratrol Glucoside Accumulation Into Alfalfa: Crop Protection and Nutraceutical Applications, IN: Crop Biotechnology, American Chemical Society Symposium Series 829. Edited by K. Rajasekaran, T.J. Jacks, and J.W. Finley, American Chemical Society, Washington, DC, published by Oxford University Press. p. 118-130.

López-Meyer, M. and Paiva, N.L. (2002) Immunolocalization of vestitone reductase and isoflavone reductase, two enzymes involved in the biosynthesis of the phytoalexin medicarpin. Physiological and Molecular Plant Pathology **61**: 15-30.

Paiva, N.L., and Hipskind, J.D. (2001) Resveratrol Glucoside Engineering: Plant And Human Health Benefits. IN: Recent Advances in Phytochemistry: Regulation of Phytochemicals by Molecular Techniques, Volume 35, J. Romeo and J. Saunders, eds., Phytochemical Society of North America, Elsevier Inc., pp.233-255.

Mundodi, S.R., Watson, B.S., Lopez-Meyer, M., and Paiva, N.L. (2001) Functional expression and subcellular localization of the *Nectria haematococca Mak1* phytoalexin detoxification enzyme in transgenic tobacco. Plant Molecular Biology **46**: 421-432.

Bell, C.J., Dixon, R.A., Farmer, A.D., Flores, R., Inman, J., Gonzales, R.A., Harrison, M.J., Paiva, N.L., Scott, A.D., Weller, J.W., and May, G.D. (2001) The Medicago Genome Initiative: a model legume database. Nucleic Acids Research **29**: 114-117.

Hipskind, J.D., and Paiva, N.L. (2000) Constitutive accumulation of a resveratrol glucoside in transgenic alfalfa increases resistance to *Phoma medicaginis*. Molecular Plant-Microbe Interactions **13**: 551-62.

Allen, D.J., Gray, J.C., Paiva, N.L., and Smith, J.T. (2000) An enantiomeric assay for the flavonoids medicarpin and vestitone using capillary electrophoresis. Electrophoresis **21**: 2051-

2057.

Paiva, N.L. (2000) An Introduction to the Biosynthesis of Chemicals Used in Plant-Microbe Communication. Journal of Plant Growth Regulation **19**: 131-143.

Paiva, N.L. (1999) Plant Cell Culture. (book chapter) In: Manual of Industrial Microbiology and Biotechnology, 2nd edition, A.L.Demain and J.E.Davies, eds., ASM Press, Washington DC, pp.192-206.

Cameron, R.K., Paiva, N.L., Lamb, C.J., and Dixon, R.A. (1999) Accumulation of salicylic acid and PR-1 gene transcripts in relation to the systemic acquired resistance (SAR) response induced by *Pseudomonas syringae* pv. tomato in Arabidopsis. Physiological and Molecular Plant Pathology. **55**: 121-130.

Paiva, N.L., Hipskind, J.D., and Cooper, J.D. (1999) Alfalfa transformation related to secondary metabolite biosynthesis, Proceedings of The Alfalfa Genome (TAG) meeting, August 1-4, 1999, Madison, Wisconsin.
http://genes.alfalfa.ksu.edu/TAG/TAGpapers/paiva/PAIVA.html
McKhann, H.I., Paiva, N.L., Dixon, R.A., and Hirsch, A.M. (1998) Expression of genes for enzymes of the flavonoid biosynthetic pathway in the early stages of the Rhizobium-legume symbiosis. In: Flavonoids in the Living System, Manthey and Buslig, eds., Plenum Press, New York, NY, pp.45-54.

Lopez-Meyer, M., and Paiva, N.L. (1998) Subcellular localization of two enzymes involved in medicarpin biosynthesis in alfalfa. 36th North American Alfalfa Improvement Conference Proceedings, p. 43.

McKhann, H.I., Paiva, N.L., Dixon, R.A., and Hirsch, A.M. (1997) Chalcone synthase transcripts are detected in alfalfa root hairs following inoculation with wild-type *Rhizobium meliloti*. Molecular Plant-Microbe Interactions **10**: 50-58.

Dixon, R.A., Lamb, C.J., Masoud, S., Sewalt, V.J. and Paiva, N.L. (1996) Metabolic engineering: Prospects for crop improvement through the genetic manipulation of phenylpropanoid biosynthesis and defense responses. Gene **179**: 61-71.

Sumner, L.W., Paiva, N.L., Dixon, R.A., and Geno, P.W. (1996) High-performance liquid chromatography/continuous-flow liquid secondary ion mass spectrometry of flavonoid glucosides in leguminous plant extracts. Journal of Mass Spectrometry **31**: 472-485.

Pallas, J.A., Paiva, N.L., Lamb, C.J., and Dixon, R.A. (1996) Tobacco plants epigenetically suppressed in phenylalanine ammonia-lyase do not develop systemic acquired resistance in response to infection by tobacco mosaic virus. Plant Journal **10**: 281-293.

Dixon, R.A., Lamb, C.J., Paiva, N.L., and Masoud, S. (1996) Improvement of natural defense responses. Annals of the New York Academy of Sciences. **792**: 126-139.

Bianchini, G.M., Stermer, B.A., and Paiva, N.L. (1996) Induction of early mevalonate pathway enzymes and biosynthesis of end products in potato (*Solanum tuberosum* L.) tubers by wounding and elicitation. Phytochemistry **42**: 1563-1571.

Howles, P.A., Sewalt, V.J.H., Paiva, N.L., Lamb, C.J., Elkind, Y., Bate, N.J., and Dixon, R.A. (1996) Overexpression of phenylalanine ammonia-lyase in transgenic tobacco plants reveals control points for flux into phenylpropanoid synthesis. Plant Physiology **112**: 1617-1624.

Guo, L., and Paiva, N.L. (1995) Molecular cloning and expression of alfalfa (*Medicago sativa* L.) vestitone reductase, the penultimate enzyme in medicarpin biosynthesis. Archives of Biochemistry and Biophysics **320**: 353-360.

Dixon, R.A., and Paiva, N.L. (1995) Stress-induced phenylpropanoid metabolism. Plant Cell **7**: 1085-1097.

Dixon, R.A., Bhattacharyya, M.K., and Paiva, N.L. (1995) Engineering disease resistance in plants: an overview. In "Advanced Methods in Plant Pathology", Singh, R.P. and Singh, U.S., eds., CRC Press, Boca Raton, pp 249-270.

Bhattacharyya, M.K., Paiva, N.L., Dixon, R.A., Korth, K.L., and Stermer, B.A. (1995) Features of the *hmg1* subfamily of genes encoding HMG-CoA reductase in potato. Plant Molecular Biology, **28:** 1-15.

Ni, W., Paiva, N.L., and Dixon, R.A. (1994) Reduced lignin in transgenic plants containing an engineered caffeic acid O-methyltransferase antisense gene. Transgenic Research **3**: 120-126.

Paiva, N.L., Sun, Y., Dixon, R.A., VanEtten, H.D., and Hrazdina, G. (1994) Molecular cloning of isoflavone reductase from pea (*Pisum sativum* L.): Evidence for a 3R-isoflavone intermediate in (+)-pisatin biosynthesis. Archives of Biochemistry and Biophysics **213**: 501-510.

Paiva, N.L., Oommen, A., Harrison, M.J., and Dixon, R.A. (1994) Regulation of isoflavonoid metabolism in alfalfa. Plant Cell, Tissue and Organ Culture **38:** 213-220. (also published in "Primary and Secondary Metabolism of Plants and Cell Cultures III", (1995) Schripsema, J. and Verpoorte,R., eds., Kluwer Academic Publishers, Boston, pp 213-220.)

Oommen, A., Dixon, R.A., and Paiva, N.L. (1994) The elicitor-inducible alfalfa isoflavone reductase promoter confers different patterns of developmental expression in homologous and heterologous transgenic plants. Plant Cell **6**: 1789-1803.

Guo, L., Dixon, R.A., and Paiva, N.L. (1994) Conversion of vestitone to medicarpin in alfalfa (*Medicago sativa* L.) is catalyzed by two independent enzymes. Journal of Biological Chemistry **269**: 22372-22378.

Guo, L., Dixon, R.A., and Paiva, N.L. (1994) The pterocarpan synthase of alfalfa: Association and co-induction of vestitone reductase and 7,2'-dihydroxy-4'-methoxy-isoflavanol (DMI) dehydratase, the two final enzymes in medicarpin biosynthesis. FEBS Letters **356**: 221-225.

Dixon, R.A., Paiva, N.L., and Harrison, M.J. (1994) Biochemical and molecular analysis of defense responses in legumes: an overview. Proceedings of the 1st European Nitrogen Fixation Conference, eds G.B. Hiss and G. Endre, Officing Press, Szeged, pp 195-198.

Dixon, R.A., Harrison, M.J., and Paiva, N.L. (1994) The isoflavonoid phytoalexin pathway: from enzymes to genes to transcription factors. Physiologia Plantarum **93**: 385-392.

Dixon, R.A., Bhattacharyya, M.K., Harrison, M.J., Faktor, O., Lamb, C.J., Loake, G.J., Ni, W., Oommen, A., Paiva, N., Stermer, B., and Yu, L.M. (1993) Transcriptional regulation of phytoalexin biosynthetic genes. In "Advances in Molecular Genetics of Plant-Microbe Interactions", Vol. 2, Nester, E.W. and Verma, D.P.S., eds., Kluwer Academic Publishers, Dordrecht, Netherlands, pp 497-509.

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Dixon, R.A., Harrison, M.J., Paiva, N.L., and Stermer, B.A. (1993) Molecular biology of disease resistance. In "Biotechnology for Aridland Plants", Mabry, T., Nguyen, H., Dixon, R.A. and Bonness, M., eds., IC^2 Institute, Austin, Texas, pp 177-203.

Dixon, R.A., Maxwell, C.A., Ni, W., Oommen, A., and Paiva, N.L. (1993) Genetic manipulation of lignin and phenylpropanoid compounds involved in interactions with microorganisms. In "Recent Advances in Phytochemistry", Vol. 28, Genetic Engineering of Plant Secondary Metabolism, Ellis, B.E., Kuroki, G.W. and Stafford, H.A., eds. Plenum, New York, pp 153-178.

Dixon, R.A., and Paiva, N.L. (1992) Prospects for accessing DNA banks for the isolation of genes encoding biologically active proteins. In, "Conservation of Plant Genes. DNA Banking and *In Vitro* Technology", Adams, R.P. and Adams, J.E., eds. Academic Press, New York, pp 99-118.

Dixon, R.A., Choudhary, A.D., Dalkin, K., Edwards, R., Fahrendorf, T., Gowri, G., Harrison, M.J., Lamb, C.J., Loake, G.J., Maxwell, C.A., Orr, J.D., and Paiva, N.L. (1992) Molecular biology of stress-induced phenylpropanoid biosynthesis in alfalfa. In, "Phenolic Metabolism in Plants", Stafford, H.A. and Ibrahim, R.K. eds., Plenum Press, New York, pp 91-138.

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Paiva, N.L., Roberts, M.F., and Demain, A.L. (1993) The cyclohexane moiety of rapamycin is derived from shikimic acid in *Streptomyces hygroscopicus*. Journal of Industrial Microbiology **12**: 423-428.

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SELECTED PRESENTATIONS

Selected significant Presentations at meetings without research students present:

December 2015: Pacifichem (a joint meeting of the American Chemical Society and several international chemical societies of the Pacific Rim): poster presented December 18, 2015, Honolulu, HI: Topic Area: (11) Connecting Chemistry to Society
Session Title: Active and Inquiry Learning in the Chemistry Classroom and Laboratory (#443)
Abstract Title: "Introductory biochemical technology lab to help chemistry, environmental science, and biology students explore microbes in different environments." This was my first time presenting in an Educational section, presenting results generated in the first offerings of Introduction to Research offered under OK NSF EPSCoR workshop funding, among faculty presenting courses or workshops that they developed at their home institutions.

Spring 2012: "Filamentous freshwater biomass as a bioenergy source", Poster presented by **Paiva, Nancy L.**; Jones, Stefan T.; Assamoi, Tetchi H.; Zounon, Judith; McKim, Steve. 243rd ACS National Meeting & Exposition, San Diego, CA, March 25-29, 2012 (BIOT-235).

Spring 2011: "Analysis of phytochemicals in a traditional herbal remedy for BPH", Poster presented by **Paiva, Nancy L**.; Baughman, Allen; Jones, Stefan T.; Faull, Kym F.; Villamil, Aris. 241st ACS National Meeting & Exposition, Anaheim, CA, March 27-31, 2011 (AGFD-130).

2009 OK-NSF-EPSCoR Annual Statewide meeting, Oklahoma City, March 31, 2009, (on nanotechnology and biofuels): presented technical poster: Dale W. Daniel, Tucker Harrison, Kati Crawford, Michael C. Pilkington, & **Nancy L. Paiva**, "*Centaurea americana* as a Potential Biodiesel Oilseed Crop", summarizing multiple years of funded research findings. (also

attended 2011 OK-NSF-EPSCoR Annual Statewide meeting, Norman-OU campus, April 21, 2011)

Additional scientific and progress report presentations were made at annual meetings called by NASA Oklahoma Space Grant, OK-INBRE, and OK NSF EPSCoR research and grant sponsors.

American Chemical Society national meetings: Posters co-authored and presented by students (*Abstracts listed in SciFinder database***).**

In each of the years listed, as the SE ACS chapter faculty advisor, I also helped the chapter members apply to the ACS National Office in Washington D.C. for a $300 group travel grant and to SE Student Government Association for $100-$200 per student, in addition to arranging other travel funds, transportation, lodging, registration and meals.

Spring 2018, New Orleans, LA, March 2018. (2 co-authored posters presented, plus escorted 1 undergraduate non-coauthor presenting summer work):

1) CHED ACS Student Affliliates "Successful Chapter" poster, Casey Love, Dyani Shores, Elizabeth Whitlow, and Payton Whitehead presenting. 2) CHED-Undergraduate research posters- Comparison of growth and energy content of Spriodela polyrhiza and Lemna minor, two potential biofuel sources. Ryan M. Robinson, Payton S. Whitehead, Patrick W. Sharp, Steve McKim, , Nancy L. Paiva.

Spring 2017, San Francisco, CA, April 2017: 1) CHED ACS Student Affliliates "Successful Chapter" poster, 2) CHED-Undergraduate research posters- Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), Payton Whitehead, E. Landers, L. Chandler, and N.L. Paiva; **Payton Whitehead** presenting.

Spring 2016, San Diego, CA, March 2016: 1) CHED ACS Student Affliliates "Successful Chapter" poster, E. Landers, L. Chandler presenting; 2) CHED-Undergraduate research posters- Biotechnology section technical research poster on *E. coli* expression of a *Medicago truncatula* cDNA-encoded anthocyanin reductase (ANR), **Ludmila Chander** presenting.

Spring 2014, Dallas TX (2 abstracts submitted): 1) CHED ACS Student Affliliates "Successful Chapter" poster, 2) CHED-Undergraduate research posters- Biotechnology section technical research poster on duckweed to biofuels research, with 2 student presenters.

Spring 2013, New Orleans, LA (2 abstracts submitted): 1) CHED ACS Student Affliliates "Successful Chapter" poster, 2) CHED-Undergraduate research posters- Biotechnology section technical research poster on duckweed to biofuels research.

Spring 2012, San Diego, CA (2 abstracts submitted): 1) ACS Student Affliliates "Successful Chapter" poster, 2) BIOT (Biochemical Technology) technical research poster on biofuels from aquatic biomass. The later was selected for presentation at both the BIOT session as well as the "Sci-Mix" interdisciplinary session.

Spring 2011, Anaheim, CA (3 abstracts submitted): 1) ACS Student Affliliates "Successful Chapter" poster, 2) AGFD technical research poster, & 3) escorting biotechnology major presenting poster on their Noble Foundation (Ardmore, OK) summer 2010 internships

Spring 2010, San Francisco, CA (3 abstracts submitted): 1) ACS Student Affliliates "Successful Chapter" poster, 2) AGFD technical research poster, & 3) escorting 2 chemistry majors presenting poster on their NSF-REU OSU Chemistry summer 2009 internships

Spring 2008, New Orleans, LA: 3 student research posters in CHED session

Spring 2007, Atlanta, GA: 1 student research poster in CHED session,

1 student/PI research poster in AGFD session
Spring 2006, San Diego, CA: 1 invited research talk in AGFD session
Spring 2004, Long Beach, CA: 1 PI research poster in AGFD session

OK-INBRE (NIH) Summer Research Intern posters mentored and co-authored with student presenters at annual July closing poster session (printed abstract proceedings):

July 2021, OK-INBRE 2021 Summer Research Intern poster session:

1) **EXPLORATION OF NUTRITIONAL COMPONENTS OF REDBUD SEEDS, Cooper McKinney**, Mackenzie Powell, Asuncion Eleazar Rubio, Sergio A. Vazquez Gomez and Dr. Nancy Paiva.

2) **ANALYSIS OF ANTI-NUTRITIONAL FACTORS OF CERCIS CANADENSIS USING MANDUCA SEXTA, Mackenzie Powell,** Skylar Fletcher, Cooper McKinney, Asuncion Eleazar Rubio, Dr. Nancy Paiva.

Both students competed and received favorable comments from poster judges.

July 2017, OK-INBRE 2017 Summer Research Intern poster session:
Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.
(also presented at Spring 2017 national American Chemical Society meeting, CHED Undergraduate Research posters (Biotechnology), San Francisco, CA, April 2017, and AISES meeting September 2017.

July 2015, OK-INBRE 2015 Summer Research Intern poster session:
E. coli expression of a *Medicago truncatula* cDNA-encoded anthocyanin reductase (ANR), **Ludmila Chander** and Nancy L. Paiva.

July 2014, OK-INBRE 2014 Summer Research Intern poster session:
Characterization of DMID, an isoflavonoid pathway enzyme, via interactions with VR, **Tyler Shannon**, Abe Blackburn, James Sharp, and Nancy L. Paiva.
(also presented by T.Shannon at the "OKAMP"/LSAMP poster session at OSU-Stillwater in September 2014)

July 2013, OK-INBRE 2015 Summer Research Intern poster session:
Characterization of DMID, an isoflavonoid pathway enzyme, via interactions with VR, **Santosh Khadka**, Abe Blackburn, Cord Carter, and Nancy L. Paiva.

American Indian Science and Engineering Society (AISES) Research Intern posters mentored and co-authored with student presenters annual National meeting poster session:

AISES October 9-13, 2019, Milwaukee, WI:

1) Cercis Canadensis (redbud) Seed Nutritional Components, Lexus Thomas, Kala Mignone, Asuncion Eleazar Rubio, Sergio A. Vazquez Gomez, and Nancy L. Paiva

2) Escorted 1 undergraduate non-coauthor (Skylar Fletcher) presenting summer poster from NSF-REU in Greece.

AISES October 4-5, 2018, Oklahoma City, OK:

No SE students presented research posters, but I escorted 3 AISES student members to attend the career and internship fair and attend research lectures.

AISES September 22, 2017, Denver, CO:

1) Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.

2) Comparison of Growth and Energy Content of Spriodela polyrhiza and Lemna minor, Two Potential Biofuel Sources. **Ryan M. Robinson**, P. Sharp, D.S. McKim, and N.L. Paiva.

3) Also escorted 1 undergraduate non-coauthor (Casey Love) presenting summer poster.

AISES November 9-12, 2016 Minneapolis, Minnesota:

1) Escorted 1 undergraduate non-coauthor (Katy Gaskill) presenting summer poster.

2) Also escorted undergraduate officers of the SE AISES chapter (Payton Whitehead, Shane Goff, Katy Gaskill) and 2 other members (Skylar Fletcher & Austin Nichols) to attend career enhancement, chapter-strengthening and regional student sessions.

AISES November 14, 2014, Orlando, Florida:

1) James Sharp, Dr. Nancy L. Paiva, Construction and expression of ANR plasmid for *E. coli*, Research Focus: Biochemistry. Southeastern Oklahoma State University.

2) Aleina M. Pate, James D. Sharp, Dr. Nancy L. Paiva, A Study of Microbes from Durant, Oklahoma, Research Focus: Biochemical Technology. Southeastern Oklahoma State University.

3) Sarrysa A. Eaves[1], A. Bastian[2], L.C. Bailey-Downs, PhD[2], M.A. Ihnat, PhD[2]. Structural Activity of AG311 and Its Efficacy on Resistant Lung Cancer Cells. Research Focus: Drug Development. [1]Southeastern Oklahoma State University. [2]Department of Pharmaceutical Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center. (Note: The research was mentored at OU-HSC, but I mentored Sarrysa through reformatting the poster for the AISES presentation and oral competition; she won $450 for 4th Place among all undergraduate posters.)

Oklahoma Research Day (annual state-sponsored research display): Multiple posters presented in **2010**, **2009, 2008, 2007 & 2006.** I stopped attending this when it moved from fall to spring, due to scheduling conflicts with ACS meetings and other spring events.

Oklahoma Research Day at the Capitol, OKC: Undergraduate researchers from my lab were selected to represent the Southeastern campus at this statewide event, and I was their mentor to guide them through preparing their presentations and the actual event. I mentor them through the reformatting of their work for a more general public audience, discuss strategies for their 3-minute presentations, and help them practice. I go with them to help them set up their displays at 7 AM on the day of the contest, and stay at least until they have presented to the judges. I do not tell tell what to present or how; the final decisions are up to the students:

2008: Tucker Harrison, Jeff B. Hill, Nancy L. Paiva, **"**The Repellent Properties of *Monarda* Species in Oklahoma against *Drosophila Melanogaster*" Tucker Harrison won First Place in the Regional University/Community College competition (and $500) for his poster presentation:

2009: Dale Daniel, Tucker Harrison, Kati Crawford, Michael C. Pilkington & Nancy Paiva, "*Centaurea americana* as a Potential Biodiesel Crop." Dale Daniel won First Place in the Regional University/Community College competition (and $500) for his poster presentation.

2011: Stefan T. Jones presented his poster at the Capitol on March 31, 2011.: Stefan Jones, Allen Baughman, Steve McKim, & Nancy L. Paiva, "Filamentous Freshwater Algae As A Bioenergy Source."

2013: Abraham G. Blackburn presented his poster at the Capitol on April 11, 2013.: Abe G. Blackburn, Ricky Lemons, Nick J. Wade, Diann Baze, Dr. S. McKim, "Duckweed, a Versatile Renewable Resource"

2018: Payton Whitehead presented his poster at the Capitol on March 26-27, 2018.

"Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), Payton Whitehead, E. Landers, L. Chandler, and N.L. Paiva. Payton Whitehead won First Place in the Regional University/Community College competition (and $500 cash) for his poster presentation.

I have also nominated and coached 4 SE student presenters who carried out their research off-campus, but were selected to represent SE. I mentor them through the reformatting of their work for a more general public audience, help them practice, and go with them to help them set up their displays at 7 AM on the day of the contest, as I do for my own research interns.:

2019: Gabrielle Ford presented her poster at the OKC Capitol on March 25-26, 2019 "Defining the Regulon of Iron-regulated small RNA NrrF in *Neisseria gonorrhoeae* FA1090 with Next Generation Illumina Sequencing", by Gabrielle P. Ford, Southeastern Oklahoma State University, and Dr. Lydgia Jackson and Dr. Dave Dyer, OU-HSC Core Facility, Department of Microbiolgy and Immunology, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma.

2017: Rup Thing presented his poster at the Capitol on March 20-21, 2017 "Bismuth(III) triflate catalyzed esterification-Fries-oxa-Michael route to 4-chromanones", by Rup Thing, Southeastern Oklahoma State University, and Dr. Richard A. Bunce, Oklahoma State University.

2015: Sarrysa Eaves presented her poster at the Capitol on March 31, 2015, entitled "Structural Activity of AG311 and Its Efficacy on Resistant Lung Cancer Cells", by Sarrysa Eaves, Anja Bastian, Lora C. Bailey-Downs, Michael A. Ihnat (OU-HSC Pharmacy).

2014: Kent Davidson presented his poster at the Capitol on April 1, 2014, and won Third Place in the Regional University/Community College competition (and $250) for his poster presentation: "Role For The Tumor Suppressor Protein P27kip1 In Cancer Cell Metabolism" by Kent Davidson (SE), Abdulah Mahayni, Robert J.Sheaff (U. Tulsa).

"OKAMP" (Oklahoma-Louis Stokes Alliance for Minority Participation):

Fall 2021: Mentored 2 LSAMP Scholars, Asuncion Eleazar Rubio and Sergio A. Vazquez Gomez, who will co-present a joint poster at the annual LSAMP meeting at OSU-Stillwater, Oct. 9, 2021: **EXPLORATION OF NUTRITIONAL AND ANTI-NUTRITIONAL COMPONENTS OF REDBUD SEEDS, Author(s): Asuncion Eleazar Rubio*, Sergio A. Vazquez Gomez*,** Cooper McKinney, Mackenzie Powell, Skylar Fletcher. **(*co-presenters)**

2005, 2009, 2013, 2014: Mentored 3 minority researchers (Ricardo Lemus, Cord Carter and Tyler Shannon) in the preparation of their OKAMP poster presentations at the annual Fall OKAMP OSU meeting.

Spring 2007 (Ricardo Lemus in Atlanta, GA) **& 2014** (Cord Carter in Dallas, TX**):** Participated in the NSF-LSAMP workshop to enhance participation in LSAMP activities, and mentored a OKAMP poster presentor during the special NSF-LSAMP-sponsored poster session.

Fall 2014 to Spring 2018: Mentored minority scholar Payton Whitehead as academic advisor and OKAMP research mentor.

Additional presentations were made at university (SE Brain Storm 2011 and 2012), regional, state and local American Chemical Society meetings.

GRANT PROPOSAL SUBMISSIONS AND SUCCESSFUL RESEARCH FUNDING:

I have written and submitted numerous grant proposals, to federal, private and campus funding sources. Below is a listing of the funded grants on which I haved served as PI, with a very brief description of each.

External Grants awarded since Fall 2002:

1) RR03010 (Waxman, state proposal coordinator) 6/30/2004 – 12/30/2006
NIH/INBRE (IDeA Networks of Biomedical Research Excellence)
For 2.5 year: $199,000 total in direct costs, plus approximately $38,000 in indirect costs.
PROJECT TITLE: Oklahoma IDeA Networks of Biomedical Research Excellence
SUBPROJECT TITLE: Biosynthesis of Isoflavonoid and Flavonoid Nutrients

The major goals of this project are to use functional genomics techniques to identify clones encoding biosynthetic enzymes essential to accumulation of nutritionally beneficial natural products in plant-based foods, and to help a new faculty member establish research contacts within the Oklahoma BRIN-INBRE network.

2) NSF 0421379 (Paiva) NSF Division of Biological Infrastructure 09/01/04-08/30/06
Program Name: Major Research Instrumentation (MRI) $67,462 (equipment only)
PROJECT TITLE: Acquisition of Protein Purification Instrumentation for Isoflavonoid Research

The major goals of this project are to acquire a protein chromatography system and associated protein purification and analysis equipment to be used in undergraduate education and research activities, and to use this instrumentation to biochemically characterize and purify enzymes related to natural product biosynthesis.

3) S06 GM08003 (Paiva) 09/15/04–07/31/09
NIGMS SCORE Individual Research Project
Approx. $500,000 for 4 years including indirect costs, plus 1 year no cost extension)
SUBPROJECT TITLE: Analysis of Beta-Glucosidases Active on Isoflavonoid Conjugates

The major goals of this project are to analyze the biochemical and molecular properties of plant beta-glucosidases (BG1 and BG2) with high specificity towards isoflavonoid conjugates, potentially important constituent of foods ("nutraceuticals").

4 & 5) NSF/EPSCoR Program Grant # EPS-0132534 (Waxman, state proposal coordinator)
06/07/04 – 05/31/05: $20,499; One-year sub-award by Oklahoma NSF-EPSCoR Summer Outreach Program, from the final year of the state proposal.
05/15/05 -4/30/08: $19,500 per year for 3 years; 3-year award from a new Oklahoma NSF-EPSCoR Summer Outreach Program, from a new state proposal.
SUBPROJECT TITLE: SOSU NSF-EPSCOR-Educational Outreach Efforts-Summer Science Workshop: "Summer Workshop on the Analysis of Medicinal and Edible Plants of Southeastern Oklahoma" The goals are to introduce college students during the summer months to research methods and reinforce science, math and computer skills required for research careers, to increase the number of students entering graduate programs or research careers in Oklahoma. The summer program provides for classroom instruction, basic laboratory skills, and development of a research project, and tours of graduate science programs and research opportunities in Oklahoma and N. Texas.

N. Paiva administers the funds, recruits students, and organizes the summer activites, but some students may carry out research in various research labs at SOSU.

6) NGT5-40111 (Prime Award) (V.Duca-Snowden, state coordinator) 10/31/02-05/31/05
$7,000/year for 3 yrs initially; NASA OSGC Subcontract No. 2003-29 from NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, to Southeastern Oklahoma State University

Renewed in 2005 for another 2 years, and later extended to August 2010, with NASA OSGC Subcontract No. 2006-23 currently providing $16,000 in undergraduate awards for the 2009-2010 year, matched by $16,000 in state tuition waivers.

SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category: Undergraduate Fellowships" (SOSU Fellowship administrator: N. Paiva)

These funds, combined with matching funds from SOSU, currently provides $32,000 annually in tuition waivers and other funds for qualifying students to pursue education and training in areas relevant to NASA's programs. Over 100 awards have been made to date.

7) NGT5-40111 (Prime Award)(V. Duca-Snowden, state coordinator) 03/01/04-present
NASA OSGC Subcontract No. 2004-34 $7,500
Renewed in 2005 for an additional **$6,087**
NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, to Southeastern Oklahoma State University

SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category: **Workforce Development**" (SOSU grant administrator: N. Paiva; Activities Director: Mr. Scott Hensley, Director, SOSU Career Services and Placement Services)

The goal is to enhance the awareness of students to potential careers and job opportunities relevant to NASA's programs and the aerospace industry. Funds supplement career fair activities, provide travel for the career services staff to relevant meetings and employers, and internships or travel opportunities for students.

The continued funding for NASA workforce development activities are now merged with the NASA OSGC Fellowship awards described in #6 above.

8) NGT5-40111 (Prime Award)(Snowden, state coordinator) 06/01/04-05/31/06
NASA OSGC Subcontract 2005-10 (PI: N. Paiva) $10,130
NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, to Southeastern Oklahoma State University

SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category: Research Infrastructure": Effects of Microgravity and High Iron Soils on Plant Secondary Metabolites.

The funds provide 1 mo. summer support (completed) and travel to 2 NASA research sites for the PI to explore research topics directly with NASA personnel. Limited supply funds are included to aid the generation of preliminary results on the effect of growth parameters on the phytochemical content of important food plants.

9) NASA OK Space Grant Research Infrastructure Augmentation: 08/15/08-08/14/09: $10,500: NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, Subcontract to Southeastern Oklahoma State University

SUBPROJECT TITLE: "Space Plants"

The funds provide 1 mo. summer support (completed) and travel to NASA KSC research sites for the PI to explore research topics directly with NASA personnel. Limited supply funds are included for the generation of preliminary results on the effects of extended exposure to low Earth orbit conditions on seeds and klinostat growth conditions on plants on the phytochemical content of cinnamon basil plants.

10) Oklahoma Center for the Advancement of Science and Technology (OCAST) R&D Internship Program: Earth Biofuels, Inc. and Southeastern Oklahoma State University
OCAST award #AP071-i19, May 1, 2007 – February 29, 2008; Year 1: $26,736
Project Title: Investigation of Biofuels Production Parameters.
Project role: P.I./Mentor for interns.

Summary: The R & D undergraduate interns worked under the supervision of the plant manager (Jimmy Stephens, project mentor), chemist (Ron Workman, project mentor), and plant operators at the biodiesel plant on projects related to the commercial conversion of vegetable oils to high quality biodiesel (B100). To augment the chemical analysis instrumentation at this new plant and to eliminate possible delays from sending research samples generated at the plant to outside laboratories, SOSU interns used valuable research-grade instrumentation in the SOSU Department of Chemistry, Computer and Physical Sciences, under the supervision of Nancy Paiva (project P.I. and mentor). They also used SOSU computers for preparation of reports, posters and timesheets.

Operated only first year of 2 year award, due to economic difficulties at biofuels partner firm.

11) Oklahoma Center for the Advancement of Science and Technology-Applied Plant Science program. OCAST award #PSA08-03, 2 years, $50,000, including match. 05/01/08-04/30/10.
Project Title: Evaluation of *Centaurea americana* as a biodiesel oilseed crop.

The fatty acid profile of Centaurea *americana* (American basket flower) seed oil is very similar to soybean and corn oils, and therefore may serve as an excellent alternative for modern production of biodiesel fuel. This research is investigating the potential for genetic variation or environmental differences having an effect of oil composition, and investigating the possible agronomic yield of the seed and oils. Undergraduate researchers are assisting in data collection, including GC-MS analysis of fatty acids.

12) NASA OK Space Grant Research Infrastructure Augmentation: 08/15/09-08/14/10: $16,000

NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, Subcontract to Southeastern Oklahoma State University (*Received 1-year no cost extension.*)
SUBPROJECT TITLE: Biofuels from Algae

The funds provide 1 mo. summer support (in 2010) and travel to NASA events. Limited supply funds are included to aid the generation of preliminary results on the production of biofuels from algae, with undergraduate researchers.

13) P20RR016478-09 (Akins, state proposal coordinator) 04/01/2010 – 03/31/2011
NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
For 1 year: **$24,995** total in direct costs.
PROJECT TITLE: Oklahoma IDeA Networks of Biomedical Research Excellence-II,

SUBPROJECT TITLE: Analysis of Phytochemicals in a Traditional Herbal Remedy for BPH

14) P20RR016478-09 (Akins, state proposal coordinator) INBRE-I 11/19/2009-3/31/2010 INBRE-II 4/1/2011-4/30/2014; INBRE-III 5/1/2014-4/30/2019; INBRE-IV 5/1/2019-4/30/2023. NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: Oklahoma INBRE-Institutional Funds (carryforward and other funds)
TOTAL AGREEMENT 2009-2010: $70,000
TOTAL AGREEMENT 2010-2011: $40,000
TOTAL AGREEMENT 2011-2012: $32,000
TOTAL AGREEMENT 2012-2013: $24,575
TOTAL AGREEMENT 2013-2014: $40,000
TOTAL AGREEMENT 2014-2015: $25,000
TOTAL AGREEMENT 2015-2016: $25,000
TOTAL AGREEMENT 2016-2017: $25,000
TOTAL AGREEMENT 2017-2018: $20,000
In 2018-2019, no funding due to end of NIH funding cycle, but pages of reporting and other information were required to support the rewnal application to NIH. Renewed for 2019-2023.
PROJECT DIRECTOR at SE: Dr. Nancy L. Paiva (SEOSU INBRE institutional representative)
The funds are used by SOSU to purchase equipment and research supplies to support biomedical research and research training efforts in multiple departments on campus. My role is to collect equipment requests from SE faculty doing biomedical research or research-training, adapt those to the provided budget and NIH format, submit for approval by the state and federal NIH offices, submit all SE grant paperwork for approval, and make all purchases to ensure billing and delivery by the OK-INBRE and NIH funding deadlines.

15) Oklahoma National Science Foundation EPSCoR (OK NSF-EPSCoR) Small Grants Program (via subcontract from Oklahoma State University): 08/1/10-08/31/11: **$24,984**
SUBPROJECT TITLE: Evaluation of filamentous freshwater algae as a bioenergy source.
PI: N.L.Paiva Co-PI: S. McKim

16) NSF ARRA-ARI: Renovation of Biotechnology and Chemistry Research Laboratories at SEOSU. **PI: Nancy L. Paiva** Co-PIs: Joel T. Smith . Other Senior Personnel: Eddie Harbin and Jerry Polson. Submitted 08/24/09; Amount requested: $485,000.
Awarded **$475,458** from NSF on 9/10/10. Additional funding from SOSU to enhance the project provided LED lighting, to reduce energy consumption. Award was effective September 15, 2010 and expired August 31, 2013. This award was funded under the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law 111-5).

17) American Chemical Society Innovative Activities Grant (IAG) 2010-2012 to the Southeastern Oklahoma State University American Chemical Society (ACS) Student Members Chapter, from the ACS Undergraduate Programs national office
Role: PI/Advisor/author.
Proposal Title: Helping Rural Students Prepare for College Science Majors, $500 (plus $500 in match funds). Rebekah Ritchie, ACS-Student Chapter President, & Dr. Nancy L. Paiva, Chapter Co-Advisor, Southeastern Oklahoma State University (SEOSU), Durant, OK.

18) NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract No. 2006-23, (Prime Award NGT5-40111) (V. Duca-Snowden, state coordinator)
08/15/09-08/14/2011 award total (Modifications 5,6, & 7): $39,500
08/15/06-08/14/2011 (including 1-year no-cost extension to contract) 6-year total: $131,167.17
SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category (including Workforce Development)" (SOSU grant administrator: N. Paiva)

These funds, combined with matching funds from SOSU, currently provides $32,000 annually in tuition waivers and other funds for qualifying students to pursue education and training in areas relevant to NASA's programs. The goal of the Workforce Development is to enhance the awareness of students to potential careers and job opportunities relevant to NASA's programs and the aerospace industry. Funds supplement career fair activities, provide travel for the career services staff to relevant meetings and employers, and internships or travel opportunities for students.

19) NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract No #2012-10 for the project entitled "Oklahoma NASA Space Grant Consortium" under the direction of Dr. Paiva as the SEOSU Project Director. This subcontract is for the project/budget period of **1/01/11 – 10/31/16** and provides Year 1 and Year 2 funding to date in the amount of **$62,405,** and Year 3 funding for **$17,343,** and Year 4 and 5 funding for $10,500 each, with some tuition waiver match from SE**.**

This includes both NASA OSGC fellowship funding as well as funding for a robotics workshop for students and other projects.

20) NASA Oklahoma EPSCoR Travel Grant Fall 2011 (**$2,000**) and Research Infrastructure Grant (**$21,000**). 2/01/12 – 6/30/2012
Subcontract #2012-23 to SOSU from OU Prime award # # NNX07AL49A, CFDA #48.008.
Project Name: NASA EPSCoR Research Infrastructure Development: Biofuels from Aquatic Biomass
PI: N. Paiva; Co-PIs/Collaborators: Dr. Steve McKim (SOSU) and Dr. Raymond Wheeler, NASA KSC Plant Physiologist

Travel funds paid for the PI and Dr. McKim and 2 students to travel to NASA Kennedy Space Center to discuss potential areas of scientific collaboration in Fall 2011. Completion of this phase allowed the PI to successfully compete for additional travel funds for the spring and summer, to carry out relevant experiment on duckweed as a potential biomass crop and agent for water and air purification. A student will present some of these results at OK Research Day at the Capitol 2013.

21) NSF Oklahoma EPSCoR Educational Outreach Grants: Spring 2014 (**$39,679**) and Summer 2014 (**$44,761**). 6/01/13 – 5/31/2015 EPSCoR-2013-25 and amendment #1:Subaward contract to SOSU from OSU-Stillwater Prime award # IIA-1301789, CFDA #47.080.
Project Name: NSF OK EPSCoR Undergraduate Science Workshops for basic research skills and campus tours.
PI: N. Paiva; Collaborators: Cynthia Sanders, College of the Muskogee Nation, Okmulgee, OK.

National Science Foundation funds paid for lab supplies, travel expenses, student stipends, and other costs for 12 SE undergraduates (11 Native Americans) to participate in workshop exercises allowing them to get hands-on research experience. Additional workshop sessions included discussions of how to apply to future research internships in OK, how to analyze data and design experiments, and other aspects of science careers. Students were taken on tours of research campuses, emphasizing labs or researchers involved in recent EPSCoR-funded projects or core labs which would be analyzing their research samples. All students had to assemble their own research data into a scientific poster and present it to the group. Students received cash stipends upon completion of the workshop exercises. All SE student also received 2 credits via the course listing of CHEM4972: Special Studies: Introduction to Research. This grant also generated over $4,000 in Indirect costs paid to Southeastern.

22) OK-INBRE Release Time Award for Spring 2016: "NSF S-STEM scholarships for Southeastern Oklahoma State University science majors". OK-INBRE is providing funds release me from 25% of my Spring 2016 teaching load, to allow me to have more time to prepare and submit a large scholarship proposal on behalf of Southeastern. The funds come from the Oklahoma State Reagents of Higher Education funds which OK-INBRE receives as match for the National institutes of Health. In addition to student scholarships, the proposal will requests funds for activities and course or curriculum modifications to enhance the graduations rates of STEM students from low-income backgrounds.

This award saves the SE budget **over $10,000** this semester, at a time of budget crises.

23) OK-INBRE Travel Grants for Faculty for Spring 2016: NPaiva & LChandler travel to ACS Spring 2016 meeting. OK-INBRE has awarded **$2,000** to partially fund the travel of Dr. Paiva and Lily Chandler for the undergraduate to present her Summer 2015 OK-INBRE Internship results at the American Chemical Society national meeting in San Diego. As mentor, Dr. Paiva will assist her co-author is presenting, and attend curriculum development sessions during the meeting, in addition to both attending technical presentations.

24) On-going: NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract on Prime Award # NNX15AK02H for the project entitled "Oklahoma NASA Space Grant Consortium" under the direction of Dr. Paiva as the SEOSU Project Director. This subcontract is for the project/budget period of **5/01/15 – 04/30/18 plus 4th year extension** and provides Year 1 to Year 3 funding to date in the amount of **$117,250,** including $30,000 in supplemental Summer 2017 funding for special intern and travel projects, with SE in-state tuition waivers as partial match from SE**. The 5th year of continued funding was approved and will end in June 2020, at which time the funding will switch to a very different format, emphasizing undergraduate research more than academic cost defrayment and scholarships.**

25) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2016 SMaRT Program Interns (Summer Mentoring and Research Training) Award: **$6,732** Funds provided for part-time support of 2 interns and partial summer support for PI, and $1,000 in research supplies, to host 2 Sophomore students

(under 70 hours complete at time of application). Program is designed to address need to encourage lower-level students not yet ready for regular upper-level INBRE internships.

26) A) Oklahoma NSF EPSCoR Travel grants: Fall 2016 award: **$5,000**. Fall 2017 award: **$8,085**.
PI: NPaiva
Educational Outreach funds were awarded to cover most of the costs of taking 5 students to the Fall 2016 AISES meeting in Minneapolis, MN, and 4 students to the Fall 2017 AISES meeting in Denver, CO, along with 2 faculty advisors (NPaiva and ASpahn). The funds cover airfare, lodging, registration and food while at the meeting. AISES (American Indian Science and Engineering Society) promotes increasing the participation of Native Americans in STEM activities and careers, and the meeting provides many mentoring activities and ways to connect with future internship hosts and graduate programs.

B) Oklahoma NSF EPSCoR Physics Instructor Support grants: Fall 2016 award: **$32,000**. Fall 2017 award: **$32,000**.
Prime Award No.: OIA-1301789 **Subaward No.:** EPSCoR—2016-10
Administrative Contact/Lead Author: NPaiva **Project Director:** Tim Smith
Project title: Full –Time Physics Instructor and Additional STEM Mentor for Native American Undergraduates
During Summer 2016, when SE was entering a severe budget crisis, I was approached by the OK-NSF-EPSCoR office about how a previously-planned outreach project had fallen through at another campus, and I was asked to submit something that would benefit Native American STEM majors at SE. After consultation with newly-appointed Assistant VP Tim Boatmun, we agreed that seeking funding to support Alex Spahn as the Physics Instructor would best serve NA students seeking medical degrees, by helping to protect that position from budget cuts, while helping the overall university funding situation. The proposal I eventaully submitted on behalf of SE covered approximately 50% of all salary and benefits for a full-time physics intructor for 2 years, saving the university thousands of dollars over-all yet still increasing the instructor's pay slightly over the year before. I wrote several drafts of the proposal incorporating feedback on the correct tone and content from the OK EPSCoR office, received the initial contracts from the lead office, then asked Dr. Smith to serve as Project Director as Department Chair of CCPS, so that he could handle all of the department and grant employee transaction paperwork in parallel.

The travel grants described immediately above were also intended to take the partially-funded Physics Instructor to 2 AISES national meeting along with multiple students, to make him more aware of issues concerning Native American STEM majors, as well as opportunities available to them.

27) Oklahoma NSF EPSCoR Research Opportunity Award (ROA) May 1, 2017 to August 15, 2017. Award: **$12,499.52** PI: NPaiva
Project title: Genome Sequencing of Microbes Isolated from Oklahoma Soils-ROA.
Pass through entity: Oklahoma State University, PTE Federal Award #: OIA-1301789
Funds provided for the purchase of next-generation DNA sequencing reagents, travel between Durant and Stillwater for training and consultation with scientific mentor at OSU, development of teaching resources for Biochemistry and Molecular Genetics laboratory classes.

28) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer Intern 2018 Funds-hosting Payton Whitehead. Oklahoma-INBRE provided **$2,200** in research supplies to off-set some of the costs associated with hosting a summer undergraduate research intern, and preparing his research poster for presentation at the mandatory session in OKC, and **$5,000** in summer intern wages.

29) Oklahoma Center for the Advancement of Science and Technology (OCAST) R&D Interns Project #: IP17-021 for 2 years (1/1/2017 to 12/31/2018) with company partner ETS-Lindgren, Inc., Durant, OK.
PROJECT TITLE: Research to Improve the Reproducibility and Performance of EM-Absorbing Foam Products at ETS Lindgren, Durant, OK.
Award: OCAST**:$10,230**/yr, Match from ETS and NASA OK Space Grant: **$11,230**/yr
Funding supports 1-2 SE undergraduates as R&D interns helping to develop EM-blocking foam products by 2 methods and improve or adapt new manufacturing systems.

30) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2018 SMaRT Program Interns (Summer Mentoring and Research Training) Award: **$5,995**
Funds provided for part-time support of 2 interns and partial summer support for PI, and $1,000 in research supplies, to host 2 Sophomore students (under 70 hours complete at time of application; Dyani Shores and Auston Patton). Program is designed to address need to encourage lower-level students not yet ready for regular upper-level INBRE internships.

31) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2019 SMaRT Program Interns (Summer Mentoring and Research Training) Award: **$5,972**
Funds provided for part-time support of 2 interns and partial summer support for PI, and $1,000 in research supplies, to host 2 Sophomore students (under 70 hours complete at time of application; Sergio Vazquez Gomez and Lexus Thomas). Program is designed to address need to encourage lower-level students not yet ready for regular upper-level INBRE internships.

32) Oklahoma NSF EPSCoR Travel grants: Fall 2019 award: **$3,000**. PI: NPaiva
Educational Outreach funds were awarded to cover most of the costs of taking 2 students to the Fall 2019 AISES meeting in Milwaukee, WI. The funds cover airfare, lodging, registration and food. AISES (American Indian Science and Engineering Society) promotes increasing the participation of Native Americans in STEM activities and careers, and the meeting provides many mentoring activities and ways to connect with future internship hosts and graduate programs. Both students were required to be Native American, AISES members, and presented judged research posters.

33) On-going: NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract from new lead office at OSU-Stillwater, with requirement for mission-oriented research major component. **New award**

approved for NASA funds totalling $30,000/yr for 4 years, from July 2020 to June 2024, plus match from SEOSU.

34) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education Award: **$25,728** (including Indirect Costs)**, May 1, 2020 to April 30, 2021.**
PTE Federal Award No: 5P20GM103447-21 Subaward No: RS20181585-36
PROJECT TITLE: Oklahoma IDeA Network of Biomedical Research Excellence: OK-INBRE Supplemental Research Funding Requests
SubAward PI for funding to support undergraduate research experiences for SE students during the coming 2020-2021 grant year, to use up funds that were carried over due to cancellation of Summer 2020 internship opportunities. Our plan is to give priority to 2 students who had either applied and been accepted to the regular upper-level INBRE 2020 Summer Internships (now cancelled), and others who were named in a SMaRT **(Summer Mentoring and Research Training)** proposal for lower-level students that was in the process of being submitted when our campus was closed in mid-March 2020. If those original students are not available sufficiently to work enough hours to use up their allotted funds during the coming year, we do have additional alternate students who were accepted to out-of-state internship programs that were cancelled, and/or who could also benefit from additional research experience before graduation.

35) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: Oklahoma IDeA Network of Biomedical Research Excellence-OK-INBRE Equipment Requests, Fall 2020 to April 30, 2021
Award: **$50,000**

As SE campus OK-INBRE representative, I coordinated assembling the SE request for equipment to support reseach and research training on our campus. A total of $50,000 was offered to SE, with a short response deadline. I requested input from CCPS and Biological Sciences, worked with faculty to cut requests that were redundant with equipment already available on campus (which I had purchased as INBRE rep in prior years). I also secured accurate quotes including required accessories, shipping and handling, plus edited faculty justifications for these requests. After SE approval, I sent all documents to the OK-INBRE office to be included in the state request to NIH in D.C. Final purchases were all made before April 30 deadline.

35) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2021 Interns, May 1 to August 15, 2021
Award: **$4,400**

Internal SOSU Campus Research grants awarded since Fall 2002:
1) Title III Center for Instructional Development &Technology (CIDT) 07/01/03 - 06/30/04 (Via award to Southeastern Oklahoma State University) Total awarded: $9,001
Composite Project/Proposal Title for 4 separate CIDT proposals for 5 items: Acquisition of computers, software, and digital projectors for chemistry instruction:

a) Requested a high-end personal computer and color printer for use in laboratory research and biotechnology instruction and digital imaging. This computer has been heavily used, to photodocument gels and other research specimens, and to draft research presentations.
b) Requested a ceiling-mounted digital projector for S217, facilitating PowerPoint presentations for course lectures and student research presentations. This projector has been heavily used, by both myself and other faculty.
c) Requested a document camera (ELMO) d) Requested a student response system (Educue).

2) I was awarded $800 from the SEOSU Organized Research Fund to help cover my travel costs to an American Chemical Society spring national meeting in Long Beach, CA, in 2004. I was also awarded $7,000 to purchase a refrigerated microbial incubator and a freezer in 2002, to initiate my campus research.

3) I was awarded $1050 from the SEOSU Organized Research Fund to help cover my travel costs to an American Chemical Society spring national meeting in San Diego, CA, in 2012.

4) I was awarded $3,808 from the SEOSU Organized Research Fund to help cover my travel and research supply costs for a duckweed biofuels research project in collaboration with the OSU Bioenergy Center during Summer 2013.

5) I was awarded $1,644 for Fall 2018-Spring 2019 from the SEOSU Organized Research Fund to cover the generation of custom polyclonal antisera raised against the ANR antigen generated by recent OK-INBRE SMART and regular summer interns.

PROFESSIONAL SERVICE: (outside Southeastern)

Refereeing and Reviewing:

USDA Small Business Innovation Research (SBIR) Grants Program, ad hoc grant reviewer, for the Biofuels and Biobased Products topic area, 2018-2019.

USDA Small Business Innovation Research Grants Program, grant review panel member, 2001, 2004 & 2009.

Oklahoma Space Grant Consortium NASA-EPSCoR Research Initiation Grants and Travel Awards review panel member, 2006-present.

Center for Dietary Supplement Research: Botanicals, UCLA Center for Human Nutrition, review panel member, 2000 to 2005.

USDA National Research Initiative Competitive Grants Program, grant review panel member, 1997, 1998, and 2000.

Peer-reviewed grant proposals for USDA, BARD and NSF.

Reviewed manuscripts for journals including Journal of Agriculture and Food Chemistry, Plant Molecular Biology, Plant Cell, Plant Physiology, Phytochemistry, Proceedings of the National Academy of Science, Nature, Plant Pathology, Phytopathology, and Molecular Plant-Microbe Interactions.

Enzyme and Microbial Technology, international advisory board member, 1999-2002.

State Committee Service:

2005 Summer Statewide Grant Writing Workshop mentor (Linda Mason, coordinator)

2012-2014 OK NSF EPSCoR Broader Impact Committee member (Dr. James Wicksted, chair)

Professional Society Service:

American Chemical Society faculty adviser reviewer of external Student Member Chapter reports, **2013 to present**.
American Chemical Society **"Chemistry Ambassador"** (a volunteer program coordinated by the national office), **2013 to present**, working to help improve public appreciation of chemistry.
Guest lecturer: Lectured at University of California at Los Angeles (UCLA) in Spring 2007, Fall 2008, Fall 2009, Fall 2012 and Fall 2013 to support a course on plant-microbe interactions. Title of lecture: "An Introduction to the Biosynthesis of Chemicals Used in Plant-Microbe Communication."

Special Assignments or Service projects at Southeastern:

Annual March SE Curriculum Contest, Author and Administer Chemistry Exam, 2007 to 2013, 2018: Write or revised a 50-question multiple choice chemistry exam consistent with OK state curriculum guidelines, and organize the testing of up to 120 high-school competitors in 3 classrooms, followed by grading, score reporting and declaration of the winners. After several consecutive years of service, I had handed off the assignment to a new faculty member who recently left SE, so I was asked to take the duty back again.

Science Olympiad at Southeastern:

2016: Organized and scored the **Food Science** (emphasizing dairy science) paper exam and lab activities event for middle-schoolers, plus recruited and organized student volunteers (mainly from ACS student members). Provided additional food and T-shirts for volunteers.

2017: Organized and scored the **Food Science** (emphasizing calorimetry of dry foods and sugar analysis) paper exam and lab activities event for middle-schoolers, and **Experimental Design** simple experiment challenge and extensive write-up form for middle-school and high school students. Recruited and organized student volunteers (mainly from ACS student members). Provided additional food and T-shirts for volunteers.

2018: Organized and scored 4 events, with help of 1 faculty and multiple students. **Crime Busters (B):** Middle-school versions of forensics competition, where students are given a written scenario of a crime, chemical or physical evidence collected at the scene plus reagents and standards, and are asked to examine the evidence and propose which suspect committed the crime. **Chemistry Lab (C):** High-school event emphasizing chemical thermodynamics and other designated experiments, plus a written exam involving calculation from data provided. **Fermi Questions (C):** High-school event emphasizing order-of-magnitude approximation of numerical answers to a wide variety of questions. (Most of the questions and answer key were written by Dr. McKim, who could not be present to administer or score exam.) **Fast Facts (B):** Middle-school paper-based competition where pairs of students attempt to fill in as many correct answers on a grid answer sheet with categories on 1 axis and first letter of the answer on the 2nd axis. 3 5-minute rounds are scored. Recruited and organized student volunteers (mainly from ACS student members). Provided additional food and T-shirts for volunteers.

2019: Organized and scored 2 events (**Fermi Questions (C) & Density Lab (B),** a new event), with help of 1 faculty member and students. Helped ACS students sell refreshments.

STEM Day recruiting event at SE, Saturday, December 1, 2018. Presented 2 30-minute talks about the Chemistry Department and the 3 non-medical degree tracks available to high-school students, as part of a new half-day SE recruiting event for STEM majors.

SE Summer Orientation Events. 2016, 2017, 2018. At the request of the SE office of Student Life and other organizers, I have served as a "Faculty Friend", speaking to multiple

groups of incoming students about designated topics from a faculty perspective, and answering questions. I try to reassure them that faculty want students to succeed, and give some advice on things to do or avoid.

Professional Courses Attended:

Space Exploration Plant and Plant Microbiome Learning Sessions, weekly October 1, 2020 to October 29, 2020, free on-line on Zoom conference of over 200 participants. Conference featured NASA and outside researchers explaing the past 30 years of plant research carried out in space and on land, reviewed current equipment available or soon to be available, and related NASA mission information. NASA ia trying to educate a community to help plan future research and mission priorities. This was very useful to plan future NASA OSGC Space Grant research steps at SEOSU. I also attended the follow-up town hall planning session online.

Mass Spec Summer School 2019, University of Wisconsin, Madison, WI, July 21-23, 2019. Hosted by Dr. Joshua J. Coon, Director, NIH National Center for Quantitative Biology of Complex Systems. Funded by NIH and a special award from NSF to fund registrations of 20 plant researchers interested in using mass spec in plant metabolomics and proteomics. I applied to gain more updated information for my research and Biochemistry teaching, and to learn how instrumentation has evolved to change experimental design requirements. Some presentations were excellent and relevant, while some were examples of how not to teach students.

NSF-EPSCoR Native STEM Summit, in Montana Kalispell MT Meeting Sept. 27-29, 2018. The meeting was sponsored by the MT-NSF-EPSCoR office, but I was requested to accompany the Oklahoma NSF-EPSCoR delegation, based on my involvment in many aspects over the past 15 years. Goals included discussion of Native American STEM education issues in an organized forum with an eye to writing future grant proposals, with or without collaborations with tribal organizations or other state partners outside of Oklahoma. The discussions identified many obstacles facing Native American students, made lists of programs that had been implemented in other states in the past, and possible future directions. The Oklahoma EPSCoR office may be collaborating on an NSF INCLUDES multi-state application, but some of the information discussed is very relevant to much smaller proposals from other agencies.

"**ASMCUE 2018 Pre-Conference Workshop: "Design and Implementation of Your Own CURE in Synthetic Biology**" and **American Society for Microbiology Conference for Undergraduate Educators** (**ASMCUE**), Austin, TX, July 26-29, 2018.

The pre-conference workshop mainly dealt with introducing the principle behind the "Bio Bricks" cloning system, which greatly simplifies assembling a series of contructs by mixing and matching coding regions, promoters, enhancers and terminators in various plasmids using either pre-made units ("BioBricks") or user-generated custom fragments. One huge recent advancement to make the system more accessible and useful for educators is that a collection containing over 3000 parts is available for distribution via the iGEM organization for a fee of $500. iGEM also maintains an on-line registry of the parts in the annual kit, plus others are available by request. A few additional reagents are needed to impliment the system, but I thought the system would be a great to use for large portions of Molecular Genetics (CHEM/BIOL 4124) the next time is is offered, or to use for Biochemistry lab or even my

research (and therefor CHEM 4990). iGem also sponsors national competitions of teams of undergraduates using the technology to design and answer real research questions; viewing these examples on-line or assembling our own team would be educational for students and in line with OK-INBRE and NASA OK Space Grant research training goals.

I also attended most of the main ASMCUE meeting. This was the first time I have ever attended a meeting designed mostly for educators, with no students attending, but I thought it might be a good way to pick up techniques or ideas to improve my teaching or help me handle problems that I have with some students. The plenary speakers and some of the larger sessions were very interesting and useful. However, some of the mini-sessions had appealing titles and abstracts but had little or no useful content, or used vast resources (like squads of graduate student TAs) that are not available at SE. I met many experienced faculty members at all levels who were attending ASMCUE for the first time.

"Chemical Engineering for Chemists", American Chemical Society Short Course (professional education), Chicago, IL, June 20-22, 2017. Reviewed basics of chemical engineering calculations, but also learned about new computer resources and terms or techniques, which could be integrated into a future offering of the departmental course listed in the SE catalog on this topic.

OSU Bioinformatics workshop, Oklahoma State University, Stillwater, OK, campus, August 3-7, **2015**. (participated, and escorted 1 undergraduate participant). https://pods.iplantcollaborative.org/wiki/display/Events/2015+OSU+Workshop

Mitochondrial Biochemistry, Genetics, and Molecular Biology Workshop, an NSF-Sponsored cCWCS workshop (Chemistry Collaborations, Workshops and Communities of Scholars; www.ccwcs.org), at University of Puerto Rico Medical Sciences Campus in San Juan, PR, July 5-10, **2015**.

"**From Computational Biophysics to Systems Biology**" (CBSB2015) international conference, hosted by Dr. Hansmann, SAMIS Education Center, Oklahoma City, OK (OUHSC hospital/campus), http://www.hansmann-lab.com/cbsb15, May 17-19, **2015**.

Educators' Leadership Academy (ELA) **2014** Symposium: "Remaining True to Your Educator-Self in the 21st Century: Embracing Deep, Intentional, Integrative Learning Workshop", UCO-Edmond, OK, May 15, 2014.

Computational Chemistry for Educators, OSU-Stillwater, OK, July 2011, and SC11, Seattle, WA, November **2011**.

Agilent GC-MS Enviroquant software training, Agilent Training Center (Alpharetta, GA, 2009)
Microarray Techniques Workshop, Oklahoma State University (Stillwater, OK, 2005)
Basic Web Page Design, Southern Oklahoma Technology Center (Ardmore, OK, 2001)
Introductory Molecular Modeling training course (Molecular Simulations Inc./Biosym, Naperville, Illinois. 1996)
Practical Capillary Electrophoresis (American Chemical Society Short Course, 1995)
Molecular Modeling: Methods and Techniques (American Chemical Society Short Course, 1994)

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Caleb Smith

425 W. University Blvd • Durant, OK 74701
Phone: 580.745.2242 • E-Mail: cmsmith@se.edu

Education

Ph.D. Environmental Science, Concentration in Science Education. 2020. Dissertation Title: "The Effects of Leadership Development on Student Retention in STEM".

M.S. Biology. University of North Texas. 2013. Thesis Title: "Bioconcentration and Morphological Effects of Triclosan in Three Species of Wetland Plants".

B.A. Biology with Honors. Hardin-Simmons University. 2006.

Work Experience

- Southeastern Oklahoma State University, Assistant Professor, Chemistry, Computer and Physical Sciences. — August 2020-Present
- Southeastern Oklahoma State University, Instructor, Chemistry, Computer and Physical Sciences. — August 2019-July 2020
- Austin College. Instructor, Biology Support Associate and Vivarium Manager. — November 2011-July 2019
- Grayson County College. Adjunct Biology Professor. — August 2013-May 2014
- University of North Texas. TA/RA. — January 2011-Dec. 2011
- Denison High School. Science Teacher/Coach. — August 2007-May 2010
- GreenBelt Gardens. Assistant Manager. — July 2006-July 2007

Publications/Presentations

- **Smith C**, Shannon K, & Hardy M. PI-STEM Academy Student Experience. AERA Online Paper Repository. — Submitted
- Hardy M, Shannon K, & **Smith C**. Teaching STEM for social justice. Round Table Discussion. OACTE/OEQA Annual Conference. — October 2020
- Sliffe P, Ward J, Olivo A, Twanabasu BR, **Smith CM**, Stevens KJ. Restoring Texas Blackland Prairies: An insight into the effects of management practices on mycorrhizal fungi. Student poster presentation 8th International Conference on Mycorrhiza. — August 2015
- Twanabasu BR, **Smith CM**, Stevens KJ, Venables BJ, Sears WC. 2013. Triclosan inhibits arbuscular mycorrhizal colonization in three wetland plants. Sci Total Environ 447:450-457. — March 2013
- The Effects of Triclosan in Wetland Plant Communities. Austin College Seminar Series in Biology. — November 2012
- A preliminary study of the effects of Triclosan on root morphology and — May 2011

arbuscular mycorrhizal colonization of five wetland plants. Poster presentation Society of Environmental Toxicology and Chemistry (SETAC) regional meeting.

- Development of a sensitive toxicity test for macrophyte stress due to environmental contaminants of aquatic systems. Poster presentation SETAC regional meeting. May 2011

Research Experience

- Integrated STEM Education Research Group 2019-Present
- Science Education Research Lab, University of North Texas. Rudi Thompson PhD, Mentor. 2014-2020
  - Leadership Development and Retention in STEM
- Wetland Plant Ecology Research Group, University of North Texas. Kevin Stevens PhD, Barney Venables PhD, Mentors. 2010-2013
  - Environmental Contamination and Toxicity.
  - Wetland Development and Management of Grand Prairie Landfill Oxbow.
  - Plant Community Monitoring in a Bottomland Hardwood Forest.
  - Growth Room and Greenhouse Plant Cultivation. Seed Collection.

Teaching Experience

College and High School

- Assistant Professor. Department of Chemistry, Computer & Physical Sciences. Southeastern Oklahoma State University. PSCI 1114, SCIE 3123, SCIE 5903, SCIE 5403, BIOL 5943. August 2020-Present
- Instructor. Department of Chemistry, Computer & Physical Sciences. Southeastern Oklahoma State University. PSCI 1114, SCIE 3123, SCIE 5903, SCIE 5403, BIOL 5943. August 2019-May 2020
- Instructor of Biology. Austin College. Cell Biology lab. January 2014-July 2019
- Adjunct Faculty. Grayson County College. Survey of Anatomy and Physiology. August 2013-May 2014
- Teaching Assistant UNT. Biology for Educators lab and Contemporary Biology lab. January 2011-Dec. 2011

- Science Faculty, Coach. Denison High School. Biology, Integrated Physics and Chemistry, and Environmental Systems — August 2007-May 2010

Professional Development

- OACTE/OEQA Annual Conference. — October 2020
- Society of Environmental Toxicology and Chemistry regional meeting. — May 2011
- Society of Wetland Scientist regional meeting. — October 2010

Affiliations/Memberships

- National Science Teaching Association — 2020-Present
- Texas Classroom Teachers Association — 2007-2010
- Society of Wetland Scientist — 2010
- Society of Environmental Toxicology and Chemistry — 2011

Certifications

- CITI Human Subjects Researcher
- CITI IACUC Member Certification
- NIH Human Subjects Certification.
- AALAS Animal Care and Use in Research Certification.
- Texas 8-12 Life Science Teaching Certification. 8-12 Composite Science Examination.

Experience/Technical Expertise

- Environmental Trace Analysis: Organic and Inorganic Sample Extraction, GC-MS, LC-MS, Flame Atomic Absorption Spectroscopy.
- NSF Grant Writing.
- Biology Student Employee Supervisor, Vivarium Manager, Institutional Animal Care and Use Committee (IACUC) Member. Austin College.

Scholarships/Grants

- OSRHE Summer Academies for Science, Mathematics and Multidisciplinary Studies Grant
- UNT Department of Biological Sciences Beth Baird Graduate Tuition Scholarship
- UNT CAS Dean Altermann/Bradford Scholarship
- UNT Academic Achievement Scholarship
- CAS Travel Grant, UNT
- SGA Travel Grant, UNT

CURRICULUM VITAE

Joel Timothy Smith
Professor of Chemistry
Eagles Chair of Biomedical Sciences
Southeastern Oklahoma State University
425 W. University Blvd.
Durant, Oklahoma 74701
Office: Science Building – S204
580.745.2444
Fax: 580.745.7488
tsmith@se.edu

EDUCATION

1994	Ph.D.	Analytical Chemistry	Oklahoma State University
1990	B.S.	Chemistry	Southeastern Oklahoma State University

ACADEMIC AND RELATED NON-ACADEMIC EXPERIENCE

2021-Present	NCAA Faculty Athletic Representative
2011-Present	Chair, Department of Chemistry, Computer and Physical Sciences
2006-Present	Professor of Chemistry, SEOSU
2002-Present	Engles Endowed Chair of Biomedicine, SEOSU
2001-2006	Associate Professor of Chemistry, SEOSU
1995-2001	Assistant Professor of Chemistry, SEOSU
1994-1995	Senior Research Chemist, Monsanto Corporate Research
1994-1991	Research Assistant, Oklahoma State University
1990-1991	Mass Spectrometry Service Technician, Oklahoma State Univ.
1990	Teaching Assistant, Oklahoma State University

PROFESSIONAL INTERESTS

Non-traditional teaching methodologies
Inquiry-based laboratory experiences
Bio-analytical separation techniques
Hyphenated-analytical methodologies
High-throughput screening techniques
Alternative teaching strategies

SELECTED COMMITTEES AND SPECIAL ASSIGNMENTS

University

2021-	Search Committee for Asst. Professor/Chair of Aviation Sciences
2020-	Athletics Committee: Building On-Campus Freshman Enrollment
2020-	Covid Taskforce: Subcommittee on Instruction

2020	Tenure and Promotion Committee for Dr. Gabriel LeBlanc, Univ. Tulsa
2019-	Institutional Assessment Committee
2018-	Coordinator for STEM Day at Southeastern
2017-2018	CCPS Faculty and Staff search committees; 6 searches; chair of 4
2016-2018	Higher Learning Commission, 2018 Assurance Report, Criterion 5 co-author
2015-2019	Science Olympiad – Invitational Tournament coordinator and event supervisor for Forensic Science
2016	Promotion Committee for Dr. Kenneth Roberts, Univ. of Tulsa
2015-2017	Presidential Budget Advisory Committee, Chair
2015-2017	Academic Vision Committee
2014	Center for Instructional Development & Technology Director Search Committee
2011-2013	Harvard Professional Development
2010-present	Academic Council
2009-present	Course Equivalency Program: Chemistry OSRHE
2009-2015	Faculty Appellate Committee
2001-2003	Grants Incentive Pay Committee, chair
2001-present	Numerous Faculty Tenure and Promotion Committees
1997-present	Pre-Professional Advisory Committee
1999-2001	Research and Assessment Committee
2003-2005	Search Committee for Director of Research & Sponsored Programs
1999-2001	Program Review Committee

State

1997-1999	American Chemical Society - Oklahoma Chapter chair-elect, chair, and past chair
2003-2008	American Chemical Society - Oklahoma Chapter section alternative councilor
2003-2009	Oklahoma NIH IDeA-INBRE Campus Coordinator

Community

1998-2011, 2020-	Board of Directors for Wesley Center, vice-chairperson (2007-11)
2002-2004	Board of Directors for SEOSU Alumni Association
2010-2019	Construction supervisor for 4 Eagle Scout projects

AWARDS AND HONORS

2019	Faculty Senate Award for Teaching Excellence
2017	Faculty Senate Award for Teaching Excellence
2017	Faculty Senate Award for Meritous Service
1998, 2008	Faculty Senate Award for Research
1994	Research Excellence Award, Honorable Mention, Oklahoma State
1991-1994	Water Resource President Fellowship, Oklahoma State University
1990	Centennial President Fellowship, Oklahoma State University
1990	Skinner Fellowship, Oklahoma State University

1990 Outstanding Senior Student Majoring in Chemistry, American Institute of Chemists Foundation

PROFESSIONAL MEMBERSHIPS

American Chemical Society
Blue Key Honor Society
Phi Lambda Upsilon, President of OSU chapter (1992-1993)
American Society for Mass Spectrometry

COURSES TAUGHT

PSCI 1114	General Physical Sciences
CHEM 1315	General Chemistry I
CHEM 1415	General Chemistry II
CHEM 2311	Chemical Literature
CHEM 3025	Introduction to Analytical Methods
CHEM 3425	Chemical Analysis
CHEM 3525	Instrumental Analysis
CHEM 4213	Advanced Analytical
CHEM 4562	Advanced Laboratory
CHEM 4951	Senior Seminar
CHEM 4990	Research
CHEM 5990	Graduate Research

PUBLICATIONS

Peer-reviewed Publications (in chronological order)

J. Cai, J. T. Smith, and Z. El Rassi, "Determination of the Ionization Constants of Weak Electrolytes by Capillary Zone Electrophoresis," *J. High Resol. Chromatogr.*, 15 (1992) 30-33.

E. Levy, F. J. Gough, K. D. Berlin, P. W. Geno, and J. T. Smith, "Inhibition of *Septoria tritici* and other phytopathogenic fungi and bacteria by *Pseudomonas fluorescens* and its antibiotics," *Plant Pathology* , 41 (1992) 335-341.

J. T. Smith and Z. El Rassi, "Capillary Zone Electrophoresis of Biological Substances with Surface-Modified Fused Silica Capillaries with Switchable Electroosmotic Flow," *J. High Resol. Chromatogr.*, 15 (1992) 573-578.

J. T. Smith and Z. El Rassi, "Capillary zone electrophoresis of biological substances with fused-silica capillaries having zero or constant electroosmotic flow," *Electrophoresis* , 14 (1993) 396-406.

W. Nashabeh, J. T. Smith, and Z. El Rassi, "Studies in Capillary Zone Electrophoresis with a Post-Column Multiple Capillary Device for Fraction Collection and Stepwise Increase in the Electroosmotic Flow during Analysis," *Electrophoresis*, 14 (1993) 407-416.

J. T. Smith, A. Mackie, S. Van Waggoner, G. Gandy, M. Washburn, R. Self, A. Horn, J. L. Kiel, and J. R. Wright, "Chemiluminescent Dosimetry of Microwave Heating

and Acoustic Irradiations Based on Luminol and Metal Oxide Catalyst," *Microchemical J.*, 47 (1993) 197-205.

J. T. Smith, W. Nashabeh, and Z. El Rassi, "Micellar Electrokinetic Capillary Chromatography *In Situ* Charged Micelles. 1. Evaluation of *N* -D-gluco-*N*-methylalkanamide Surfactants as Anionic Borate Complexes," *Analytical Chemistry*, 66 (1994) 1119-1133.

J. T. Smith and Z. El Rassi, "Micellar Electrokinetic Capillary Chromatography *In Situ* Charged Micelles. 2. Evaluation and Comparison of Octylmaltoside and Octanoylsucrose Surfactants as Anionic Borate Complexes in the Separation of Herbicides," *J. Microcol. Sep.*, 6 (1994) 127-138.

J. T. Smith and Z. El Rassi, "Micellar Electrokinetic Capillary Chromatography *In Situ* Charged Micelles. 3. Evaluation of Alkylglucoside Surfactants as Anionic Butylboronate Complexes," *Electrophoresis*, 15 (1994) 1248-1259.

J. T. Smith and Z. El Rassi, "Micellar Electrokinetic Capillary Chromatography *In Situ* Charged Micelles. 4. Influence of the Nature of the Alkylglycoside Surfactant," *J. Chromatogr.*, 685 (1994) 131-143.

J. T. Smith and Z. El Rassi, "Micellar Electrokinetic Capillary Chromatography *In Situ* Charged Micelles. 5. Evaluation of Background Fluorophores for Indirect Fluorescence Detection," *J. Cap. Elec.*, 2 (1994) 136-143.

J. T. Smith and D. V. Vinjamoori, "Rapid Determination of Logarithmic Partition Coefficients Between Octanol and Water Using Micellar Electrokinetic Capillary Chromatography," *J. Chromatogr. B*, 669 (1995) 59-66.

Y. Merchref, J. T. Smith and Z. El Rassi, "Micellar Electrokinetic Capillary Chromatography with *In Situ* Charged Micelles. VII Expanding the Utility of Alkylglycoside-borate Micelles to Acidic and Neutral pH," *J. Liq. Chromatogr.*, 18 (1995) 3769-3786 .

J. T. Smith, "Developments in Amino Acids Analysis using Capillary Electrophoresis," *Electrophoresis,* 17 (1997) 2377-2392.

L. Maddox, M. Reeves, K. Wood, K. Roberts, J. Studer, J. Wetzel, J. T. Smith, K. Whittington, J. L. Alls, J. E. Parker, E. Holwitt, J. Kiel, and J. R. Wright, "Acoustic Wave Dosimetry Based on Diazotized Luminol Solutions," *Microchemical J.,* 58 (1998) 209-217.

J. R. Wright, J. Kiel, E. Holwitt, J. T. Smith, K. Roberts, J. Studer, C. Mclemore, K. Campbell, B. Russo, K. Wood, "Preliminary characterization of a polymer prepared by diazotization of 3-amino-L-tyrosine, " *Polymer Preprints*, 39 (1998) 365-366.

D. J. Allen, W. E. Wall, K. D. Denson, and J. T. Smith, "Adjusting Selectivity in Micellar Electrokinetic Capillary Chromatography with 1,2-Hexanediol," *Electrophoresis,* 20 (1999) 100-110.

W. E. Wall, K. D. Denson, D. J. Allen, G. I. Love, and J. T. Smith, "Explorations of Alkyl Polyols as Class I Organic Modifiers to Adjust Selectivity in Micellar Electrokinetic Capillary Chromatography," *Electrophoresis,* 20 (1999) 2390-2399.

J. T. Smith, "Recent Advancements in Amino Acid Analysis using Capillary Electrophoresis", *Electrophoresis,* 20 (1999) 3078-3083.

D. J. Allen, J. C. Gary, N. L. Paiva, and J. T. Smith, "An Enantiomer Assay for Flavonoids Medicarpin and Vestitone using Capillary Electrophoresis," *Electrophoresis,* 21 (2000) 2051-2057.

B. R. Baggett, J. D. Cooper, E. T. Hogan, J. Carper, N. L. Paiva, and J. T. Smith, "Profiling Isoflavonoids Found in Legume Root Extracts using Capillary Electrophoresis," *Electrophoresis*, 23 (2002) 1642-1651.

V. M. Russo, J. K. Collins, P. Perkins-Veazie, and J. T. Smith, "Carbohydrate Distribution in Stalks and Ears of Sweet Mazie with Different Endosperm Genotypes," *Cereal Research Communications*, 32 (2004) 91-98.

C. D. Broeckling, D. V. Huhman, M. Farag, J. T. Smith, G. D. May, P. Mendes, R. A. Dixon, and L. W. Sumner, "Metabolic profiling of Medicago truncatula cell cultures reveals effects of biotic and abiotic elicitors on metabolism", *J. Experimental Botany,* 56 (2005) 323-336.

B. J. Williams, C. J. Cameron, R. Workman, C. D. Broeckling, L. W. Sumner, and J. T. Smith, "Amino acid profiling in plant cell cultures: An inter-laboratory comparison of CE-MS and GC-MS", *Electrophoresis*, 28 (2007) 1371-1379.

A. J. Fabich, S. A. Jones, F. Z. Chowdhury, A. Cernosek, A. Anderson, D. Smalley, J. W. McHargue, G. A. Hightower, J. T. Smith, S. M. Autieri, M. P. Latham, J. J. Lins, R. L. Allen, D. C. Laux, P. S. Cohen, and T. Conway, "Comparison of Carbon Nutrition for Pathogenic and Commensal Escherichia coli Strains in the Mouse Intestine", *Infection and Immunity,* 76 (2008) 1143-1152.

M. F. Traxler, S. M. Summers, H.-T. Nguyen, V. M. Zacharia, G. A. Hightower, J. T. Smith, and T. Conway, "The global, ppGpp-mediated stringent response to amino acid starvation in *Escherichia coli*", *Molecular Microbiology*, 68 (2008) 1128-48.

Books

Z. El Rassi and J. T. Smith, "Other Direct and Indirect Detection Methods of Carbohydrates in HPLC and HPCE," *Carbohydrate Analysis: High Performance Liquid Chromatography and Capillary Electrophoresis*, Z. El Rassi (Editor), Journal of Chromatography Library-volume 58, Elsevier, Amsterdam, copyright 1995.

L. W. Sumner, A. L. Duran, D. H. Huhman, and J. T. Smith, "Metabolomics: A Developing and Intergral Component on Functional Genomic Studies of *Medicago truncatula*", in *Recent Advances in Phytochemistry* - Phytochemistry in the Genomics and Post-genomics Era, Vol 36, John T. Romeo (Editor), 2002, Elsevier.

Published Abstracts and Other Publications of Non-Refereed Journal Articles

Dr. Smith has presented research at over 50 conferences at the state, national, and international level. Undergraduate students in the Smith Research Lab have presented more than 200 posters and oral presentations at state, national, and international conferences.

RECENT FUNDING

Ongoing Research Support

None.

Ongoing Support

None.

Completed Research Support

Organized Research – Profession Development, Turning Technologies User Meeting March 30 – April 1, 2014, Las Vegas, NV.

1126719, Sumner, Lloyd (PI) 09/01/11 – 08/31/14
NSF/DBI
MRI: Acquisition of a 600 MHz NMR
Role: co-PI
The goal of this project was to acquire a high-field NMR to be integrated with UPLC-MS-SPE technology to enable high throughput chemical annotation in plant metabolomics.

2 P20 RR016478-09 Waxman, Frank (PI) sub-project dates 5/1/09-4/30/10
NIH/EPSCoR/INBRE
Capillary electrophoresis of glycans
Role: P.I. – mini-grant research program
The overall goal of this project was to explore the application of capillary electrophoresis in the analysis of model glycans.

2 P20 RR016478-08 Waxman, Frank (PI) sub-project dates 5/1/08-4/30/09
NIH/EPSCoR/INBRE
Metabolism of *E. coli*
Role: P.I. - Collaborative research program
The overall goal of this project is to determine the carbohydrate nutritional preference of various strains of *E. coli* using in vitro and in vivo models. The role of JTS on this collaborative project is to develop the required bio-analytical assays.

RECENT PRESENTATIONS

- Joel T. Smith, “Chemistry in Southeast Oklahoma", oral presentation at the Oklahoma Pentasectional ACS meeting at Norman, OK on April 13th, 2019.
- Joel T. Smith, “Piloting a Flipped Format Upper Level Chemistry Course", oral presentation at the Oklahoma Pentasectional ACS meeting at Cameron University on March 24th, 2017.
- Joel T. Smith, “Piloting a Flipped Format Upper Level Chemistry Course", oral presentation at Northwestern Oklahoma State University on March 3rd, 2017.
- Joel T. Smith and Karl Frinkle, “Student Engagement: Interactive Learning with your Audience”; Faculty Symposium-SE, August 12, 2014.
- Joel T. Smith, “Using Lecture Videos in Hybrid Format classes”; Faculty Symposium-SE, August 13, 2013.
- Joel T. Smith. “Clickers – Using the Turning Hardware”, SOLD-SE, January 8, 2014.
- Joel T. Smith, “Student Response Devices to Promote Student Learning”; Faculty Symposium-SE, August 12, 2014.
- Joel T. Smith, Ying Lin, and Robert Howard. “Faculty Workshop - Clickers”, CIDT-SE, September 18, 2014.

Vita

Alexander Spahn

"Nothing has such power to broaden the mind as the ability to investigate systematically and truly all that comes under thy observation in life." - Marcus Aurelius

Education

May 2015 **M.S. Physics**, *Texas A&M University-Commerce*, Commerce,TX, *GPA – 3.83.*

May 2013 **B.S. Astrophysics**, *Florida Institute of Technology*, Melbourne, FL, *GPA – 3.10.*

B.S. Mathematical Sciences.

Experience

8/15–Present **Instructor of Physics and Astronomy**, Southeastern Oklahoma State University, Durant, OK.

Primary responsibilities:

- Teaching general physics 1, general physics 2, general astronomy, and all associated labs
- Developing new lecture and lab material
- Tutoring in physics

8/13–8/15 **Graduate Assistant**, Texas A&M University-Commerce, Commerce, TX.

Worked as a teaching assistant, a research assistant, and stockroom manager.

Primary teaching responsibilities:

- Managing laboratory courses in Physics I, Physics II, and Acoustics
- Teaching Physics II lectures several times throughout each semester
- Writing new laboratory manuals for the Physics I and Physics II courses
- Assisting students by tutoring and hosting study sessions beyond the classroom

Primary research responsibilities:

- Time series analysis of V1101 Aquilae - A nova-like cataclysmic variable star
- Probing the nature of astrophysical disks and the origin of negative superhumps
- Applying Fourier transforms and filtering to extract information from the data

Primary stockroom manager responsibilities:

- Maintaining the quality of the equipment and the stockroom as a whole
- Taking inventory and purchasing necessary equipment/replacements
- Implementation of a checkout/check-in process to keep track of equipment
- Creating a filing system for equipment and laboratory manuals

221 E Canyon Grove Rd., Apt. 631 – Sherman, TX 75092
☎ *(414) 875-7931* • ✉ *aspahn@se.edu*
alexandercspahn.wordpress.com

12/12–4/13 **Laboratory Assistant**, Florida Institute of Technology, Melbourne, FL.
Primary responsibilities:
- Operated the 0.8 m Ortega telescope
- Reduced source data using IRAF software
- Developed light curves of various white dwarf stars

2/10–5/13 **Office Assistant**, Florida Institute of Technology, Melbourne, FL.
Primary responsibilities:
- Responsible for all incoming telephone calls
- Assisted professors with various tasks
- Distributed mail both within the department and throughout the campus
- Filed student documents

Masters Thesis

Title *Time Series Analysis of V1101: A Z Cam Cataclysmic Variable Star*

Supervisor Dr. Matt A. Wood

Description This thesis employed several time series analysis techniques in order to probe the nature of accretion disks within cataclysmic variable star systems.

Student Organizations

5/14–4/15 **President**, *The Society of Physics Students*.
Detailed achievements:
- More than tripled the number of active members from 8 to 27
- Created brochures, flyers, and a Facebook page for the organization
- Participated in several outreach programs both on and off-campus, including SXSWedu
- Hosted bi-monthly meetings, planetarium movie nights, and game nights

Professional Societies

- American Association of Physics Teachers
- American Astronomical Society
- American Physical Society
- Sigma Pi Sigma

Awards

May 2014 AAPT Outstanding Physics Teaching Assistant

March 2014 NSF STEM Scholarship

Volunteering

June 2013 Moore OK Disaster Relief, *Serve Moore*

Dec. 2012 Science Fair Judge, *Indialantic Elementary*

221 E Canyon Grove Rd., Apt. 631 – Sherman, TX 75092
☎ (414) 875-7931 • ✉ aspahn@se.edu
alexandercspahn.wordpress.com

CURRICULUM VITAE

Loide Mayer Wasmund, Ph.D.

Emeritus Professor of Chemistry

Department of Chemistry, Computer and Physical Sciences

Southeastern Oklahoma State University

1405 N. 4th Ave.

Durant, OK 74701-0609

Office: Science Building — S204

Office: (580) 745-2314

lmwasmund@se.edu

Education

1988	**Doctor of Philosophy**	*Major:* Organic Chemistry *Minor:* Biochemistry	New Mexico State University, Las Cruces, NM

Dissertation Title: *New Direct Thionation Methods for the Synthesis of Endothiopeptides, Desoxopeptides and Thionucleosides* under the direction of Dr. Frank S. Guziec, Jr.

1985	**Master of Science**	*Major:* Organic Chemistry	New Mexico State University, Las Cruces, NM
1981	**Bachelor of Arts**	*Double Major:* Chemistry & English/Communi-cations	Trinity College (currently: Trinity International University), Deerfield, IL

Academic and Related Non-Academic Experience

2002-2019	**Professor of Chemistry**	Southeastern Oklahoma State University, Durant, OK
1996-2002	**Associate Professor of Chemistry**	Southeastern Oklahoma State University, Durant, OK
1990-1996	**Assistant Professor of Chemistry**	Southeastern Oklahoma State University, Durant, OK
1988-1990	**College Assistant Professor**	New Mexico State University, Las Cruces, NM
1988-1989	**Post-doctoral Fellow**	Agronomy and Horticulture Department, New Mexico State University, Las Cruces, NM
1983-1988	**Research Assistant**	New Mexico State University, Las Cruces, NM
1981-1983; 1985-1987	**Teaching Assistant**	New Mexico State University, Las Cruces, NM
1980-1981	**Editor-in-Chief**	Trinity College Yearbook, Trinity College, Deerfield, IL

Professional Interests

Academic Specialty
•Organic Synthetic Chemistry
•Medicinal Chemistry
•Biochemistry

Research Interests
•Peptides and peptide modifications
•Solid-phase peptide synthesis
•Nucleoside modifications
•Development of synthetic methods
•Biological testing

Selected Committees and Special Assignments

2011-2019 PreMed Club Faculty Sponsor
2010-2019 Kaiser Scholarship Liaison
2009-2016 The Rhetoric Center Advisory Council
1997-2019 Preprofessional Advisory Committee:
2009-2019 Chair
1997-2019 Official Liaison between SOSU and MCAT, DAT, AADSAS, AACOMAS and the Medical and Dental Schools in Oklahoma
2001-2005 Student Personnel Policies Committee
2003-2005 Chair
2001-2003 North Central Subcommittee to Address Criterion 3
1998-1999 Science Building Renovation Committee
1997-2019 Faculty Chemical Stock and Safety Review Committee
1998-1999 Committee for the Self Study for the Chemistry and Medical Technology Programs
1998-1999 Chair
1997-1998 Senator on the Faculty Senate for the School of Science and Technology
1997-1998 Member of the Personnel Policies Committee of the Faculty Senate
1997-1998 Member of the University Affairs Committee of the Faculty Senate
1997-1998 Faculty panel for the program review in the School of Arts & Letters
1996-Present Faculty Advisor for the Gamma Lambda Chapter of the Alpha Chi Sigma Chemistry Professional Fraternity
1994-1997 Institutional Research and Planning Committee
1994-1995 Faculty Panel for the program review in the School of Education and Behavioral Sciences
1991-1994 Senator on the Faculty Senate for the School of Science and Technology
1991-1994 Member of the Personnel Policies Committee of the Faculty Senate
1993-1994 Chair

Awards and Honors

2013, 2015	Beta Sigma Phi, Zeta Nu Chapter — Woman of the Year
2004-2005	Empire Who's Who Registry
2003-2004	Who's Who Among America's Teachers
1999	Beta Sigma Phi, Zeta Nu Chapter — Woman of the Year
1999	Beta Sigma Phi, Zeta Nu Chapter — Sweetheart
1993	Appeared on a segment of the PBS show *Newton's Apple*
1983	Teaching Assistant of the Year, New Mexico State University, Las Cruces, NM
1978	Outstanding Freshman Chemistry Student, Trinity College, Deerfield, IL
1977-1981	Illinois State Scholarship
1977-1979	Trinity College Presidential Scholarship
1977	Illinois State Scholar

Professional Memberships

American Chemical Society
Division of Organic Chemistry — American Chemical Society
Division of Education — American Chemical Society
Alpha Chi Sigma
American Association for the Advancement of Science

Effective Teaching

Courses Developed & Taught at SE:
•Advanced Organic Chemistry
•Organic/Biochemistry

Courses Taught at SE:
•Organic Chemistry I & II
•General Chemistry I & II
•Senior Seminar
•Physical Science
•Advanced Laboratory

Honors Program at SE:
•Honors contracts with students in CHEM 3153 Organic Chemistry II

Courses Taught at NMSU:
•Organic Chemistry I & II
•Organic Chemistry for nonmajors
•General Chemistry for nonmajors

Teaching Awards

2003-2004	Who's Who Among America's Teachers (nominated by a former student)
1983	Teaching Assistant of the Year (NMSU Chemistry Dept)

Publications

1995 Wasmund, Loide M., Denson, Kent D., Ellexson, Mary E., Sloan, Leslie S., Teeter, Karen L. "Synthesis of a Series of Endothiotripeptides and Tetrapeptides" *Proc. Okla. Acad. Sci.,* **1995**, *75*, 63.

1995 Collins, Margaret D., Wasmund, Loide Mayer, and Bosland, Paul W. "Improvement of Procedures for Quantifying the Capsaicinoids in *Capsicum*." *Journal of Agricultural and Food Chemistry*, *HortScience*, **1995**, *30*, 137-139.

1990 Guziec, Jr., Frank S.; SanFilippo, Lynn James; Wasmund, Loide Mayer "Convenient Preparations of Metabolites of 6-*n*-Propylthiouracil" *Organic Preparations and Procedures Int.*, **1990**, 22, 619-622.

1990 Guziec, Jr., Frank S., and Wasmund, Loide Mayer "An Improved Method for the Preparation of Desoxopeptides—Reductions of Endothiopeptides" *Tetrahedron Letters* **1990**, *31*, 23.

1989 Guziec, Jr., Frank S. and Wasmund, Loide Mayer. "Synthesis and Reactions of Endothiopeptides," *Journal of Chemical Research (S)*, **1989**, 155; *Journal of Chemical Research (M)*, **1989**, 1301-1353.

Presentations

March 6-8, 1996 "Preparation of a Series of Endothiotetrapeptides as Potential Collagenase Inhibitors," Research Days, Texas Women's University, Denton, TX.

November 1994 "Synthesis of a Series of Endothiotripeptides and Tetrapeptides," Oklahoma Academy of Science, University of Oklahoma, Norman, OK.

November 1994 "Synthesis of a Series of Endothiotripeptides and Tetrapeptides," American Chemical Society Southwest Regional Meeting, Fort Worth, TX.

April 7, 1992 "Potential Anti-Cancer Agents: Peptides and Endothiopeptides," The 1st Annual Graduate Faculty Colloquium, Southeastern Oklahoma State University, Durant, OK.

June 1986 "New Methods for the Preparation of Thiopeptides and Dithioesters," American Chemical Society Rocky Mountain Regional Meeting, Denver, Colorado.

April 1986 "Synthesis and Reactions of Thiopeptides—Routes to Desoxopeptides," American Chemical Society 1986 National Meeting, New York City, NY.

June 1984 "Preparation and Reactions of Thiopeptides," American Chemical Society Rocky Mountain Regional Meeting, Albuquerque, New Mexico.

December 1982 "Selective Oxidations Using New Chromium (VI) Amine Complexes," American Chemical Society Rocky Mountain Regional Meeting, El Paso, Texas.

Grants and Contracts

Sept 2000-Aug 2004 "Research Initiative for Scientific Enhancement (RISE)" $709,449 4-year grant awarded by the National Institutes of Health - National Institute of General Medical Sciences — Project Director: Dr. John R. Wright; Dr. Wasmund was a summer workshop instructor and wrote part of the grant.

Feb 1995-Jul 1995	"A Direct Method for the Preparation of Dithioesters of N-Protected Amino Acids" $4,665 grant awarded to continue research by the Organized Research Fund of Southeastern Oklahoma State University.
Sept 1993-Jan 1994	"A Direct Method for the Preparation of Dithioesters of N-Protected Amino Acids" $5,623 grant awarded by the Organized Research Fund of Southeastern Oklahoma State University.
Jul 1991-Jun 1995	"Synthesis and Testing of Polypeptide Derivatives as Collagenase Inhibitors" $166,947 4-year grant awarded by the Minority Biomedical Research Support Program of the National Institutes of Health.
May 1992-Aug 1992	"Preparation of Capsaicinoids" $3,000 contract to synthesize several compounds to be used as HPLC standards. Awarded by Paul W. Bosland, Dept. of Agronomy and Horticulture, New Mexico State University, Las Cruces, New Mexico.
Mar 1991-Jun 1991	"The Preparation of Small Peptides" $11,000 grant awarded by the Organized Research Fund of Southeastern Oklahoma State University.

Professional Service

Reviewer

1993	Served on a Minority Biomedical Research Support Program (MBRS) Review Subcommittee as selected by the NIH-NIGMS

Professional Societies

1998	Represented the Gamma Lambda Chapter at the Alpha Chi Sigma Biennial Conclave
1996	Charter Member of the Gamma Lambda Chapter of Alpha Chi Sigma
1996	Represented the Gamma Lambda Colony at the Alpha Chi Sigma Biennial Conclave
1993	Organized the 28th Annual Oklahoma American Chemical Society Meeting-in-Miniature

Other National Societies

2002-2015	Girl Scouts of the USA — Troop Leader, Assistant Troop Leader, Troop Cookie Coordinator
1992-Present	*Beta Sigma Phi – community service sorority*

Other

2010-2012	Church Council Secretary, Trinity Lutheran Church, Sherman, TX
2008-2010	Education Chairperson, Trinity Lutheran Church, Sherman, TX
2002-2005	Theatricks Board Member, Sherman, TX
1990-Present	Science Fair Judge Washington-Irving Elementary School, Durant, OK Bonham Junior High, Bonham, TX Dillingham Intermediate School, Sherman, TX Calera Elementary School, Calera, OK Texoma Christian School, Sherman, TX

Jiuhong (Jonathan) Zhang

(234)-263-9966 | jzhang@se.edu

1320 N 9th Ave, Durant, OK 74701

EDUCATION

Kent State University — Kent, OH

Ph.D. Organic Chemistry — 2011-2017

Wuhan Institute of Technology — Wuhan, China

Bachelor of Science, Applied Chemistry — 2007-2011

TEACHING EXPERIENCE

Southeastern Oklahoma State University — Durant, OK

Assistant Professor — 2018-present

- Teach Organic Chemistry Lecture with Lab I and II
- Teach Basic Chemistry Lecture with Lab I and II
- Teach Physical Science (Traditional and Online)

Department of Chemistry, West Virginia Wesleyan College — Buckhannon, WV

Chemistry Faculty — 2017-2018

- Teach General Organic and Biochemistry Lecture with Lab I and II
- Teach General Chemistry Lecture with Lab I and II

Department of Chemistry and Biochemistry, Kent State University — Kent, OH

Teaching Assistant — 2011-2017

- Teach General Chemistry Lab I and II
- Teach Organic Chemistry Lab I and II
- Teach Intermediate Organic Chemistry Lab

RESEARCH EXPERIENCE

Undergraduate Research Mentor — 2018-present

Organized Research Fund (Southeastern Oklahoma State University)

OK-INBRE Summer Research Mentorship Fund (University of Oklahoma)

Research Assistant — 2012-2017

Department of Chemistry and Biochemistry, Kent State University — Kent, OH

PUBLICATION & CONFERENCES

- **Zhang, J.**, Sampson, P., Seed, A., "A Novel Synthetic Method for accessing 2-*O*-thienylcarboxylate Building Blocks and its Application in the Synthesis of New Liquid Crystals Displaying the SmC Phase", *Liquid Crystal*, Manuscript Under Review.

- Adas, S. K., Bharadwaj, V., Zhou, Y., **Zhang**, **J**., Seed, A. J., Brasch, N. E., Sampson, P., "HNO Donating Properties of the Piloty's Acid Analogue Trifluoromethanesulphonylhydroxamic Acid: Evidence for Quantitative Release of HNO at Neutral pH Conditions", *Chem. Eur. J.* **2018**, 24, 7330.
- **Zhang**, **J.,** Sampson, P., Seed, A. J., "Synthesis and photolysis of *p*-hydroxyphenacyl-based HNO donors", the 48th Central Regional Meeting of American Chemical Society, Dearborn, Jun. **2017**.
- **Zhang, J.**, Xie, Z., Yan, J. and Zhong, J., Synthetic Biodegradable Polymers for Bone Tissue Engineering. *Handbook of Composites from Renewable Materials, Biodegradable Materials*, **2017,** *5*, 355.
- **Zhang, J.**, Xie, Z., Zhong, J., "Nanosuspension Drug Delivery System: Preparation, Characterization, Solidification and Application", in Multi-Volume Set Nanostructures in Therapeutic Medicine, Elsevier, **2017**, 413-443.
- Xie, Z., **Zhang, J.** et al, "Hierarchical Sandwich-like Structure of Ultrafine N-Rich Porous Carbon Nanospheres Grown on Graphene Sheets as Superior Lithium-Ion Battery Anodes", *ACS Appl. Mater. Interfaces*, **2016**, 8, 10324-10333.
- **Zhang**, **J.,** Sampson, P., Seed, A. J., "5-substituted 2(3*H*)-Thienones as building blocks for the synthesis of O-thienylcarboxylate-based liquid crystals", the 45th Central Regional Meeting of American Chemical Society (ACS), Pittsburg, Nov. **2014**.
- J. Wu, F. Qin, G. Cheng, H. Li, **J. Zhang**, Y. Xie, H. Yang, Z. Lu, X. Yu, R. Chen, "Large-scale synthesis of bismuth sulfide nano-rods by microwave irradiation", *Journal of Alloys and Compounds*, **2011**, 509, 2116-2126.

PROFESSIONAL TRAINING, SERVICE AND AWARD

- Faculty Senate Research Award, Southeastern Oklahoma State University 06/2020
- Department Safety Committee, Student Advisor 08/2017-Present
- Supervisor for Oklahoma Science Olympiad Invitational Tournament 02/ 2019
- Certificate for Independent Applying the QM Rubrics (Statewide System) 04/2017
- Online Teaching Orientation and Refresher (Advanced Certificate), Kent State University 01-04/2017
- Higher Education Blackboard Innovative Teaching Series (BITS): Teach Online 01/2017
- Super Judge for Western Reserve District 5 Science Day, University of Akron 02/2016, 02/2017

APPENDIX II
Chemistry Degree Plans
Check List

Student Name: _____ Student ID:_____

Southeastern Oklahoma State University

Bachelor of Science in Chemistry - *Major*

Effective: Fall 2013

Advisor Check Sheet

Revised: July 2022

Required Courses and Electives				**Major: 40 hours**
Course	**Scheduled**	**Completed**	**Grade**	**Hours**
CHEM 1415 General Chemistry II (Spring)				5
CHEM 2113 Inorganic Chemistry I (Spring)				3
CHEM 3053 Organic Chemistry I (Fall)				3
CHEM 3062 Lab Organic Chemistry I (Fall)				2
CHEM 3425 Chemical Analysis (Fall)				5
CHEM 4951 Senior Seminar (Fall and Spring)				1
Chemistry Electives - Approved by Department				**21 hours**
CHEM 2212 Introduction to Research				
CHEM 2311 Chemical Literature				
CHEM 3153 Organic Chemistry II (Spring)				
CHEM 3162 Lab Organic Chemistry II (Spring)				
CHEM 3525 Instrumental Analysis (Spring even yrs)				
CHEM 3612 Intro to Nuclear Chem (Fall-odd yrs)				
CHEM 4115 Biochemistry I (Fall)				
CHEM 4124 Molecular Genetics				
CHEM 4193 Biochemistry II (Spring)				
CHEM 4333 Inorganic Chemistry II (Fall odd yrs)				
CHEM 4562 Advanced Laboratory				
CHEM 4553 Physical Chemistry I (Fall even yrs)				
CHEM 4653 Physical Chemistry II (Spring odd yrs)				
CHEM 4662 Physical Chem I Lab (Fall even yrs)				
CHEM 4960 Directed Reading (arranged)				
CHEM 4970 Special Studies (varies)				
CHEM 4990 Research (varies)				
			Total Hours of Chemistry Completed	

Required General Education Electives *must* include **CHEM 1315** (General Chemistry I-Fall only) **and** MATH-2143 (Brief Calculus) **or** MATH 2215. All Chemistry majors must complete as least 6 hours of MATH courses.

Student Name: _____ Student ID:_____

Southeastern Oklahoma State University

Bachelor of Science in Chemistry - *Medical Sciences (double major)*

Effective: Fall 2011

Advisor Check Sheet

Revised: July 2022

Required Courses and Electives	**Interdisciplinary Double Major: 76 hours**			
Course	**Scheduled**	**Completed**	**Grade**	**Hours**
CHEM 1315 General Chemistry I (Fall and Su)				5
CHEM 1415 General Chemistry II (Spr)				5
CHEM 3053 Organic Chemistry I (Fall)				3
CHEM 3062 Lab Organic Chemistry I (Fall)				2
CHEM 3153 Organic Chemistry II (Spr)				3
CHEM 3162 Organic Chemistry II (Spr)				2
CHEM 3425 Chemical Analysis (Fall)				5
CHEM 4115 Biochemistry I (Fall)				5
Chemistry Electives - (CHEM) ***see options on back***				**8 hours**
BIOL 1404 Principles of Biology I (Fall, Spr and Su)				4
BIOL 1504 Principles of Biology II (Spr)				4
BIOL 2114 Introductory Microbiology (Fall & Spr)				4
BIOL 3404 Genetics (Fall & Spr)				4
BIOL 3814 Cell and Molecular Biology (Fall & Spr)				4
BIOL 3614 Human Physiology (Fall, Spr & Su)				4
BIOL 3624 Human Anatomy (Fall, Spr & Su)				4
Biological Sciences Electives - (BIOL, BOT, CONS, and/or ZOOL) ***see options on back***				**10 hours**

Additional Support Courses: CHEM/BIOL 4193 (Biochemistry II/Metabolism [Spring only]) and CHEM/BIOL 4314 (Immunology [Spring only]) are required as either chemistry or biology electives. CHEM 4951/BIOL 4981 (Senior Seminar) is required and may be counted in the 76 total hours.

Note: All chemistry majors must take 6 hours of mathematics (approved by their advisor) within their first 20 hours of chemistry. _____

Common Electives in Chemistry				**8 hours**
Course	**Scheduled**	**Completed**	**Grade**	**Hours**
CHEM 2113 Inorganic Chemistry I (Spring)				
CHEM 3525 Instrumental Analysis (Spr even yrs)				
CHEM 3612 Intro to Nuclear Chem (Fall odd yrs)				
CHEM 4124 Molecular Genetics				
CHEM 4193 Biochemistry II (Spring)				
CHEM 4333 Inorganic Chemistry II (Fall even yrs)				
CHEM 4314 Immunology (Spring)				
CHEM 4562 Advanced Laboratory				
CHEM 4553 Physical Chemistry I (Fall even yrs)				
CHEM 4653 Physical Chemistry II (Spring odd yrs)				
CHEM 4662 Thermodynamic Lab (Fall even yrs)				
CHEM 4951 Senior Seminar (Fall and Spring)				
CHEM 4970 Special Studies (arranged)				
CHEM 4990 Research (arranged)				
Common Electives in Bology			**10**	**hours**
BIOL 3913 Biostatistics (Fall)				
BIOL 4124 Molecular Genetics				
BIOL 4193 Metabolism (Spring)				
BIOL 4314 Immunology (Spring)				
BIOL 4423 Developmental Biology				
BIOL 4434 Histology				
BIOL 4642 Bioethics (Fall and Spring)				
BIOL 4653Human Disease				
BIOL 4981 Senior Seminar (Fall and Spring)				
BIOL 4990 Research (arranged)				

Student Name: _____ Student ID:_____

Southeastern Oklahoma State University

Bachelor of Science in Chemistry -*Biochemical Technology (major-minor)*

Effective: Oct. 2012 **Advisor Check Sheet** Revised: July 2022

Required Courses and Electives				**Major-Minor: 58 hours**
Course	**Scheduled**	**Completed**	**Grade**	**Hours**
CHEM 1415 General Chemistry II (Spring)				5
CHEM 3053 Organic Chemistry I (Fall)				3
CHEM 3062 Lab Organic Chemistry I (Fall)				2
CHEM 3425 Chemical Analysis (Fall)				5
CHEM 4115 Biochemistry I (Fall)				5
CHEM 4124 Molecular Genetics				4
CHEM 4193 Biochemistry II (Spring)				3
CHEM 4951 Senior Seminar (Fall and Spring)				1
CHEM 4990 Research (Fall, Spring, and Summer)				4
BIOL 1504 Principles of Biology II (Fall and Spring)				4
BIOL 2114 Introductory Microbiology (Fall & Spr.)				4
BIOL 3404 Genetics (Fall and Spring)				4
BIOL 3814 Cell and Molecular Biology (Fall & Spr.)				4
Common Electives - Approved by Department (5 hours upper division)				**10 hours**
CHEM 2113 Inorganic Chemistry I (Spring)				3
CHEM 3525 Instrumental Analysis (Spring even yrs)				5
CHEM 3153 Organic Chemistry II (Spring)				3
CHEM 3162 Lab Organic Chemistry II (Spring)				2
CHEM 4314 Immunology (Spring)				4
or approved Chemistry Elective(s)				

Required General Education Electives *must* include CHEM 1315 (Fall or Su) and BIOL 1404 (Fall, Spr or Su). All Chemistry majors must complete as least 6 hours of MATH courses.

Student Name: _____ Student ID:_____

Southeastern Oklahoma State University

Bachelor of Science in Chemistry - *Professional Chemist (Major-Minor)*

Effective: Fall 2011 **Advisor Check Sheet** Revised:July 2022

Required Courses and Electives				**Major-Minor: 60 hours**
Course	**Scheduled**	**Completed**	**Grade**	**Hours**
CHEM 1415 General Chemistry II (Spring)				5
CHEM 2113 Inorganic Chemistry I (Spring)				3
CHEM 3053 Organic Chemistry I (Fall)				3
CHEM 3062 Lab Organic Chemistry I (Fall)				2
CHEM 3153 Organic Chemistry II ((Spring)				3
CHEM 3162 Lab Organic Chemistry II (Spring)				2
CHEM 3425 Chemical Analysis (Fall)				5
CHEM 3525 Instrumental Analysis (Spring)				5
CHEM 4115 Biochemistry I (Fall)				5
CHEM 4333 Inorganic Chemistry II (Fall odd yrs)				3
CHEM 4553 Physical Chemistry I (Fall even years)				3
CHEM 4662 Physical Chem I Lab (Fall even years)				2
CHEM 4951 Senior Seminar (Fall and Spring)				1
CHEM 4992 Research (Fall, Spring, and Su)				2
PHYS 1114 General Physics I (Fall or Su)				4
MATH 2315 Calculus II (Fall and Spring)				5
Common Electives - Approved by Department				**7 hours**
CHEM 3612 Intro to Nuclear Chem (Fall odd yrs)				
CHEM 4055 Advanced Organic Chemistry				
CHEM 4124 Molecular Genetics				
CHEM 4193 Biochemistry II (Spring)				
CHEM 4562 Advanced Laboratory				
CHEM 4653 Physical Chemistry II (Spring odd years)				
PHYS 1214 General Physics II (Spring)				
MATH 3113 Multivariate Calculus				
MATH 3213 Differential Equations				
MATH 4133 Linear Algebra				

Required General Education Electives *must* include CHEM 1315 (Fall and Su) and MATH 2215.

APPENDIX III

Annual Chemistry Program Assessment Reports

CHEMISTRY PROGRAM OUTCOMES ASSESSMENT REPORT FOR 2020-2021

Tim Smith

SOUTHEASTERN OKLAHOMA STATE UNIVERSITY

EXECUTIVE PROGRAM SUMMARY

Learning Outcome	Measure 1 (# of students assessed)	Measure 2 (# of students assessed)	Measure 3 (# of students assessed)
1	Acceptance into Graduate Programs (1)	ACS Exams (166)	MCAT Exam (4)
2	Critical Analysis of Data in Laboratory (41)		
3	Senior Seminar Presentations (9)		
4	Student Presentations (2)		
5	Student Research (8)	Group Clicker Responses (no data)	
6	Safety in Lab Final Exam for CHEM-3425 (no data)	Reported Laboratory Incidents	

In general, we feel that our students are achieving their academic goals and showing acceptable target results are met for most of our assessment outcomes. We realize we may have set the targets too high for some courses including the introductory level (CHEM-1315/1415) where many students realize they are not going to be chemistry majors. In general scores this year were lower than those in previous years although the data is limited by Covid. We attribute this in part to the conversion to online learning and blended format course deliveries.

No changes for the major to propose at this time based on our data. We do acknowledge that some Learning Outcomes need additional measures to better verify the findings.

PROGRAM OUTCOMES ASSESSMENT REPORT	
Department: Chemistry, Computer, and Physical Sciences	
Degree Program: Chemistry	
Report Submitted By: Dr. Tim Smith	**Date of Submission: 10/5/21**
Program Mission Statement: The Department of Chemistry, Computer and Physical Sciences is dedicated to preparing its students to face the challenges and take advantage of the opportunities of the 21st century in an expanding global community by providing excellence in teaching, outstanding academic programs, and relevant research opportunities.	
Goal 1: Prepare students for career opportunities in business, industry, and government not just in the U.S. but around the globe.	
Student Learning Outcome 1	Demonstrate knowledge of chemical concepts, laws, theories, and the ability to use process skills in chemistry through observation, measurement, classification, inference, interpretation, and experimentation (including controlling variables, graphing, and communication).
Acceptance Rate into Graduate and Professional Programs	***The chemistry program serves as a major for students entering a variety of professional programs and graduate programs. Include Medical School, Dental School, Pharmacy School, Optometry School as well as other professional programs.*** ***One (1) of the one (1) of the graduates that applied to graduate or professional got accepted on their first attempt. We are not reporting students that reapplied or took a gap year to refine their application. This represents 100% admittance percentage. In AY2021, the Chemistry program had 6 graduates. This does represent a smaller fraction of our graduates applying to graduate or professional programs.*** ***The acceptable/ideal target is for 50% of the Chemistry majors applying to a graduate or professional program to be accepted. Target was exceeded.*** ***1. The one student was accepted into the entomology graduate program at Texas A&M University in College Station, TX.***
ACS Exam in Analytical Chemistry	***Every student majoring in chemistry is required to take Chemical Analysis (CHEM-3425). In the lecture portion of this course the student studies the concepts, laws, and theories governing analytical chemistry. For the final exam, the ACS National standardized Analytical Chemistry exam is given which provides a national norm data set. Ten (10) students took the exam in the Fall 20 as their final exam in CHEM-3425. 10.0% scored above the national average and 60.0% scored within one standard deviation unit of the national average.*** ***The acceptable target is to have 35% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. Target not met in both aspects however this was a slight improvement over AY1920. This performance was attributed in part to COVID and the online learning environment.*** ***See appendix: Figure 1. ACS Exam scores in CHEM-3425 and Figure 2. Historic CHEM-3425 exam scores.***
ACS Organic Chemistry Exams	***Every student majoring in chemistry is required to take Organic Chemistry I (CHEM 3053) and most choose Organic Chemistry II (CHEM 3153) as one of their electives – which is required in 3 of the 4 options for the Chemistry major. In the lecture portion of this two semester sequence in Organic, the student studies the concepts, laws, mechanisms, and theories governing organic chemistry.***

	The acceptable target is to have 25% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. **In the Fall 20, the ACS First term Organic Chemistry Exam was <u>not</u> given as the final exam in CHEM-3053. The exam is controlled and copyright protected material that could not be given in the online format. The institution switched to online only following Thanksgiving. No data collected for CHEM-3053. In the Spring 21, twenty-four (24) students enrolled in CHEM-3153 took the ACS Organic Chemistry exam as their final. 12.5% scored above the national average and 54.2% scored within one standard unit of the national average. This data are shown graphically in Figure 3. The historic data for CHEM-3153 are shown graphically in Figure 4.** **Neither assessment target was meet for CHEM-3153. These are very aggressive targets for typically second year chemistry students. We attribute this in part to the difficulties students had adapting to the hybrid format forced to use in order to maintained required social distancing due to COVID.**
ACS Exam in Inorganic Chemistry	***CHEM 2113 offers fundamental knowledge of Inorganic Chemistry to the students who completed CHEM 1214 or 1415 with a grade of C or better. Students should sit for a comprehensive exam prepared by the American Chemical Society (ACS) as their final exam.*** **Inorganic Chemistry -1 (CHEM 2113) is required for students in Chemistry and Professional Chemist major tracks and an elective course for students in Biochemical Technology and the Medical Sciences tracks.** **CHEM 2113 is a spring semester course and offers fundamental knowledge of Inorganic Chemistry to the students who completed CHEM 1214 or 1415 with a grade of C or better. At the end of the semester, the students are evaluated using a comprehensive exam prepared by the American Chemical Society (ACS). The scores are compared to the national average during the course evaluation process. The Chemistry Department target is to have 25% of the students scoring above the national average and 50% of the students scoring within one standard deviation unit or higher.** **Of the eleven (11) students who took the exam, 9.1% were within ±1 standard deviation units of the national average or higher. None of the students have scored above the national average. DFW rate for the course was 9.1%. This data is shown gracphically in Figure 5.** **In conclusion, Inorganic Chemistry-1 (CHEM 2113) did not meet the Chemistry Department target in Spring 2021.**
ACS Biochemistry Exam Biochemistry I	***Biochemistry I (CHEM-4115) is a Fall chemistry course available only to students who have passed Organic Chemistry I with a grade of C or better. While approximately 50% or more of the students take Organic and General Chemistry at SE, a large percentage take their prerequisite chemistry courses at another institution. CHEM-4115 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Sciences and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry minors, especially combined with a Biology major. Biochemistry I is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry I includes coverage of the basic building blocks of proteins and cells, their functions and nomenclature, simple biochemical calculations (including kinetics) and data interpretation. The course contains a 4-hour laboratory weekly component to provide an introduction to basic biochemical laboratory techniques and to re-enforce lecture concepts.*** ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester and therefore cover broader material in the single semester. For years in CHEM 4115, students were asked to answer only the ACS exam questions covered in the Biochemistry I course, since many of the questions relate to the follow-up Biochemistry II course at SE.***

	Beginning in Fall 2012, CHEM 4115 students were asked to answer all questions on the 2 semester exam, and their scores were compared with the national norms available for student in 1-semester courses. The scores obtained by the students served as their Final Exam grade, at 10% of their overall grade, and had a direct impact on their final grade unlike some previous years. The weight is relatively low, and several students did not have to do very well to keep the overall grade earned on the other 90% of the grade, so the students were not highly motivated to do well on the ACS exam. The student scores in CHEM-4115 are also compared with the national averages for only the "core 40" questions as recommended by ACS. The coverage of Biochemistry I is not designed to match the "40 Core" question content, but the students do very well on the 20 "non-core" questions because they emphasize techniques and content covered in CHEM 4115. The "core 40"scoring is not used on any other current ACS subject exams. **Eighteen (18) students took the ACS Biochemistry Exam in the Fall 2020. This data is displayed in a Figure 6 in the Appendix. The historic data for this exam is shown in Figure 7. The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.** **Neither target was met or almost met in Fall 20 with only 22% scoring with one standard deviation unit of the national average, and only 5.6% (=1 student) scored at or above the national average. The cohort was almost as large as the Fall 2018 cohort (20 enrolled), which had met the first target but had only 2 students (10%) above the national average. However, we did have to take the ACS exam prior to Thanksgiving, not during finals week, so they had not yet studied the last 2 chapters thoroughly for their Exam 4. Also, in addition to the mis-match of the ACS "core" content with the SE Biochem I (and II) course descriptions, many seemed under-prepared or missed classes due toCovid isolation, work conflicts, or family matters. 100% of the lectures were recorded and posted on the Zoom cloud for access after class. The overall class performance on Exam I, which is largely reviewing and expanding upon Gen Chem I & II and Organic basics, was one of the worst in years, with many close to failing. Plaigiarism on lab reports was also a greater problem than in the past. The data for the Fall 20 and historic data are shown in Figures 6 and 7.**
ACS Biochemistry Exam Biochemistry II	***Biochemistry II (CHEM-4193) is a Spring chemistry course available only to students who have passed Biochemistry I with a grade of C or better. (The course is cross-listed as CHEM-4193: Biochemistry II and BIOL-4193: Metabolism.) Typically approximately 50% of the students who take Biochemistry I will continue on to take Biochemistry II. CHEM-4193 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Science and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry and Biology minors. This course is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry II includes coverage of the basic knowledge of common anabolic and catabolic pathways, the regulation of these pathways, and their relation to energy production or human diseases. Pathways covered include the breakdown and synthesis of carbohydrates, amino acids, lipids, and nucleotides. The course also includes an introduction to basic biochemical methodology and techniques for determining the nature of these pathways and to illustrate the relevance of biochemistry to everyday life and medicine.*** ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester. It provides different norms for 1-semester and 2-semester courses, but uses only 40 of the 60 questions for the 1-semester courses. Beginning in Spring 2013, CHEM 4193 students were asked to answer all questions on the 2 semester exam (rather than just the questions covered in BiochemistryII/Metabolism), and their scores were compared with the national norms available for student in 2-semester courses.*** **The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.**

	As a part of the 2021 second semester of Biochemistry (CHEM 4193 Biochemistry II) each student was required to take the newly-released American Chemical Society Standardized Exam BC17, an exam described by the source as "Designed for the end of a two-semester sequence in Biochemistry. Includes a few items with content related to laboratory experiments in Biochemistry." Twelve (12) students took the new exam in Spring 2021, and some topics covered on the exam were not covered in the current edition of the Biochemistry I & II textbook. Unfortunately, nationally still very few students have taken the exam, so official statistics were not published on-line on the day the class took the exam. In May 2019, the temporary national average was 30.0 out of 60 for only 102 students, while in May 2021, the temporary national average was 32.7 (+/- 8.2) out of 6 for only 169 students from only 5 institutions. **Of the 12 students taking the new exam in Spring 2021, only 2 (16.7%) were within 1 standard deviation of the national average, with a 3rd student missing inclusion by less than 1 point. Only 1 student (8%) scored above the national average, but he scored in the 95th percentile. Therefore neither target was met for this cohort.** **Although the national averages had increased a little (2.7 points) in 2 years, in Spring 2019 42.9% of the 14 students scored above the new national average for the 2-semester scores, while 78.6% of the students are within +/- 1 standard deviation of the national average or higher. Despite weather and COVID problems in 2021, the ZOOM format let all students participate in the lectures in real time or review them after posting, and the extent of the coverage of the course content in lectures was not that different. From student casual comments and questions asked, it became apparent that although many made a grand show of signing on to Zoom so their attendance was "recorded", many were not actually listening to the lectures, and those that missed the live lectures rarely or never listened to the recordings. This was also reflected in their section exam scores, especially the first 2 exams. Overall, the hybrid ZOOM format and not having enough seating in the classroom (due to social distancing interpretations) prevented requiring the students from attending in person; this does not guarantee that they will fully engage in the lecture material, but it appears to encourage it. Additional online quizzes focused on key concepts that might appear on the section exams helped the class during the 2nd half. The data for theSpring 21 and historic data are shown in Figures 8 and 9.**
ACS First Semester General Chemistry Exam in CHEM-1315	***General Chemistry I (CHEM-1315) is the highest of the three levels of first-semester chemistry courses offered at SE. This course is commonly referred to as "Majors/Pre-Professional Chemistry". CHEM-1315 is the entry point for students who will major in Chemistry and Medical Sciences; for all students meeting general chemistry requirements for entrance into programs of advanced healthcare degrees and a Chemistry minor. It includes nomenclature, atomic and molecular structure, stoichiometry, bonding, states of matter, thermochemistry, acids and bases, and gas laws. The course contains a 4-hour laboratory weekly component.*** ***At the beginning of the last decade, we came to recognize the importance of assessing student learning not only in the junior and senior level courses, but also in the freshman level Chemistry courses as well. As a part of this, each student in CHEM-1315 has been required to take the American Chemical Society First-Semester General Chemistry Exam starting in Fall 2011. This exam tests the student's knowledge of both theoretical and experimental first semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** **During the Fall 2020 and Spring 2021 semesters, a total of fifty-five (55) students took the exam. 32.7 percent of the students were within one standard deviation of the national mean or higher, a 17.3 percent decrease from the previous year. 7.3 percent of the students were above the national average, a 13.0 percent decrease from the previous year. Figure 10 illustrates individual student performance on this exam. One previous area of concern had been the %DWF rate for CHEM-1315. Changes in teaching assignments annually yield a different set of faculty teaching this course. Figure 11 shows the %DFW rate annually over the past 9 years for CHEM-1315 (Fall 11/12 – 20/21). Although the DFW rates remain favorable when compared to BIOL-1404 and MATH-1513 which are typically taken by the same students, the DFW rate was noticeably higher than the previous year. This drop in scores and higher DFW rate is attributed to the hybrid/online environment in which the**

	CHEM-1315 sections had to be taught due to the COVID-19 pandemic. Many students did not adapt well to this change. This was a common occurrence over the entire campus. **In conclusion, the acceptable target (25%) of students scoring above the national average and the acceptable target (55%) of students scoring within one standard deviation unit or higher of the national average were not met. We attribute this to the COVID-19 pandemic.**
ACS Second Semester General Chemistry Exam in CHEM-1415	***General Chemistry II (CHEM-1415) is the continuation course of CHEM-1315. It also serves as the prerequisite for most upper-level Chemistry courses and a prerequisite for most pre-professional programs. Success in CHEM-1415 is critical for students who will continue to major in Chemistry, Biotechnology, and Medical Sciences. CHEM-1415 emphasizes on kinetics, equilibrium, thermodynamics, electrochemistry, qualitative analysis, organic chemistry, biochemistry, and nuclear chemistry. The course also contains a 4-hour laboratory weekly component.*** ***As was the case with CHEM-1315, we have recognized the importance of assessing student learning in CHEM-1415. As a part of this assessment, each student in CHEM-1415 was required to take the American Chemical Society Second-Semester General Chemistry Exam. This exam also tests the student's knowledge of both theoretical and experimental second semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** **In Spring 2021, twenty-nine (29) students took the exam. The individual student performances are show in Figure 12. The performance of the cohort improved compared to the Fall on average, 65.5 percent of the students were within one standard deviation of the national mean or higher and 13.8 percent of the students scored at the national average or higher. The results were a significant variation from the previous year, but these cycles with different cohorts of students are somewhat the norm. The department continues to track the various factors that have contributed to this data. It is critical that Chemistry majors have a proper foundation in General Chemistry in order to be successful in the major. We have placed an emphasis on providing the students with the strongest foundations possible. The DFW rates remained low in CHEM-1415 as shown in Figure 13.** **In conclusion, the acceptable target (25%) of scoring above the national average was approached but not met whereas the acceptable target (55%) of scoring within one standard deviation unit or higher of the national average was exceeded.**
ACS Diagnostic of Undergraduate Chemistry Knowledge Exam in CHEM-4951	***The Diagnostic of Undergraduate Chemistry Knowledge (DUCK) exam is designed to be taken at or near the end of a four-year undergraduate curriculum. This was developed by the American Chemical Society's Exams Institute and has comparative national norm data. All items on the exam are part of scenarios that require knowledge from more than one traditional area of chemistry. Thus, the performance of the student on this exam is reflective of their cumulative learning experience in the entire chemistry major. This exam is given during the capstone Chemistry Senior Seminar course, CHEM-4951. Assessment is required for all majors, even students taking Biology Senior Seminar as part of the Medical Sciences track.*** **The acceptable target is to have 25% of the students scoring above the national average and 60% of the students scoring within one standard deviation unit or higher of the national average.** **For the academic year 20/21, a total of 7 students took the ACS Diagnostic of Undergraduate Chemistry Knowledge Exam (DUCK). Individual student performances are shown in Figure 14. 28.6% of the students scored within one standard deviation unit of the national average. 28.6% of the students scored above the national average. The percentage of students that scored within one standard deviation unit of the national average was lower than the last assessment year (academic year 18/19). However, the percentage of students that scored above the national average was higher than the last assessment year (academic year 18/19).** **In conclusion, the acceptable target (25%) of students scoring above the national average was met whereas the acceptable target (60%) of students scoring within one standard deviation unit or higher of the national average was not met.**

Medical College Admission Test (MCAT)	***The MCAT is a test required for admission into all medical programs, medical doctorate and osteopathic doctorate, in the U.S. The MCAT is a standardized, multiple- choice examination designed to assess the examinees' problem solving, critical thinking, writing skills, and knowledge of science concepts and principles necessary to the study of medicine. Scores are reported in Verbal Reasoning, Physical Sciences, Writing Sample, and Biological Sciences. Chemistry represents anywhere from 35 to 40% of the MCAT by subject area. Students are to have completed a minimum of 20 hours of chemistry (General and Organic Chemistry) at the point of taking the MCAT and most have more than 30 hours at this point. The MCAT is administrated by the Association of Medical Colleges and a student's performance on this critical test is made available to the pre-medical advisory committee at each undergraduate institution.*** **The acceptable target is for the 50% of chemistry majors to score 492 or higher on the MCAT. A 492 represents the minimum score required to apply by medical scores in Oklahoma and Texas.** **Our combined average MCAT for 20/21 was a 501.3 for the four (4) students that took the MCAT during this period. The minimum MCAT required to apply to Oklahoma medical school (OUHSC and OSUCOM) is a 492. One hundred percent of the students scored at a level to meet the minimums to apply with individual scores 493 (21st percentile) to 516 (93rd percentile. Figure 8 shows the low, high, and average MCAT in comparison to recent years at SE. This cohort was significantly stronger than most years in that no student scored less than the minimum MCAT to apply. The acceptable target was meet with 50% of the students scoring above a 492.** **Figure 9 illustrates the applicant to admission numbers to Medical School for the past 11 years. We are confident that recent changes made into our program have lead to stronger acceptance rates in Professional programs for our majors.**
Summary of Assessment Results	**A portion of our normal assessment data was not obtained due to COVID issues in AY2021. Most outcomes are being measured by means of national comparative norm data using standardized exams. Some of the courses meet they acceptable targets when the ACS exam was part of the student's grade (final exam). Like most programs, some individual students performed extremely well and some individuals performed poorly. By increasing the standards of "C" higher to proceed into CHEM-1415 and CHEM-3053 and using the ACS exams for our final exams, the number of low performing students is a smaller percentage compared to 10 years ago. The number of students entering graduate and professional programs strongly indicates our students are gaining the fundamental knowledge need to succeed in the major. A key question in which we are not certain is "Are the lower ACS exam scores across the curriculum as a whole due to the stress and learning environment of COVID or it this fundamentally a weaker cohort of student?"**
Use of Results and Reflection	*One of greatest challenges continues to be dealing with the increasing number of transfer students that come in with their first one- or two-years of chemistry being completed at a junior college that does not have the level of rigor we required for freshman chemistry. While certainly some transfer students have succeeded, others have found the transition to be very difficult. An additional challenge is with a reduced student expectation of educational responsibility with hybrid or online courses. The reduced enrollment in the General Chemistry sequence will certainly result in reduced number of majors in the future.*
Student Learning Outcome 2	Show competence in cognitive analysis of chemical information, recognition of organizing principles in information, and proficiency in library and computer skills in obtaining information and analyzing data.
Critical Analysis of Chemical Data	***This outcome is measured in several courses and because of its nature it is difficult to quantitatively measure. The outcome can be seen in two aspects of the department's instruction. The first is in the cognitive analysis of the student's own information collected in the laboratory portion of core and elective courses. The instructional emphasis in the 5-semester hour courses is forty percent on these laboratory-based competencies. Specific requirements are discussed in the paragraphs below. The second aspect of this competency is exhibited in the cognitive analysis of literature information assigned in several of the courses. Several of the 3000 and 4000 level courses include a research paper that requires***

	that the student perform a literature search, organize key scientific information, and prepare a report and/or oral presentation. ***The acceptable target is for Organic Chemistry Laboratory (CHEM-3062/3162) is that 75% of the student will earn an A, B, or C in that course. Chemical Analysis (CHEM-3425) also has a significant laboratory component that requires critical analysis of data. The acceptable target for CHEM-3425 is that the student's average laboratory component be 70% or higher of the available points.*** **In Organic I (CHEM3062-Fall 20) the percentage of students earning an A, B, or C was 96.6% with a total of twenty-nine (29) students. In Organic II (CHEM3162-Spring 21) the percentage of students earning an A, B, or C was 100% with a total of 25 students.** **In Chemical Analysis (CHEM3425), the student's average lab score was 78.4% with a total of twelve (12) students. Ten of the twelve students in CHEM-3425 for the Fall 20 had a lab average that exceeded 70%.** **These scores exceeded the acceptable target.**
Critical Analysis of Chemical Data Summary of Assessment Results	**This learning outcome is one of the harder to quantify. Overall student performance in the selected courses demonstrate an acceptable skill set for processing chemical information. It should be noted that all of the students being evaluated are beyond freshman status and many are juniors or seniors by credit hours. These students have frequently developed a strong cognitive analysis skill set due to the complex nature of the CHEM-3000 and -4000 courses.**
Critical Analysis of Chemical Data Use of Results and Reflection	*These findings illustrate a strength of our students. Our chemistry majors take significantly more lab courses (and hours) than chemistry majors at other institutions in the state and nationally. The increased lab exposure leads to increased student success.*
Student Learning Outcome 3	Demonstrate skill in the synthesis of information by preparing and presenting reports, proposing plans or sets of operations, and/or making derivations of abstract relations.
Senior Seminar Presentations	***These outcomes are assessed in several of our advanced chemistry courses where students are required to write up detailed laboratory reports using both library and computer skills. However, every student taking Senior Seminar is required to do a research project which requires them to use library resources, organize and present their findings in both a poster presentation, a written report, and an oral presentation. It is important to note that while chemistry majors and chemistry major-minor students must take the Chemistry Senior Seminar, some of the interdisciplinary double majors (chemistry-biology) opt to take the Biology Senior Seminar and, therefore, do not appear in the statistics. The chemistry faculty evaluates the poster presentations, the oral reports, and the written reports. The evaluations are used in assigning a grade for each individual student's performance. Generally, it can be said that the chemistry faculty believes that the students' performances on their presentations and reports met the requirements of Outcomes 2 and 3. Since students in the Biology Senior Seminar have to met similar requirements as those in chemistry, it seems reasonable to assume that the interdisciplinary Medical Sciences majors also met the requirements of Outcomes 2 and 3 as well.*** ***The acceptable target is that 80% of all graduating chemistry majors produce an acceptable senior seminar presentation.*** **For the academic year 20/21, the number of graduating chemistry majors that took CHEM-4951 was nine (9). All students demonstrated satisfactory skills in the synthesis of information in their projects and no repeats were required in the Seminar Course (CHEM-4951). The acceptable target was exceeded.**
Summary of Assessment Results	**The track record for students taking our CHEM-4951 remains strong. Rarely do students have to repeat presentations due to a lack of performance. We do have a variable number of students that course the Medical Sciences option that take the Biology Seminar course (BIOL-4981) in lieu of our CHEM-4951 in order to fulfill hour requirements.**
Summary of Assessment Results Use of Results and Reflection	*Target is greatly exceeded. Several upper level chemistry courses also require reports and presentations as part of their normal course expectations. Data was not collected for courses other than CHEM-4951.*

Student Learning Outcome 4	Exhibit intellectual honesty, open- mindedness, and objectivity in the accumulation and interpretation of information and form value judgments on ethical issues in the conduct of chemistry and the applications of chemistry in society.
Student Presentation and Publications	**The acceptance of papers for presentation and publication not only demonstrates the students' skills in synthesis of information but also supports the first part of this competency as well. Without the qualities of intellectual honesty, open mindedness, and objectivity they would not be accepted. The same can be said for the students' performance at state, regional and national meetings where they deliver poster and platform presentations.** **The acceptable target is 30% of graduating students perform a student presentation or publications at local, state, or national conferences each year.** **All of the conferences and meetings our students planned to participate in for the AY2021 were canceled due to COVID in 2020 except the OK-INBRE Summer 2021 Intern poster presentation in July 2021.**
Summary of Assessment Results	**Two students each presented at the final poster session for the statewide biomedical research programs in Oklahoma City, July 20, 2021. Both students were required to participate in order to receive their 3rd stipend paycheck. Students had the option of competing in the judged poster competition; both requested to compete, and were scored by a panel of 3 students enrolled in the OKC PhD track graduate biomedical programs, and received written feedback.** **The posters they presented were largely based on data they had generated during the summer internships, as well as data they had generated with other student co-workers in Spring 2021, while taking CHEM4990 for credit and pay. The posters were titled:** **1) EXPLORATION OF NUTRITIONAL COMPONENTS OF REDBUD SEEDS, Cooper McKinney, Mackenzie Powell, Asuncion Eleazar Rubio, Sergio A. Vazquez Gomez and Dr. Nancy Paiva.** **2) ANALYSIS OF ANTI-NUTRITIONAL FACTORS OF CERCIS CANADENSIS USING MANDUCA SEXTA, Mackenzie Powell, Skylar Fletcher, Cooper McKinney, Asuncion Eleazar Rubio, Dr. Nancy Paiva.**
Use of Results and Reflection	Participation in meeting attendance and poster presentations were down substantially, but these 2 posters are displayed in the Science hallways, to inspire more students to participate in the future. One student (a Sophomore is definitely intending to do additional research next summer, to prepare for PhD program applications, while the other is currently aiming for medical programs, where prior research experience is still valued..
Student Learning Outcome 5	Show interpersonal skills that promote the accomplishment of team goals in small groups.
Student participation in research	***The Department of Chemistry, Computer, and Physical Sciences has historically had active research groups. These groups involve chemistry students and faculty who conduct original research, most of which is funded by external grants from places such as the National Institutes of Health (NIH) OKINBRE, the Oklahoma Center for the Advancement of Science (OCAST), National Science Foundation Oklahoma EPSCoR, and the National Aeronautics and Space Administration (NASA) Oklahoma Space Grant and EPSCoR.*** ***During the research process students typically work in teams under the direction of a faculty advisor. The students are intimately involved in accumulating, interpreting, and analyzing information acquired from the experiments they perform. They are required to make value***

	judgments on the validity of the information and experimental processes. In addition, they must be completely open and honest in the collecting and sharing of information with other team members in their respective research group. While not all student researchers enroll in CHEM4990 (Research), any student seeking course credit for research must prepare a written research report explaining what they did, why and how they did it, what their results meant, and also acknowledging any input from other fellow researchers. Some students work as paid summer research interns off campus, and learn to work with other students, postdocs, technicians, and PhD researchers in a fulltime laboratory environment to try to answer very specific research questions, while also writing reports and earning CHEM4990 Research course credit. Not all but many of these student researchers contribute to a public presentation of the research team's results, most commonly in poster format. Our American Chemical Society student chapter (composed of a variety of science majors) also worked together in small groups to accomplish many projects, and also presented a summary of their activities in poster format at their national professional meeting. ***The participation in research is done at the discretion of the student. Both chemistry major minor tracks (Professional Chemist and Biochemical Technology) require a research for credit (CHEM4490) of 2 to 4 hours. Students may choose to do this during the academic year or over the summer semester. Opportunities for research exist on the SE campus and at off campus sites.*** ***The acceptable target is that 50% of all chemistry majors participate in some organized semester long research activity.***
	Due to COVID restrictions, at times lab research was not possible, and most in-person summer programs were cancelled in March and April 2020. However, a total of 8 undergraduates enrolled in CHEM 4990 from Summer 2020 to Summer 2021, and 2 of these have already graduated, with 2 more on track to graduate in Dec 2021. This is actually average or higher participation, partly due to a special OK-INBRE student research wages award to make up for cancelling their other undergraduate programs. **The SE campus closure limited research in Summer 2020 to only online work, but 1 student interested in Bioinformatics started 4 credits of online research in Summer 2020, and completed his hours and his research paper by doing additional hands-on research in Spring 2021, to graduate in May 2021 and he has started a laboratory technician job at a hospital in TX, were laboratory research skills are valued.** **The many social distancing requirements and faculty overloads made research very uncertain in the Fall, but another Sr Chem major signed up for 4 credits hours of CHEM 4990 in Fall 2020. While some progress was made, the student was repeatedly quarantined, and had to complete her hours and research paper by doing additional hands-on research in Spring 2021, to graduate in May 2021, and she has started a research-based Masters/PhD program in TX.** **5 other students took CHEM 4990 Research for 1 to 3 credits in Spring 2021, and worked in teams on 3 overlapping projects, and also helping the above 2 graduating Seniors to learn additional techniques and to see if they wanted to continue the projects after others graduated. 1 student took 3 credits of CHEM 4990 in Summer 2021 while participating in the OK-INBRE Summer 2021 Intern program. All completed a significant number of research hours, but due to becoming ill with COVID or multiple quarantine events, plus the severe weather events in February, only 2 of these completed their research papers on time, and the other 4 still need to complete a little lab work or writing. This is not too unusual in real research programs, and the student all benefitted in learning new techniques and gaining confidence in the lab. Additionally, 3 of the Spring interns came back to continued paid research during the summer.** **Although it is not always the case, all of these 8 interns earned either $15/hr due to INBRE COVID funding, or NASA Space grant awards, or 2 received $5000 stipends for being OK-INBRE Summer 2021 Interns (see above Presentations section). These funds allowed us to compete successfully with other employment options.** **Participation in undergraduate research was still strong, at least under the section of CHEM 4990 that Dr. Paiva supervised.**
Group Student Participation With Clicker Questions	***Some of the chemistry courses utilize student response systems (aka Clickers) to gain real time student input over lecture materials. General Chemistry I (CHEM-1315), and Chemical Analysis (CHEM-3425) are such classes in which the student responses given as daily assessment count towards they students course grade. Student responses are most commonly given as individual questions in which a student formulates their response***

	individually. In an effort to promote peer learning in the classroom, students are also given the opportunity to work the problem in small groups of 4 or less. Each student still responds individually after the group discussion on the assessment question. Ideally if peer learning is effective, the student performance should increase with the group responses. ***The acceptable target is that there is a positive impact on the group response clickers compared to the individual response clickers. Also the group responses should exceed 80% correct.*** ***Data no collected in the Fall 20/Spring 21 due to Zoom format teaching.***
Summary of Assessment Results	*N/A*
Use of Results and Reflection	*N/A*
Student Learning Outcome 6	Show the ability to anticipate, recognize, and respond appropriately to laboratory hazards or hazardous conditions, and take appropriate safety precautions.
Laboratory Safety	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean of Students and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures.*** ***Instruction on proper safety procedures is provided weekly to every student in every laboratory. The instructors always include relevant instruction at the beginning of every laboratory activity. Students who fail to adhere to the guidelines on any particular activity are immediately corrected in lab and may be dismissed for continuing to ignore those instructions. During the course of the work in the laboratory there are specific requirements for the disposal of excess reagents, waste, or by- products of the chemical operations and the final product. Even "simple" actions such as smelling a chemical vapor, transferring a chemical reagent, weighing a chemical material, storing a chemical product, transporting a chemical material, or reacting to a small chemical spill have prescribed protocols for responses which the students must learn and follow. Besides safety goggles, the students are instructed to wear close-toed shoes and long shorts or pants and to NOT wear contact lenses in the laboratory. The students learn to work in a state of safety consciousness. Some measure of the success of this approach is the lack of any report of any safety violation in the past year. A better measure is the overall safe environment of the majority of laboratory areas which would not be possible if left entirely to the faculty and staff alone.*** ***A laboratory final exam in Chemical Analysis (CHEM-3425) is given at the end the semester Fall semester courses. The lab finals both include fundamental safety questions. The acceptable target is that students performance should exceed 65% on all safety related lab final questions.*** **Data not collected due to conversion of online after Thanksgiving in the Fall 20.**
Reported Laboratory Incidents in Academic Year	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Department***

	Chair and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures. Any incidents involving students are reported to Mr. Bradley Corbett (Chemical Stockroom Supervisor) who writes and files an incident report. A copy of the incident report is forward to the department chair. ***The acceptable target is that no major accidents occur that involve medical treatment and three or less accidents that involve the minor medical treatment and/or evaluation by medical professionals.*** ***No incidents were reported for the entire year. Perfect safety record. The acceptable target was met.***
Summary of Assessment Results	**The lack of accidents is critically important both for a student safety aspect as well as institutional liability. Safety should be a culture that is emphasized from the introductory courses to the senior level courses. The chemistry major and exposure to chemicals has inherit risk that must be addressed to prepare students for the future workplace settings. Our data indicates strong success in this area.**
Use of Results and Reflection	*Laboratory safety is a critically important component to a chemistry major. Simulations and online learning environments propose significant challenges in effectively teaching proper safety skills.*

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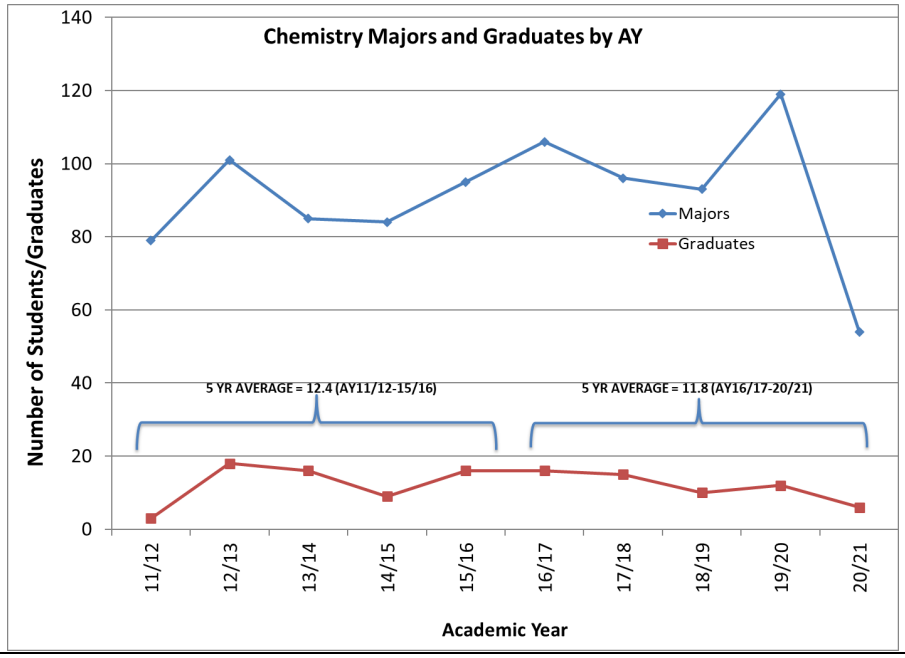
Program Reflection and Summary	

We recognize the typical student majoring in chemistry continues to evolve as our incoming students have different learned skill sets. Math and critical thinking skills in the freshman level courses are significantly weaker than 10 years ago. Fewer students are pursing science teaching due to lower career salary opportunities. This lead to the elimination of the Science Education major in prior years. More of our majors are pursing Pre-Professional paths to enter Professional Programs like Medical School or Pharmacy School. These students are very focused on their admittance goals. We continue to be challenged by the lack of student preparation for the average student entering in our CHEM-1315 (General Chemistry I). This decrease in feeder students for our major is our number 1 obstacle for program growth. Our average ACT for this course varies between 20 and 22 which is far below the national average of a chemistry major. We are generating student success with a sustained number of chemistry graduates as the overall undergraduate student population has decreased. The decrease in traditional face-to-face courses enrollment is even steeper and the chemistry program currently offers no online courses (outside of COVID). We are definitely experiencing a current downward trend in our number of majors (see graphic below). Our greatest challenge continues to be dealing with the shifting student population towards online learnings. We also must continue to place a critical role on departmental recruiting to attract majors from within the university and external outreach.



APPENDIX
for
CHEMISTRY REPORT AY2021

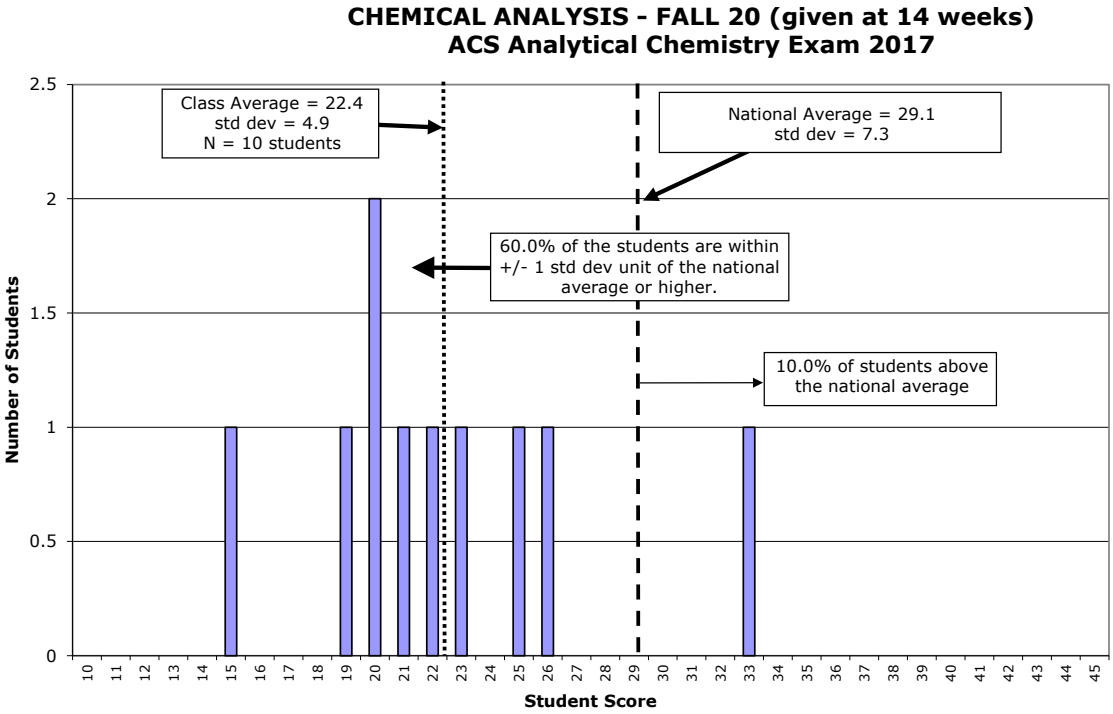


Figure 1. ACS exam for CHEM-3425 Fall 20.

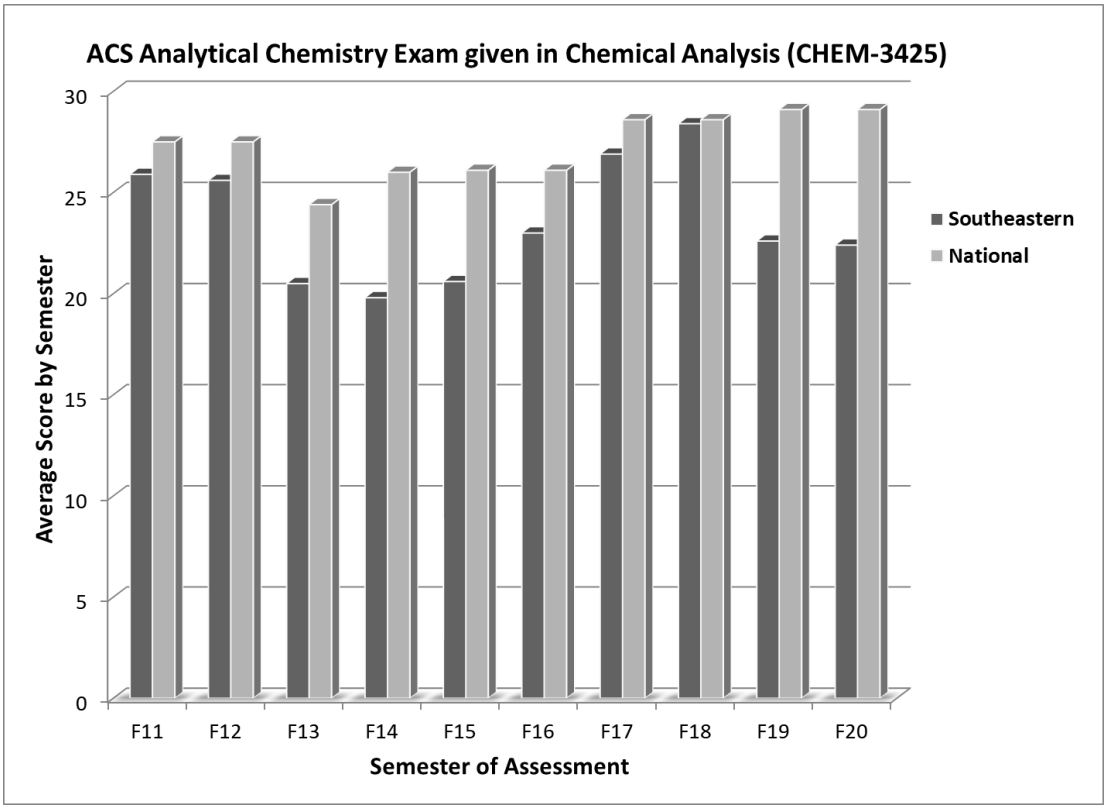


Figure 2. Historical ACS exam data for CHEM-3425.

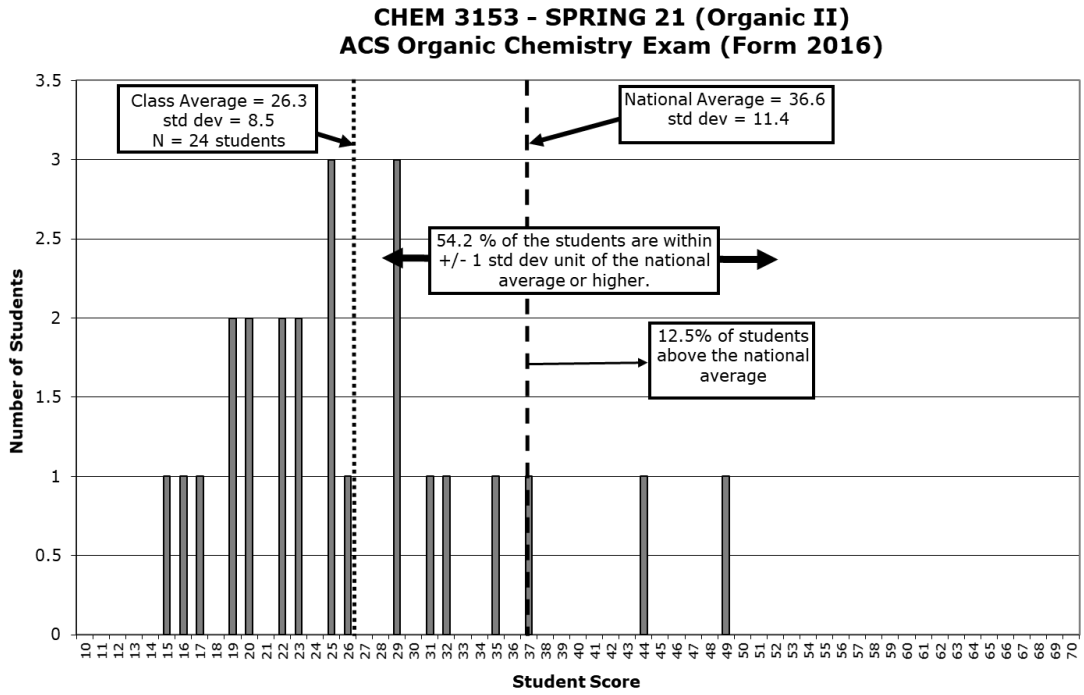


Figure 3. ACS exam for CHEM-3153 in Spr 21.

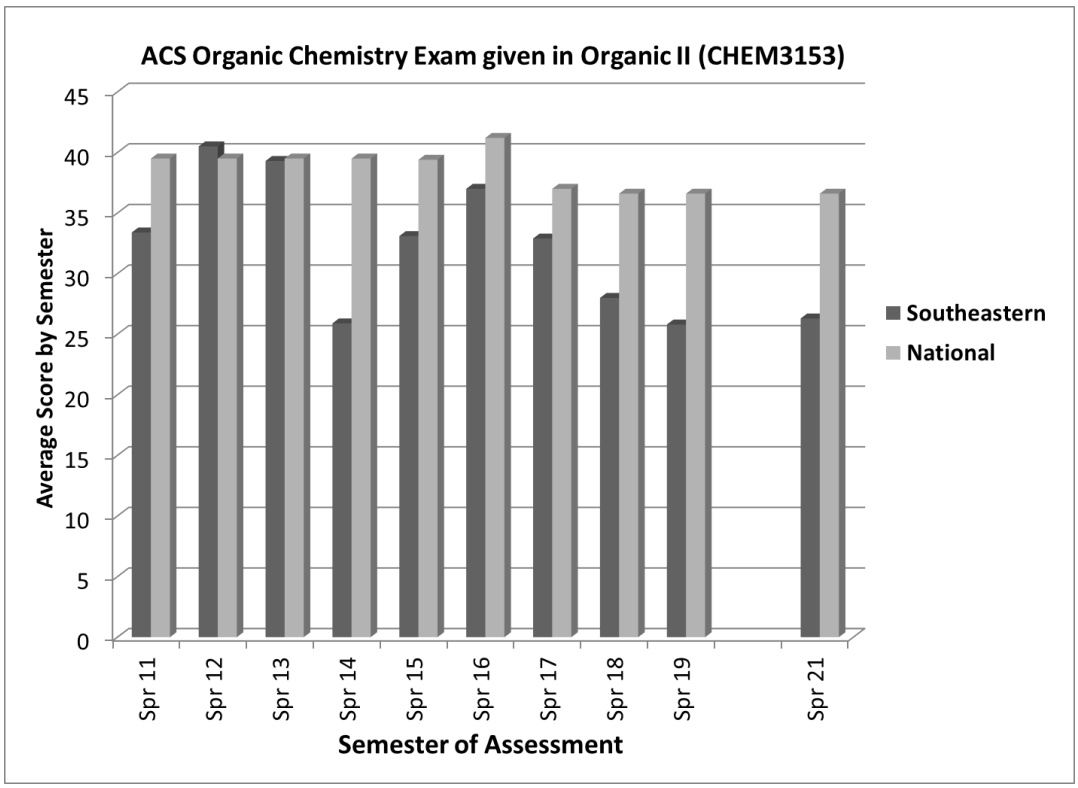


Figure 4. Historical ACS exam performance in CHEM-3153 (Organic II).

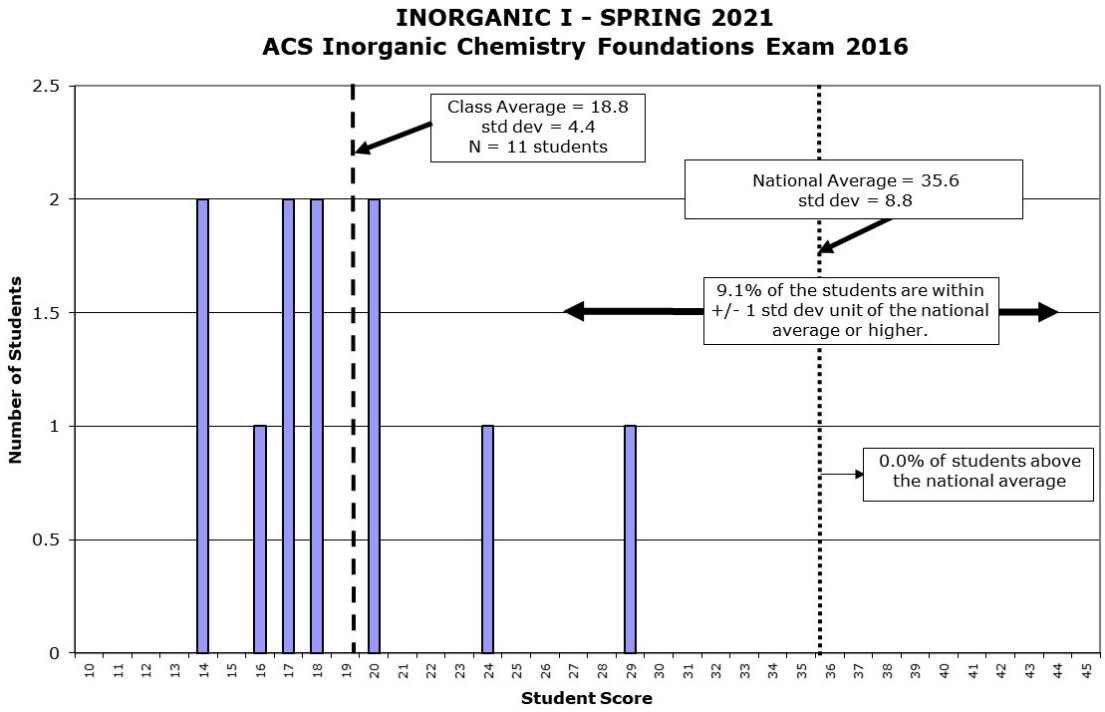


Figure 5. ACS exam performance in CHEM-2113 (Inorganic Chemistry I) in Spr21.

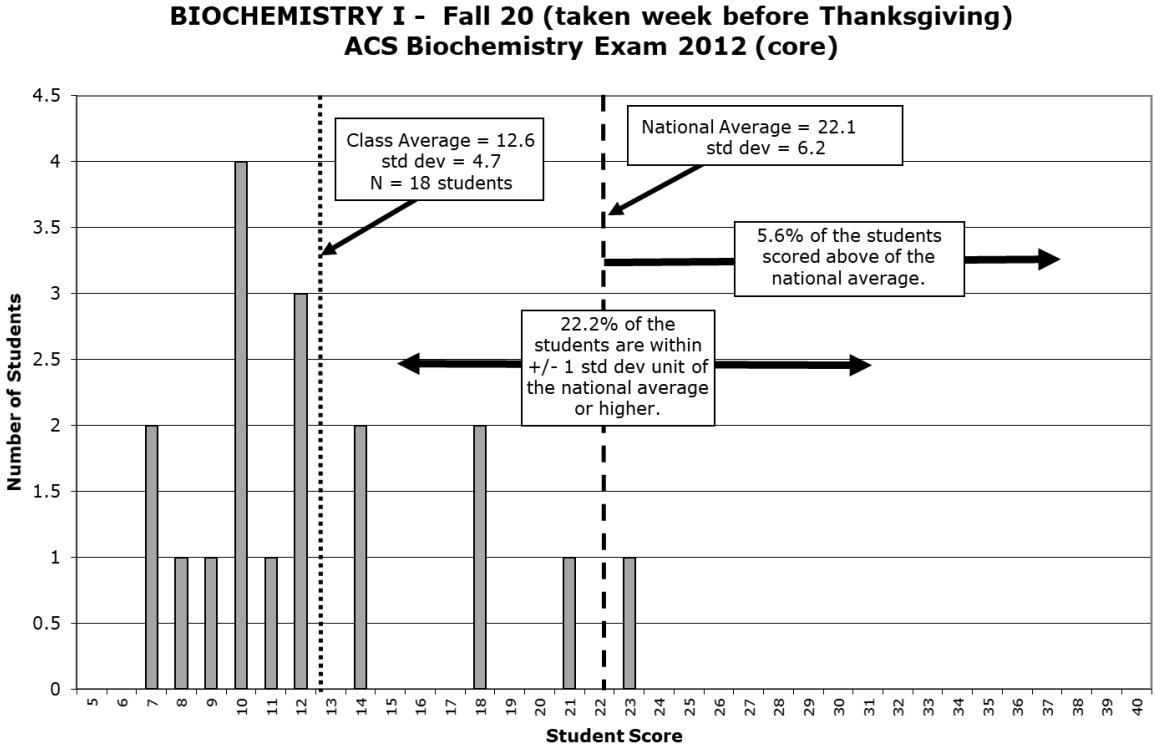


Figure 6. ACS exam performance in CHEM-4115 (Biochemistry I) in Fall 20.

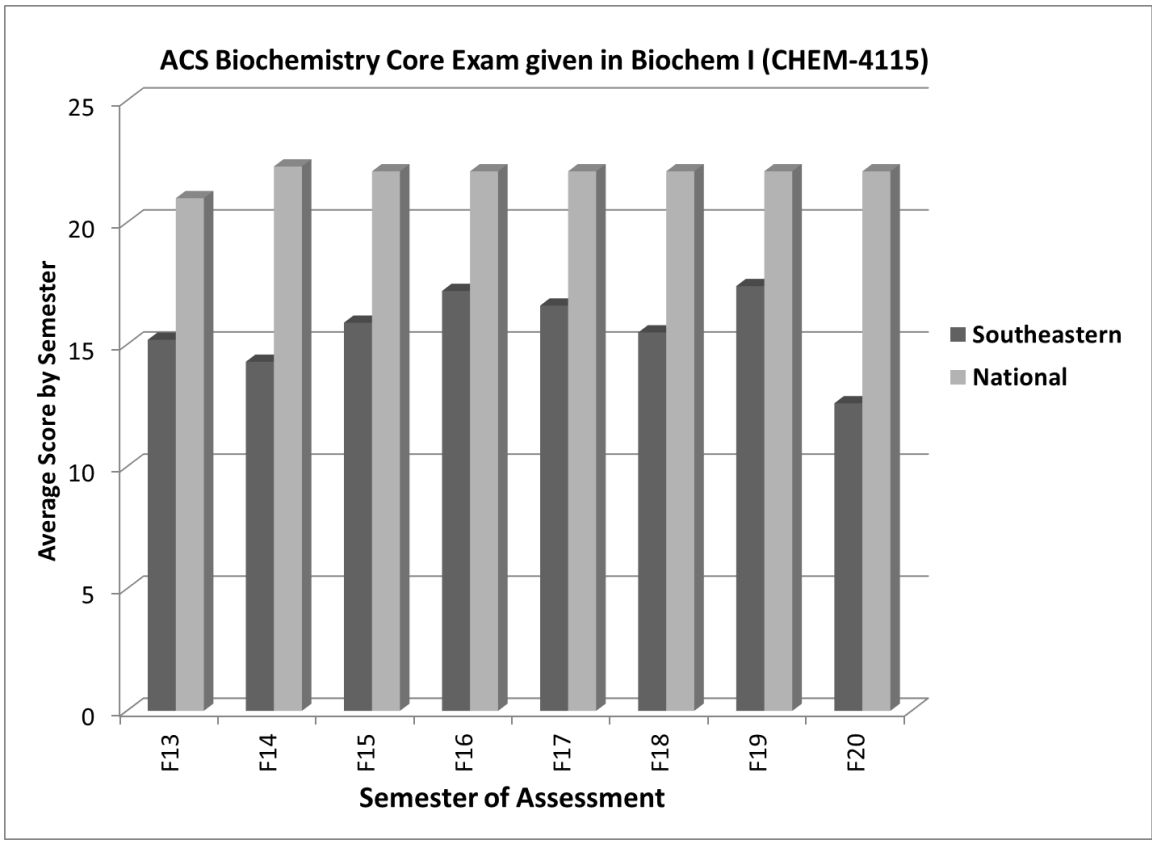


Figure 7. Historical ACS exam performance in CHEM-4115 (Biochemistry I).

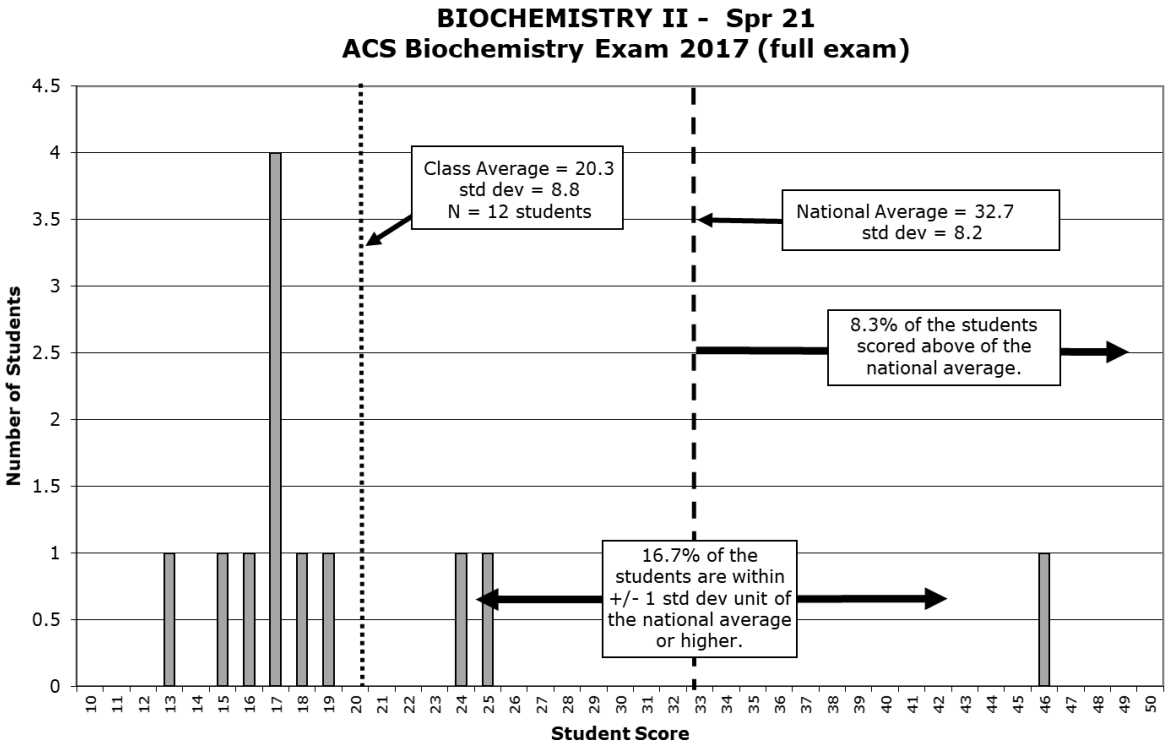


Figure 8. ACS exam performance in CHEM-4193 (Biochemistry II) in Spr 21.

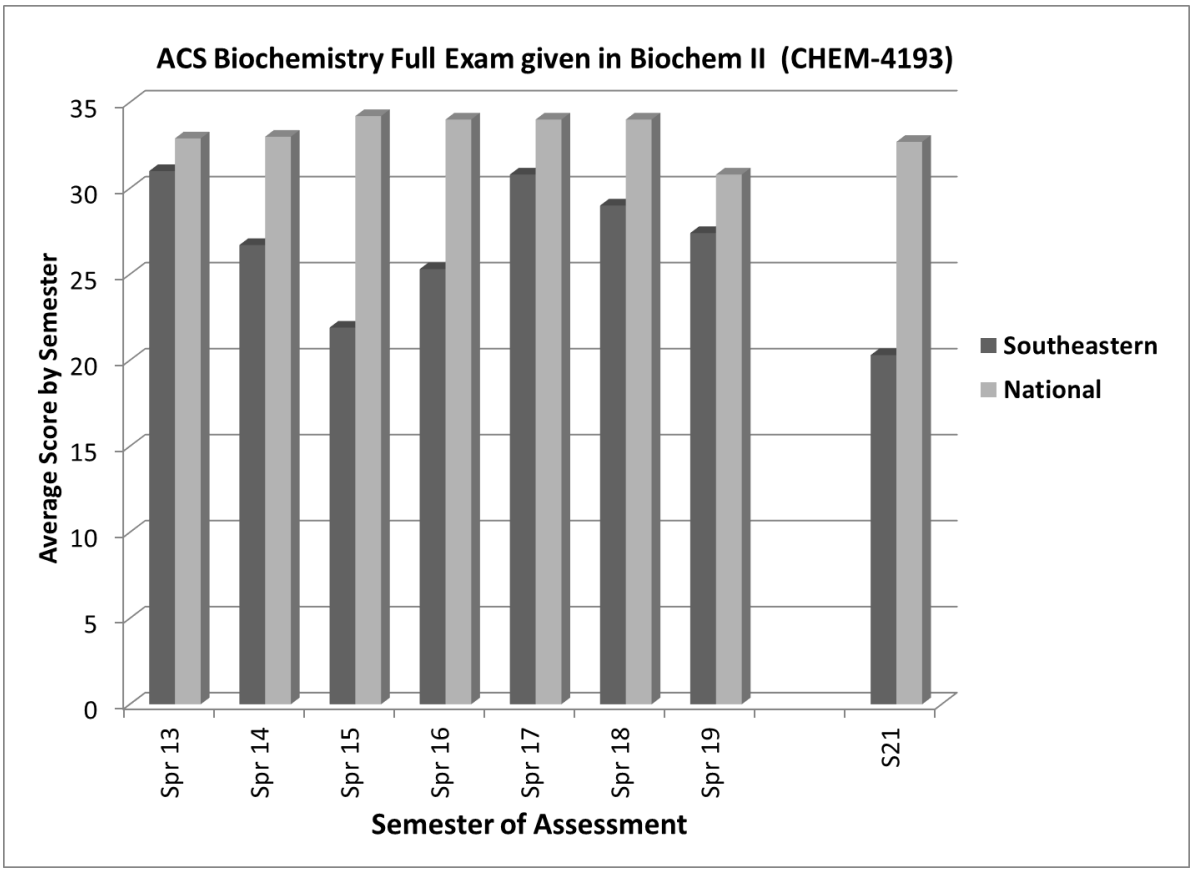


Figure 9. Historical ACS exam performance in CHEM-4115 (Biochemistry I).

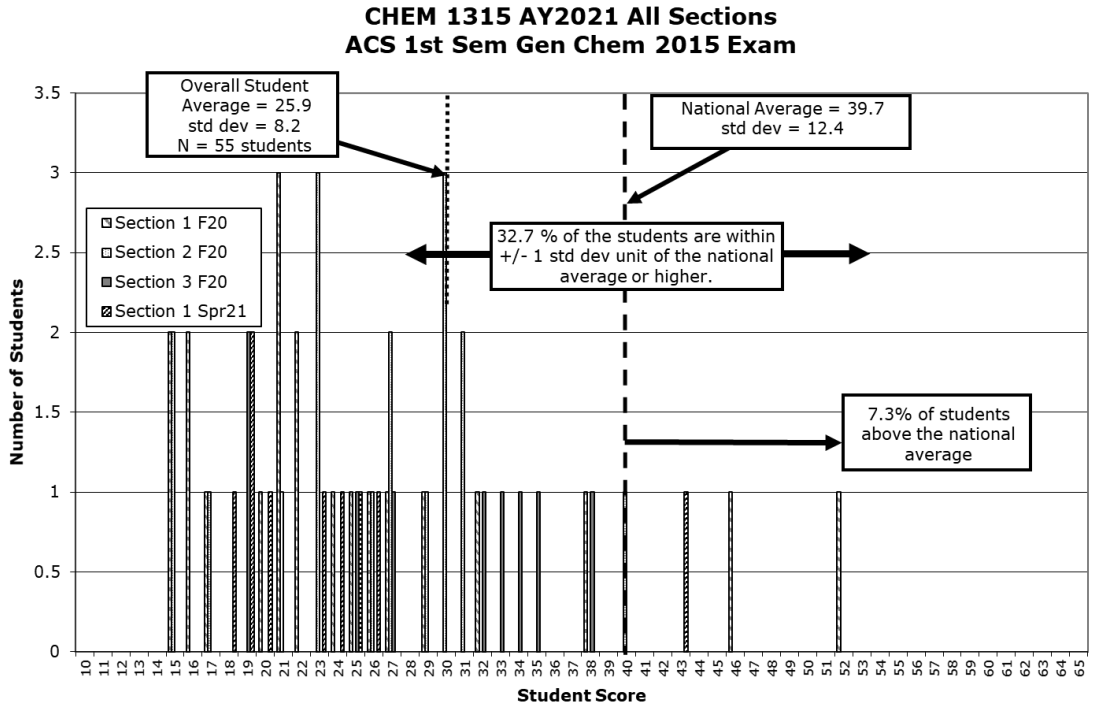


Figure 10. ACS exam performance in CHEM-1315 (Gen Chem I) in AY2021.

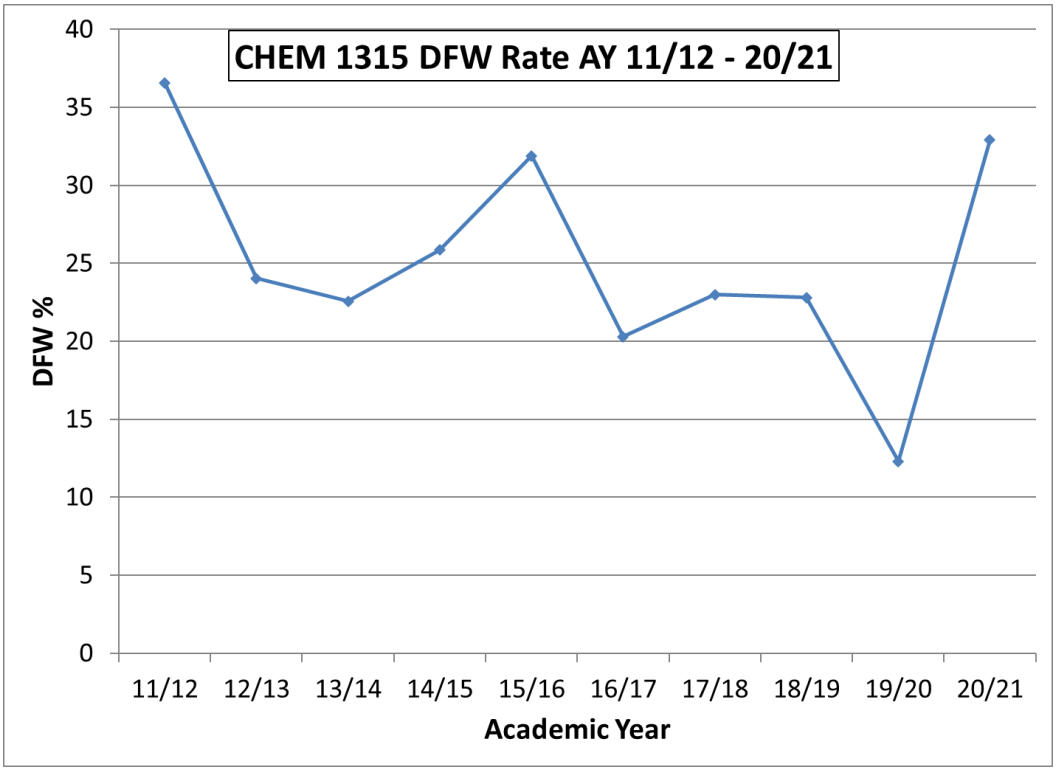


Figure 11. Historic DFW rates in CHEM-1315.

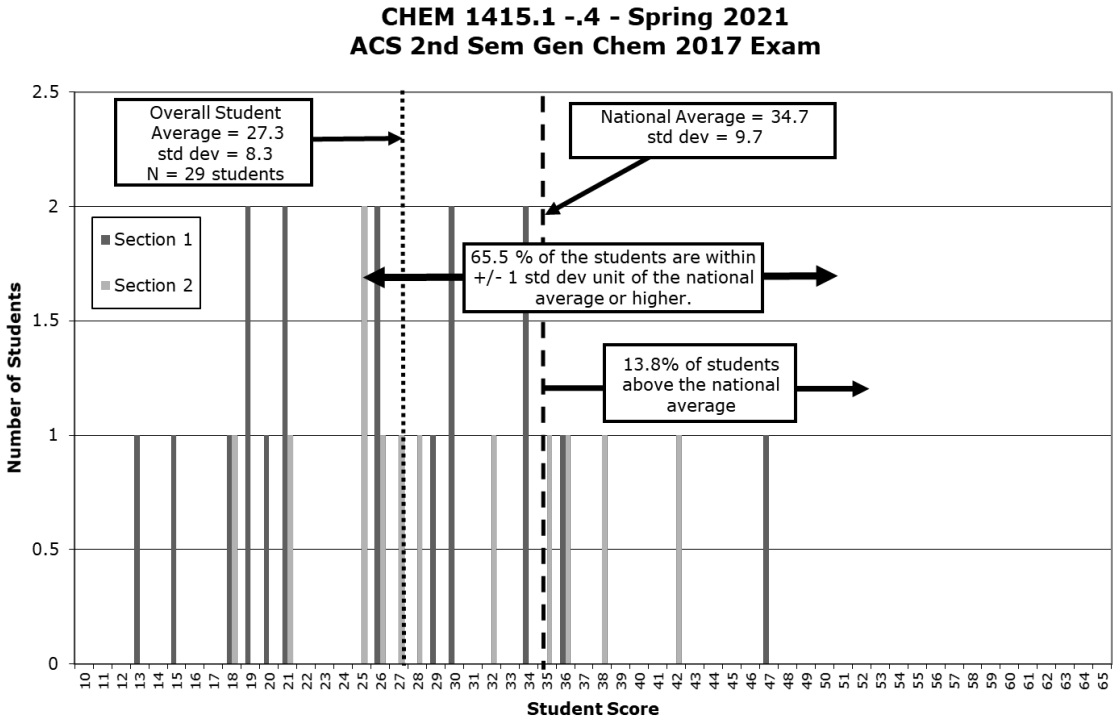


Figure 12. ACS exam performance in CHEM-1415 (Gen Chem II) in AY2021.

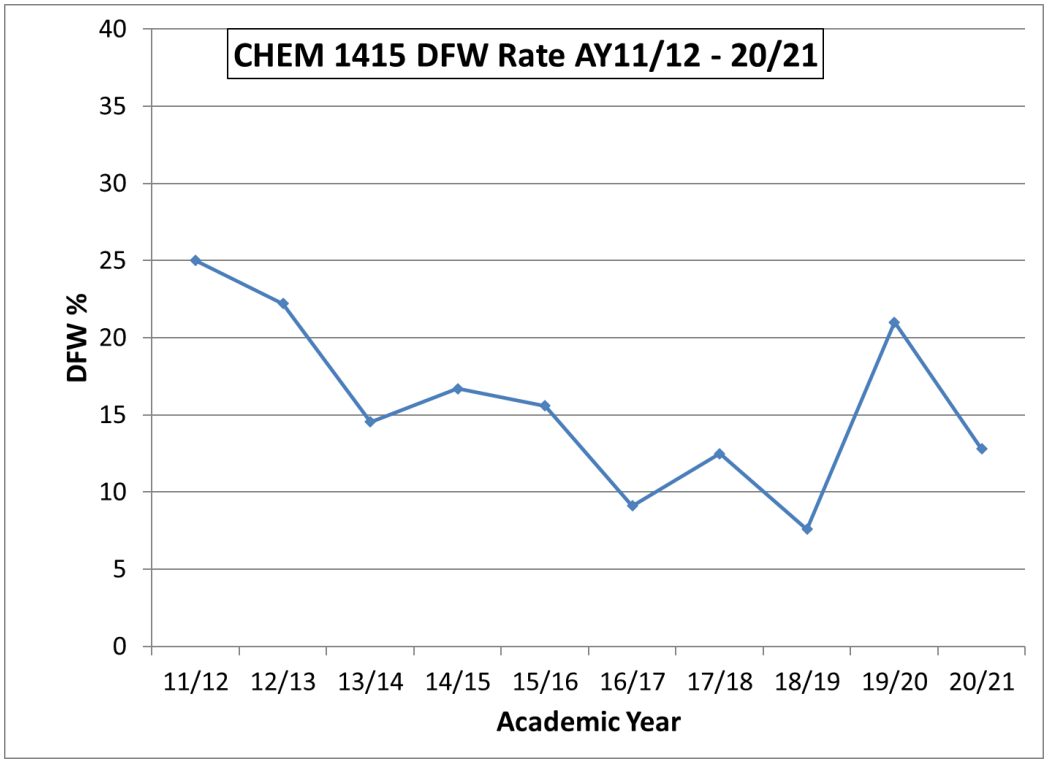


Figure 13. Historic DFW rates in CHEM-1415.

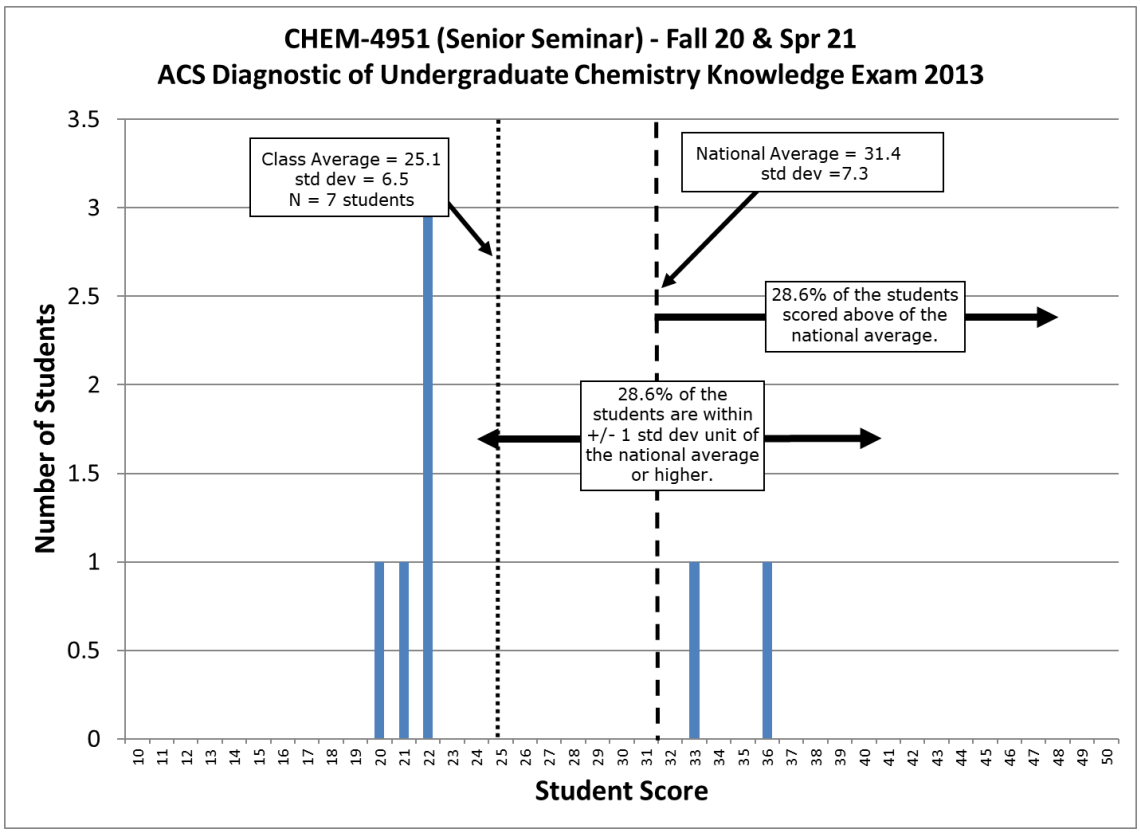


Figure 14. ACS Senior Seminar assessment exam performance in CHEM-4951 in AY20-21.

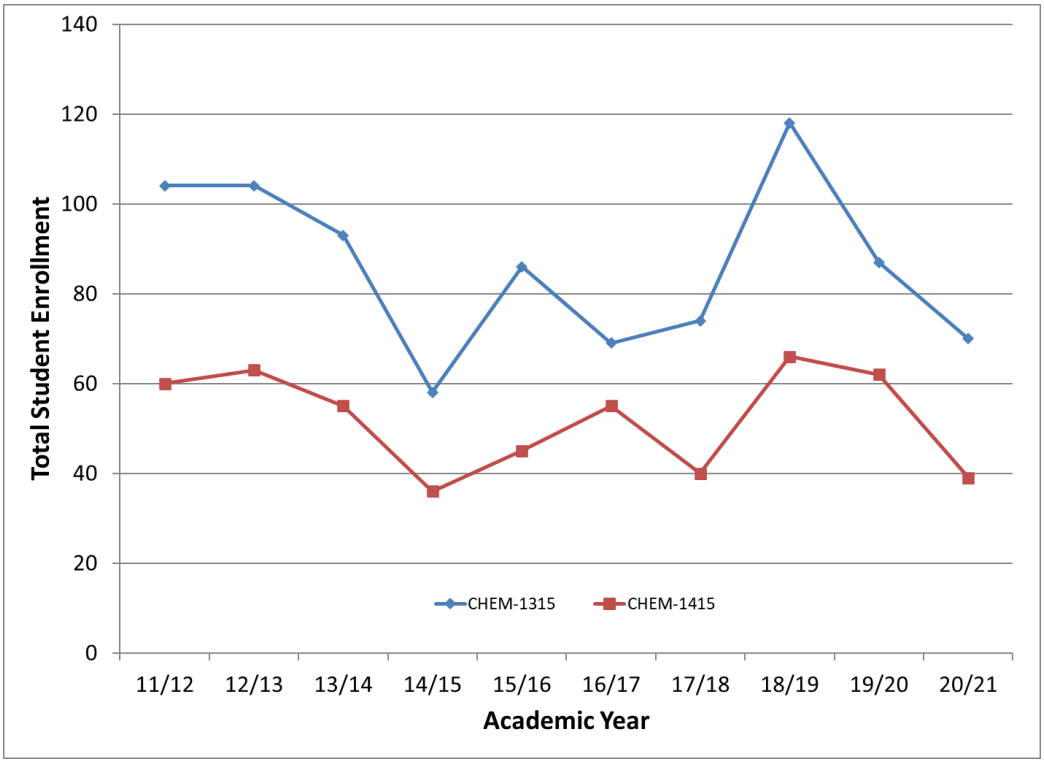


Figure 15. Historic enrollment headcounts in CHEM-1315 and -1415.

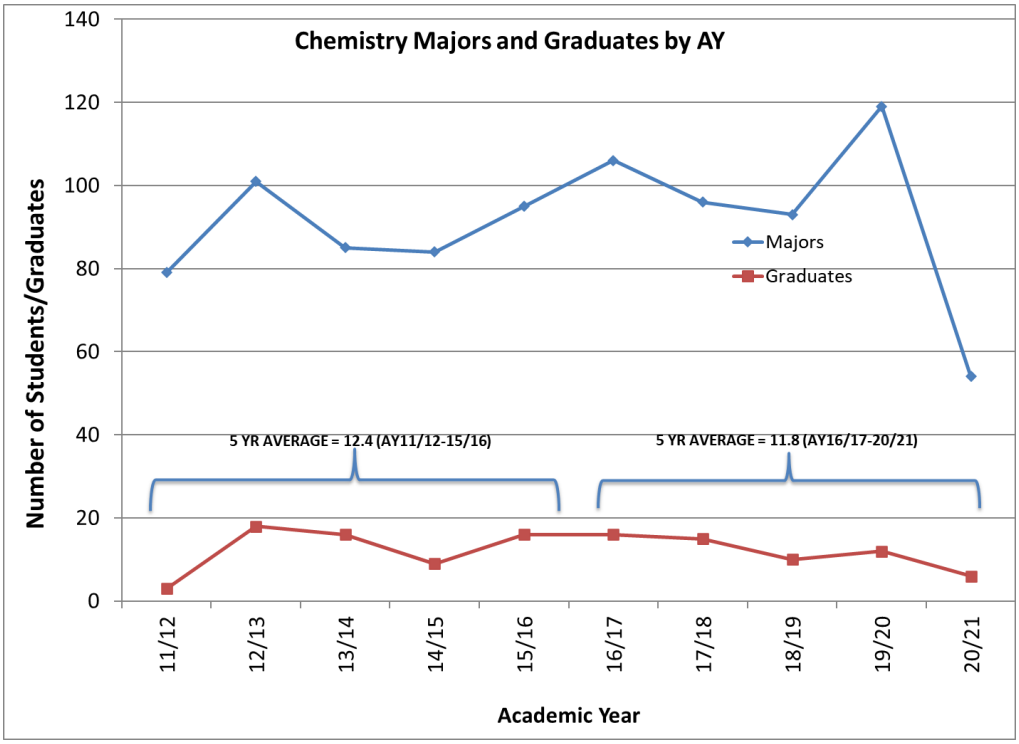


Figure X. Historic number of Chemistry majors and graduates.

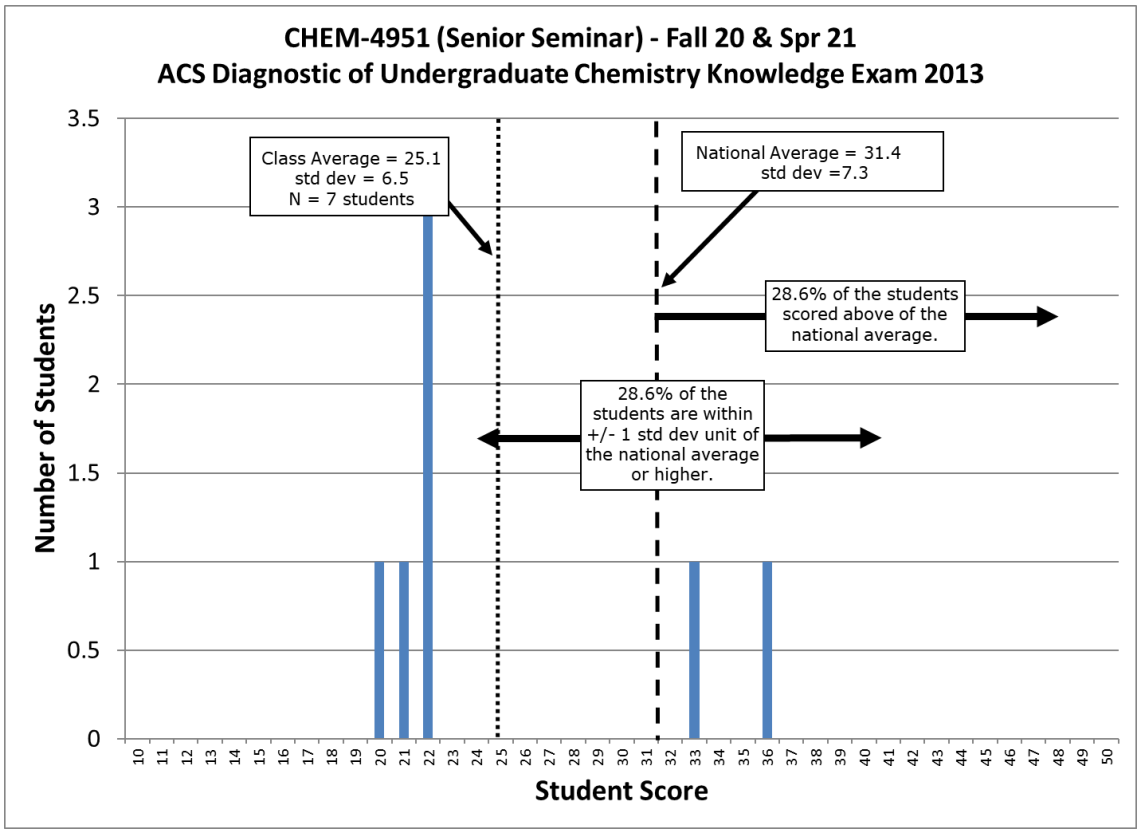


Figure X. ACS Senior Seminar assessment exam performance in CHEM-4951 in AY20-21.

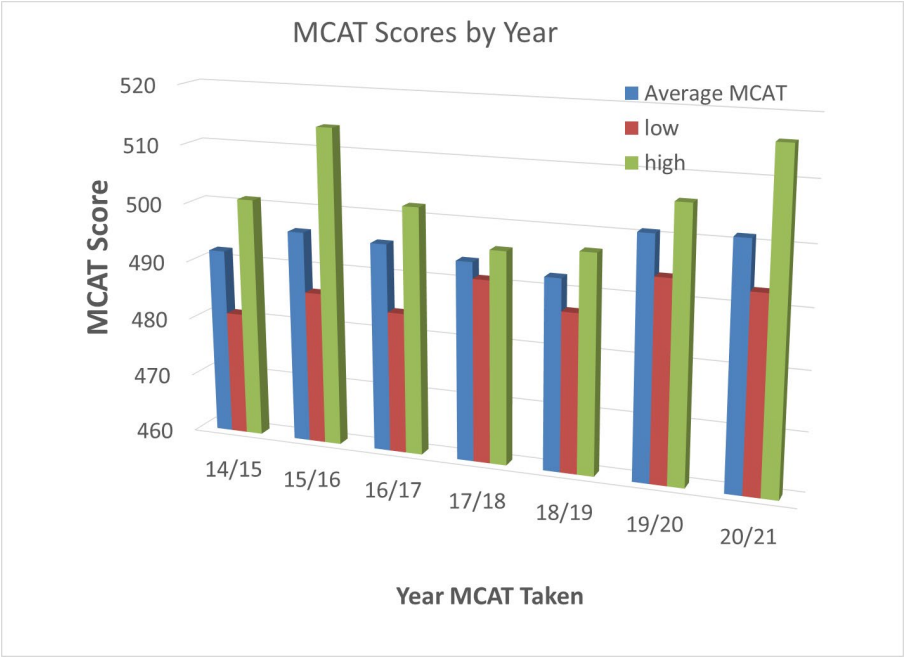


Figure 8. Variation in Composite MCAT score for SE students by year.

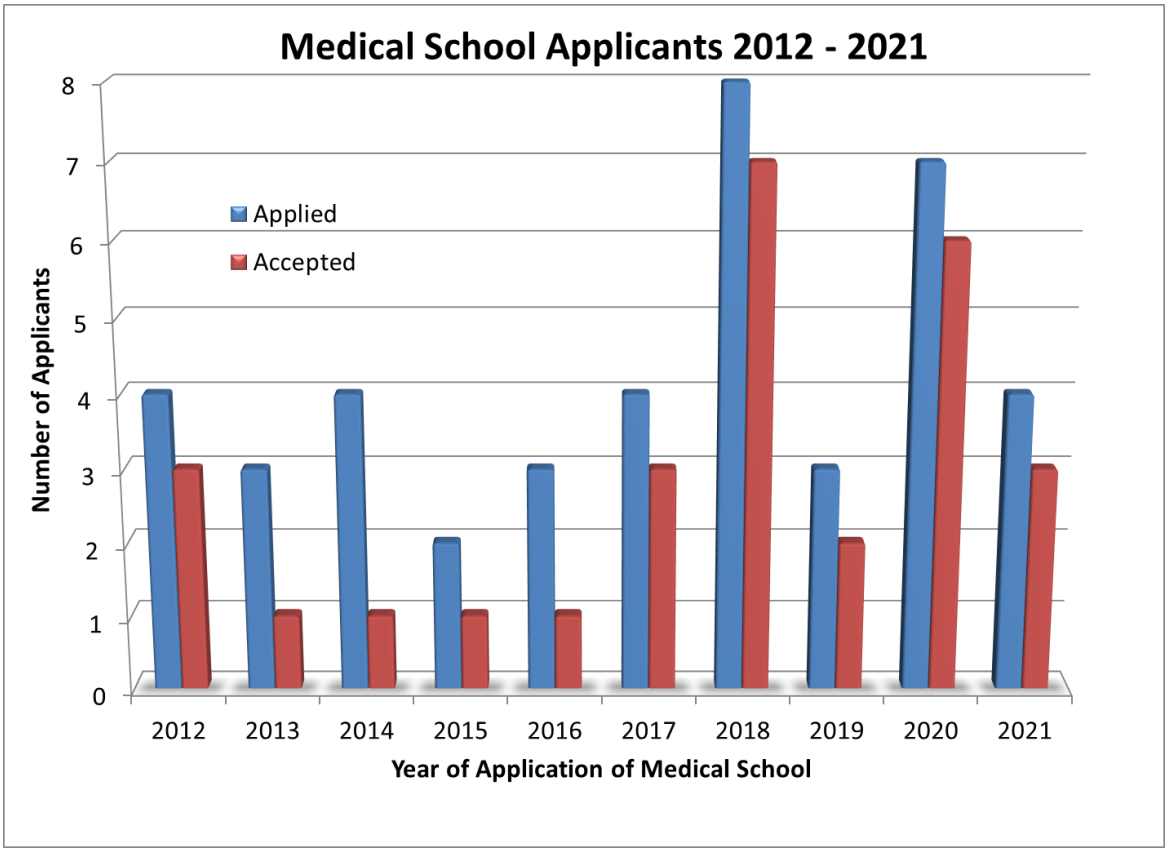


Figure 9. Medical School Applicant to Admission data by Year.

CHEMISTRY PROGRAM OUTCOMES ASSESSMENT REPORT FOR 2019-2020

Tim Smith

SOUTHEASTERN OKLAHOMA STATE UNIVERSITY

EXECUTIVE PROGRAM SUMMARY

Learning Outcome	Measure 1 (# of students assessed)	Measure 2 (# of students assessed)	Measure 3 (# of students assessed)
1	Acceptance into Graduate Programs (4)	ACS Exams (124)	MCAT Exam (5)
2	Critical Analysis of Data in Laboratory (0 – no data)		
3	Senior Seminar Presentations (12)		
4	Student Presentations (0 – no data)		
5	Student Research (no research due to COVID)	Group Clicker Responses (no data)	
6	Safety in Lab Final Exam for CHEM-3425 (18)	Reported Laboratory Incidents	

In general, we feel that our students are achieving their academic goals and showing acceptable target results are met for most of our assessment outcomes. We realize we may have set the targets too high for some courses including the introductory level (CHEM-1315/1415) where many students realize they are not going to be chemistry majors. In general scores this were very similar to those in previous years although the data is limited by Covid. Again, we have strong data to show that the students appear to be getting accepted into desired secondary programs and proceed into their future careers.

We don't have any major changes to propose at this time based on our data. We do acknowledge that some Learning Outcomes need additional measures to better verify the findings.

PROGRAM OUTCOMES ASSESSMENT REPORT	
Department: Chemistry, Computer, and Physical Sciences	
Degree Program: Chemistry	
Report Submitted By: Dr. Tim Smith	**Date of Submission:**
Program Mission Statement: The Department of Chemistry, Computer and Physical Sciences is dedicated to preparing its students to face the challenges and take advantage of the opportunities of the 21st century in an expanding global community by providing excellence in teaching, outstanding academic programs, and relevant research opportunities.	
Goal 1: Prepare students for career opportunities in business, industry, and government not just in the U.S. but around the globe.	
Student Learning Outcome 1	Demonstrate knowledge of chemical concepts, laws, theories, and the ability to use process skills in chemistry through observation, measurement, classification, inference, interpretation, and experimentation (including controlling variables, graphing, and communication).
Acceptance Rate into Graduate and Professional Programs	***The chemistry program serves as a major for students entering a variety of professional programs and graduate programs. Include Medical School, Dental School, Pharmacy School, Optometry School as well as other professional programs.*** ***Four (4) of the four (4) of the graduates that applied to graduate or professional got accepted on their first attempt. We are not reporting students that reapplied or took a gap year to refine their application. This represents 100% admittance percentage. (all AY1920 graduates – 12 students)*** ***The acceptable/ideal target is for 50% of the Chemistry majors applying to a graduate or professional program to be accepted. Target greatly exceeded.*** ***1. Four students applied and where accepted in Doctoral Medical programs. One at the University of Oklahoma Health Science Center, two at Oklahoma State University College of Medicine, and one at the University of Arkansas College of Medicine.***
ACS Exam in Analytical Chemistry	***Every student majoring in chemistry is required to take Chemical Analysis (CHEM-3425). In the lecture portion of this course the student studies the concepts, laws, and theories governing analytical chemistry. Nine (18) students took the exam in the Fall 19 as their final exam in CHEM-3425. 11.1% scored above the national average and 55.6% scored within one standard deviation unit of the national average.*** ***The acceptable target is to have 35% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. Target not met in both aspects. This cohort of students were our weakest performing group in the past 10 years as represented in the Historic plot in Fig. 2.*** ***See appendix: Figure 1. ACS Exam scores in CHEM-3425 and Figure 2. Historic CHEM-3425 exam scores.***
ACS Organic Chemistry Exams	***Every student majoring in chemistry is required to take Organic Chemistry I (CHEM 3053) and most choose Organic Chemistry II (CHEM 3153) as one of their electives – which is required in 3 of the 4 options for the Chemistry major. In the lecture portion of this two semester sequence in Organic, the student studies the concepts, laws, mechanisms, and theories governing organic chemistry.***

	The acceptable target is to have 25% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. ***In the Fall 19, thirty (30) students in CHEM-3053 took the ACS First term Organic Chemistry Exam as their final exam. Only 3.3% of the students exceeded the national average and 26.7% scored within one standard deviation unit of the national average. In the Spring 20, the ACS exam could not be given in CHEM-3153 since the delivery was online. This national copyrighted instrument expressly profits the distribution in an online setting and must be given in a controlled environment. This data are shown graphically in Figure 3-5.*** ***Target was not met in the Fall 19. These are very aggressive targets for typically second year chemistry students. However, this cohort scored at the lower than any group in the past 5 years. This was Dr. Zhang's first year to teach the organic chemistry sequence.***
ACS Exam in Inorganic Chemistry	***CHEM 2113 offers fundamental knowledge of Inorganic Chemistry to the students who completed CHEM 1214 or 1415 with a grade of C or better. Students should sit for a comprehensive exam prepared by the American Chemical Society (ACS) as their final exam.*** ***ACS Inorganic Chemistry Foundation Exam-2016 was planned as the assestment instrument for CHEM 2113 in the Spring 20 semester. Due to COVID the course was switched to online after Spring Break and that instrument could not be given online. NO DATA AVAILABLE.***
ACS Biochemistry Exam Biochemistry I	***Biochemistry I (CHEM-4115) is a Fall chemistry course available only to students who have passed Organic Chemistry I with a grade of C or better. While approximately 50% or more of the students take Organic and General Chemistry at SE, a large percentage take their prerequisite chemistry courses at another institution. CHEM-4115 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Sciences and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry minors, especially combined with a Biology major. Biochemistry I is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry I includes coverage of the basic building blocks of proteins and cells, their functions and nomenclature, simple biochemical calculations (including kinetics) and data interpretation. The course contains a 4-hour laboratory weekly component to provide an introduction to basic biochemical laboratory techniques and to re-enforce lecture concepts.*** ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester and therefore cover broader material in the single semester. For years in CHEM 4115, students were asked to answer only the ACS exam questions covered in the Biochemistry I course, since many of the questions relate to the follow-up Biochemistry II course at SE.*** ***Beginning in Fall 2012, CHEM 4115 students were asked to answer all questions on the 2 semester exam, and their scores were compared with the national norms available for student in 1-semester courses. The scores obtained by the students served as their Final Exam grade, at 10% of their overall grade, and had a direct impact on their final grade unlike some previous years. The weight is relatively low, and several students did not have to do very well to keep the overall grade earned on the other 90% of the grade, so the students were not highly motivated to do well on the ACS exam. The student scores in CHEM-4115 are also compared with the national averages for only the "core 40" questions as recommended by ACS. The coverage of Biochemistry I is not designed to match the "40 Core" question content, but the students do very well on the 20 "non-core" questions because they emphasize techniques and content covered in CHEM 4115. The "core 40"scoring is not used on any other current ACS subject exams.*** ***Nine (9) students took the ACS Biochemistry Exam in the Fall 19. This data is displayed in a Figure 5 in the Appendix. The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** ***One target was met in Fall 19 with 67% scoring with one standard deviation unit of the national average, but only 11% scored at or above the national average. .***

ACS Biochemistry Exam Biochemistry II	***Biochemistry II (CHEM-4193) is a Spring chemistry course available only to students who have passed Biochemistry I with a grade of C or better. (The course is cross-listed as CHEM-4193: Biochemistry II and BIOL-4193: Metabolism.) Typically approximately 50% of the students who take Biochemistry I will continue on to take Biochemistry II. CHEM-4193 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Science and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry and Biology minors. This course is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry II includes coverage of the basic knowledge of common anabolic and catabolic pathways, the regulation of these pathways, and their relation to energy production or human diseases. Pathways covered include the breakdown and synthesis of carbohydrates, amino acids, lipids, and nucleotides. The course also includes an introduction to basic biochemical methodology and techniques for determining the nature of these pathways and to illustrate the relevance of biochemistry to everyday life and medicine.*** ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester. It provides different norms for 1-semester and 2-semester courses, but uses only 40 of the 60 questions for the 1-semester courses. Beginning in Spring 2013, CHEM 4193 students were asked to answer all questions on the 2 semester exam (rather than just the questions covered in BiochemistryII/Metabolism), and their scores were compared with the national norms available for student in 2-semester courses.*** ***ACS Biochemistry Foundation Exam-2016 was planned as the assestment instrument for CHEM 4115 in the Spring 20 semester. Due to COVID the course was switched to online after Spring Break and that instrument could not be given online.*** ***NO DATA AVAILABLE.***
ACS First Semester General Chemistry Exam in CHEM-1315	***General Chemistry I (CHEM-1315) is the highest of the three levels of first-semester chemistry courses offered at SE. This course is commonly referred to as "Majors/Pre-Professional Chemistry". CHEM-1315 is the entry point for students who will major in Chemistry and Medical Sciences; for all students meeting general chemistry requirements for entrance into programs of advanced healthcare degrees and a Chemistry minor. It includes nomenclature, atomic and molecular structure, stoichiometry, bonding, states of matter, thermochemistry, acids and bases, and gas laws. The course contains a 4-hour laboratory weekly component. At the beginning of the present decade we came to recognize the importance of assessing student learning not only in the junior and senior level courses, but also in the freshman level Chemistry courses as well. As a part of this, each student in CHEM-1315 has been required to take the American Chemical Society First-Semester General Chemistry Exam starting in Fall 2011. This exam tests the student's knowledge of both theoretical and experimental first semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** ***During the Fall 2019, a total of sixty-four (64) students took the exam. 50.0 percent of the students were within one standard deviation of the national mean or higher, which closely matches last years results. 20.3 percent of the students were above the national average, a 4 percent improvement over the previous year. Figure 6 illustrates individual student performance on this exam. One previous area of concern had been the %DWF rate for CHEM-1315. Changes in teaching assignments annually yield a different set of faculty teaching this course. Figure 7 shows the %DFW rate annually over the past 10 years for CHEM-1315 (Fall 09/10 – 19/20). DFW rates remain favorable when compared to BIOL-1404 and MATH-1513 which are typically taken by the same students.*** ***In conclusion, the acceptable target (25%) of students scoring above the national average and the acceptable target (55%) of students scoring within one standard deviation unit or***

	higher of the national average were not met but both represent continued improvements over the previous year. In the case of the 55% target, it is being approached.
ACS Second Semester General Chemistry Exam in CHEM-1415	***General Chemistry II (CHEM-1415) is the continuation course of CHEM-1315. It also serves as the prerequisite for most upper-level Chemistry courses and a prerequisite for most pre-professional programs. Success in CHEM-1415 is critical for students who will continue to major in Chemistry, Biotechnology, and Medical Sciences. CHEM-1415 emphasizes on kinetics, equilibrium, thermodynamics, electrochemistry, qualitative analysis, organic chemistry, biochemistry, and nuclear chemistry. The course also contains a 4-hour laboratory weekly component.*** ***As was the case with CHEM-1315, we have recognized the importance of assessing student learning in CHEM-1415. As a part of this assessment, each student in CHEM-1415 was required to take the American Chemical Society Second-Semester General Chemistry Exam. This exam also tests the student's knowledge of both theoretical and experimental second semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring with one standard deviation unit or higher of the national average.*** ***ACS Second semester General Chemistry exam was planned as the assestment instrument for CHEM 1415 in the Spring 20 semester. Due to COVID the course was switched to online after Spring Break and that instrument could not be given online. NO DATA AVAILABLE.***
ACS Instrumental Analysis Exam In CHEM-3525	***Instrumental Analysis (CHEM-3525) is only a required course in the Chemistry major-minor: Profession Chemist option. Historical less than 50% of the SE Chemistry majors take CHEM-3525 but that percentage has dropped to less than 25% in the past 5 years. As more majors are choosing the Medical Sciences opinion the enrollment in CHEM-3525 continues to decrease. This course has both lecture and laboratory components involving basic electronics, computer control of chemical instrumentation, spectral, electrochemical and chromatographic methods of analysis, and laboratory automation. While the lecture portion deals with the theoretical concepts of instrumentation, the laboratory portion is very similar to analytical chemistry except that more sophisticated instrumentation is used.*** ***As a part of CHEM-3525 each student is required to take the American Chemical Society Standardized Exam in Instrumental Analysis as their final exam. This exam tests the student's knowledge of both theoretical and experimental instrumental analysis. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 35% of the students scoring above the national average and/or 75% of the students scoring within one standard deviation unit or higher of the national average.*** ***ACS Instrumental Analysis exam was planned as the assestment instrument for CHEM 3525 in the Spring 20 semester. Due to COVID the course was switched to online after Spring Break and that instrument could not be given online. NO DATA AVAILABLE.***
ACS Diagnostic of Undergraduate Chemistry Knowledge Exam in CHEM-4951	***The Diagnostic of Undergraduate Chemistry Knowledge (DUCK) exam is designed to be taken at or near the end of a four-year undergraduate curriculum. This was developed by the American Chemical Society's Exams Institute and has comparative national norm data. All items on the exam are part of scenarios that require knowledge from more than one traditional area of chemistry. Thus, the performance of the student on this exam is reflective of their cumulative learning experience in the entire chemistry major. This exam is given during the capstone Chemistry Senior Seminar course, CHEM-4951. Assessment is required for all majors, even students taking Biology Senior Seminar as part of the Medical Sciences track.*** ***The acceptable target is to have 25% of the students scoring above the national average and 60% of the students scoring within one standard deviation unit or higher of the national average.*** ***For the academic year 19/20, the total of three (3) students took the ACS Diagnostic of Undergraduate Chemistry Knowledge Exam (DUCK) in the Fall 19. The exam could not be***

	given online in the Spring 20 which is when most of the students took the course (9 students). 67% of the students scored within one standard deviation unit of the national average and 67.0 % of the students scored above the national average of the Fall 19 cohort. Again this is a very limited data set. ***In conclusion, the acceptable target of 25% of students scoring above the national average was met whereas the acceptable target of 60% of students scoring within one standard deviation unit or higher of the national average was met.***
Medical College Admission Test (MCAT)	**The MCAT is a test required for admission into all medical programs, medical doctorate and osteopathic doctorate, in the U.S. The MCAT is a standardized, multiple- choice examination designed to assess the examinees' problem solving, critical thinking, writing skills, and knowledge of science concepts and principles necessary to the study of medicine. Scores are reported in Verbal Reasoning, Physical Sciences, Writing Sample, and Biological Sciences. Chemistry represents anywhere from 35 to 40% of the MCAT by subject area. Students are to have completed a minimum of 20 hours of chemistry (General and Organic Chemistry) at the point of taking the MCAT and most have more than 30 hours at this point. The MCAT is administrated by the Association of Medical Colleges and a student's performance on this critical test is made available to the pre-medical advisory committee at each undergraduate institution.** **The acceptable target is for the 50% of chemistry majors to score 492 or higher on the MCAT. A 492 represents the minimum score required to apply by medical scores in Oklahoma and Texas.** **Our combined average MCAT for 19/20 was a 500.8 for the five (5) students that took the MCAT during this period. The minimum MCAT required to apply to Oklahoma medical school (OUHSC and OSUCOM) is a 492. One hundred percent of the students scored at a level to meet the minimums to apply with individual scores 494 (26th percentile) to 506 (68th percentile. Figure 8 shows the low, high, and average MCAT in comparison to recent years at SE. This cohort was much smaller than previous samples and significantly weaker overall in that no student exceed a 495 score. The acceptable target was meet with 50% of the students scoring above a 492.** **Figure 9 illustrates the applicant to admission numbers to Medical School for the past 11 years. We are confident that recent changes made into our program have lead to stronger acceptance rates in Professional programs for our majors.**
Summary of Assessment Results	**Even with losing a good portion of our normal assessment data set due to COVID issues in the Spring 2020, we have a good number of assessment measures that provide national comparative norm data. Several of the courses meet they acceptable targets when the ACS exam was part of the student's grade (final exam). Like most programs, some individual students performed extremely well and some individuals performed poorly. By increasing the standards of "C" higher to proceed into CHEM-1415 and CHEM-3053 and using the ACS exams for our final exams, the number of low performing students is a smaller percentage compared to 10 years ago. The number of students entering graduate and professional programs strongly indicates our students are gaining the fundamental knowledge need to succeed in the major.**
Use of Results and Reflection	*One of greatest challenges continues to be dealing with the increasing number of transfer students that come in with their first one- or two-years of chemistry being completed at a junior college that does not have the level of rigor we required for freshman chemistry. While certainly some transfer students have succeeded, others have found the transition to be very difficult. We might consider the implementation of placement or leveling exams to make sure transfer students have skills needed to succeed in the upper level chemistry courses. However, if a student is forced to repeat a course that is already accepted on their transcript by a transfer agreement issues with financial aid will likely occur.*
Student Learning Outcome 2	Show competence in cognitive analysis of chemical information, recognition of organizing principles in information, and proficiency in library and computer skills in obtaining information and analyzing data.
Critical Analysis of Chemical Data	***This outcome is measured in several courses and because of its nature it is difficult to quantitatively measure. The outcome can be seen in two aspects of the department's instruction. The first is in the cognitive analysis of the student's own information collected in the laboratory portion of core and elective courses. The instructional emphasis in the***

	5-semester hour courses is forty percent on these laboratory-based competencies. Specific requirements are discussed in the paragraphs below. The second aspect of this competency is exhibited in the cognitive analysis of literature information assigned in several of the courses. Several of the 3000 and 4000 level courses include a research paper that requires that the student perform a literature search, organize key scientific information, and prepare a report and/or oral presentation. ***The acceptable target is for Organic Chemistry Laboratory (CHEM-3062/3162) is that 75% of the student will earn an A, B, or C in that course. Chemical Analysis (CHEM-3425) also has a significant laboratory component that requires critical analysis of data. The acceptable target for CHEM-3425 is that the student's average laboratory component be 70% or higher of the available points.*** ***Data not collected in AY19/20. New faculty in Organic Chemistry did not collect the necessary data.***
Critical Analysis of Chemical Data Summary of Assessment Results	**This learning outcome is one of the harder to quantify. Overall student performance in the selected courses demonstrate an acceptable skill set for processing chemical information. It should be noted that all of the students being evaluated are beyond freshman status and many are juniors or seniors by credit hours. These students have frequently developed a strong cognitive analysis skill set due to the complex nature of the CHEM-3000 and -4000 courses.**
Use of Results and Reflection	*These findings illustrate a strength of our students. Our chemistry majors take significantly more lab courses (and hours) than chemistry majors at other institutions in the state and nationally. The increased lab exposure leads to increased student success.*
Student Learning Outcome 3	Demonstrate skill in the synthesis of information by preparing and presenting reports, proposing plans or sets of operations, and/or making derivations of abstract relations.
Senior Seminar Presentations	***These outcomes are assessed in several of our advanced chemistry courses where students are required to write up detailed laboratory reports using both library and computer skills. However, every student taking Senior Seminar is required to do a research project which requires them to use library resources, organize and present their findings in both a poster presentation, a written report, and an oral presentation. It is important to note that while chemistry majors and chemistry major-minor students must take the Chemistry Senior Seminar, some of the interdisciplinary double majors (chemistry-biology) opt to take the Biology Senior Seminar and, therefore, do not appear in the statistics. The chart below shows the number of students who have manifested the proficiencies of Outcomes 2 and 3 in Senior Seminar during the past eight years. The papers are peer-reviewed before either presentation or publication. The chemistry faculty evaluates the poster presentations, the oral reports, and the written reports. The evaluations are used in assigning a grade for each individual student's performance. Generally, it can be said that the chemistry faculty believes that the students' performances on their presentations and reports met the requirements of Outcomes 2 and 3. Since students in the Biology Senior Seminar have to met similar requirements as those in chemistry, it seems reasonable to assume that the interdisciplinary Medical Sciences majors also met the requirements of Outcomes 2 and 3 as well.*** ***The acceptable target is that 80% of all graduating chemistry majors produce an acceptable senior seminar presentation.*** ***For the academic year 19/20, the number of graduating students were 12. All students demonstrated satisfactory skills in the synthesis of information in their projects and no repeats were required in the Seminar Course (CHEM-4951 or BIOL-4981). The acceptable target was exceeded.***
Summary of Assessment Results	**The track record for students taking our CHEM-4951 remains strong. Rarely do students have to repeat presentations due to a lack of performance. We do have a variable number of students that course the Medical Sciences option that take the Biology Seminar course (BIOL-4981) in lieu of our CHEM-4951 in order to fulfill hour requirements.**

Use of Results and Reflection	*Target is greatly exceeded. Several upper level chemistry courses also require reports and presentations as part of their normal course expectations. Data was not collected for courses other than CHEM-4951.*

Student Learning Outcome 4	Exhibit intellectual honesty, open- mindedness, and objectivity in the accumulation and interpretation of information and form value judgments on ethical issues in the conduct of chemistry and the applications of chemistry in society.
Student Presentation and Publications	**The acceptance of papers for presentation and publication not only demonstrates the students' skills in synthesis of information but also supports the first part of this competency as well. Without the qualities of intellectual honesty, open mindedness, and objectivity they would not be accepted. The same can be said for the students' performance at state, regional and national meetings where they deliver poster and platform presentations.** **The acceptable target is 30% of graduating students perform a student presentation or publications at local, state, or national conferences each year.** **All of the conferences and meetings our students planned to participate in for the AY1920 were canceled due to COVID in 2020. No data collect for this outcome.**
Summary of Assessment Results	**No data collect for this outcome.**
Use of Results and Reflection	
Student Learning Outcome 5	Show interpersonal skills that promote the accomplishment of team goals in small groups.
Student participation in research	***The Department of Chemistry, Computer, and Physical Sciences has historically had active research groups. These groups involve chemistry students and faculty who conduct original research, most of which is funded by external grants from places such as the National Institutes of Health (NIH) OKINBRE, the Oklahoma Center for the Advancement of Science (OCAST), National Science Foundation Oklahoma EPSCoR, and the National Aeronautics and Space Administration (NASA) Oklahoma Space Grant and EPSCoR.*** ***During the research process students typically work in teams under the direction of a faculty advisor. The students are intimately involved in accumulating, interpreting, and analyzing information acquired from the experiments they perform. They are required to make value judgments on the validity of the information and experimental processes. In addition, they must be completely open and honest in the collecting and sharing of information with other team members in their respective research group. While not all student researchers enroll in CHEM4990 (Research), any student seeking course credit for research must prepare a written research report explaining what they did, why and how they did it, what their results meant, and also acknowledging any input from other fellow researchers. Some students work as paid summer research interns off campus, and learn to work with other students, postdocs, technicians, and PhD researchers in a fulltime laboratory environment to try to answer very specific research questions, while also writing reports and earning CHEM4990 Research course credit. Not all but many of these student researchers contribute to a public presentation of the research team's results, most commonly in poster format. Our American Chemical Society student chapter (composed of a variety of science majors) also worked together in small groups to accomplish many projects, and also presented a summary of their activities in poster format at their national professional meeting.*** ***The participation in research is done at the discretion of the student. Both chemistry major minor tracks (Professional Chemist and Biochemical Technology) require a research for***

	credit (CHEM4490 24 hours). Students may choose to do this during the academic year or over the summer semester. Opportunities for research exist on the SE campus and at off campus sites. ***The acceptable target is that 50% of all chemistry majors participate in some organized semester long research activity.*** ***In AY 1920, we had only had three (3) students enroll in either CHEM4990 Research in Fall, Spring and/or Summer semesters. This number is muchlower than in recent years, and is falls well short of 80% of the total number of people participating in CHEM Senior Seminar and therefore does not meet the acceptable target.***
Group Student Participation With Clicker Questions	***Some of the chemistry courses utilize student response systems (aka Clickers) to gain real time student input over lecture materials. General Chemistry I (CHEM-1315), and Chemical Analysis (CHEM-3425) are such classes in which the student responses given as daily assessment count towards they students course grade. Student responses are most commonly given as individual questions in which a student formulates their response individually. In an effort to promote peer learning in the classroom, students are also given the opportunity to work the problem in small groups of 4 or less. Each student still responds individually after the group discussion on the assessment question. Ideally if peer learning is effective, the student performance should increase with the group responses.*** ***The acceptable target is that there is a positive impact on the group response clickers compared to the individual response clickers. Also the group responses should exceed 80% correct.*** ***Data no collected in the Fall 19 due to flex (hybrid) format teaching.***
Summary of Assessment Results	
Use of Results and Reflection	
Student Learning Outcome 6	Show the ability to anticipate, recognize, and respond appropriately to laboratory hazards or hazardous conditions, and take appropriate safety precautions.
Laboratory Safety	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean of Students and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures.*** ***Instruction on proper safety procedures is provided weekly to every student in every laboratory. The instructors always include relevant instruction at the beginning of every laboratory activity. Students who fail to adhere to the guidelines on any particular activity are immediately corrected in lab and may be dismissed for continuing to ignore those instructions. During the course of the work in the laboratory there are specific requirements for the disposal of excess reagents, waste, or by- products of the chemical operations and the final product. Even "simple" actions such as smelling a chemical vapor, transferring a chemical reagent, weighing a chemical material, storing a chemical product, transporting a chemical material, or reacting to a small chemical spill have prescribed protocols for responses which the students must learn and follow. Besides safety goggles, the students are instructed to wear close-toed shoes and long shorts or pants and to NOT wear contact lenses in the laboratory. The students learn to work in a state of safety consciousness. Some measure of the success of this approach is the lack of any report of any safety violation in the past year. A better measure is the overall safe environment of the majority of laboratory areas which would not be possible if left entirely to the faculty and staff alone.*** ***A laboratory final exam in Chemical Analysis (CHEM-3425) is given at the end the semester Fall semester courses. The lab finals both include fundamental safety questions. The***

	acceptable target is that students performance should exceed 65% on all safety related lab final questions. ***Dr. Smith gave 6 safety assessment questions in his lab final exam in Chemical Analysis (CHEM3425) in Fall 19. All eighteen (18) students enrolled in CHEM-3425 took this assessment. The average student performance on the safety component of the lab final was 5.12/6 correct or (85.3%). The acceptable target on Laboratory Safety was met.***
Reported Laboratory Incidents in Academic Year	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures. Any incidents involving students are reported to Mr. John Williams (Chemical Stockroom Supervisor) who writes and files an incident report. A copy of the incident report is forward to the department chair.*** ***The acceptable target is that no major accidents occur that involve medical treatment and three or less accidents that involve the minor medical treatment and/or evaluation by medical professionals.*** ***No incidents were reported for the entire year. Perfect safety record. The acceptable target was met.***
Summary of Assessment Results	**The lack of accidents is critically important both for a student safety aspect as well as institutional liability. Safety should be a culture that is emphasized from the introductory courses to the senior level courses. The chemistry major and exposure to chemicals has inherit risk that must be addressed to prepare students for the future workplace settings. Our data indicates strong success in this area.**
Use of Results and Reflection	*Laboratory safety is a critically important component to a chemistry major. Simulations and online learning environments propose significant challenges in effectively teaching proper safety skills.*

Program Reflection and Summary
We recognize the typical student majoring in chemistry has shifted in recent years. Fewer students are pursing science teaching due to lower career salary opportunities. This lead to the elimination of the Science Education major last year. More of our majors are pursing Pre-Professional paths to enter Professional Programs like Medical School or Pharmacy School. These students are very focused on their admittance goals. We continue to be challenged by the lack of student preparation for the average student entering in our CHEM-1315 (General Chemistry I). Our average ACT for this course varies between 20 and 22. However, we have shown some growth for the program. It is not clear what this growth is due to. More importantly we are generating more student success with an increased number of chemistry graduates as the overall undergraduate student population has decreased. The decrease in traditional face-to-face courses enrollment is even steeper and the chemistry program currently offers no online courses. When had seen an upward trend in the number of majors in previous years but that seems to have peaked in 16/17. Our student success of entry into graduate and professional programs is the highest in the last 20 years. Our greatest challenge will be to deal with the shifting student population to online learnings. This is a topic are have ignored for the chemistry program. We can only do so for so long. We also must continue to place a critical role on departmental recruiting to attract majors from within the university and in outreach.

APPENDIX
for
CHEMISTRY REPORT AY1920

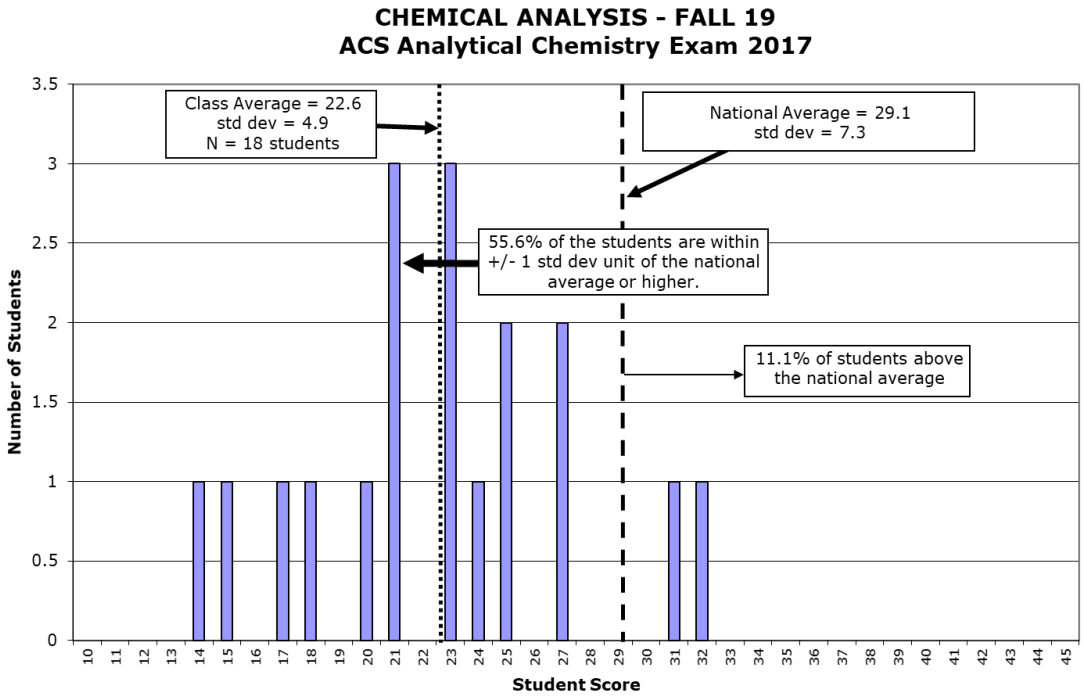


Figure 1. ACS exam for CHEM-3425 Fall 19.

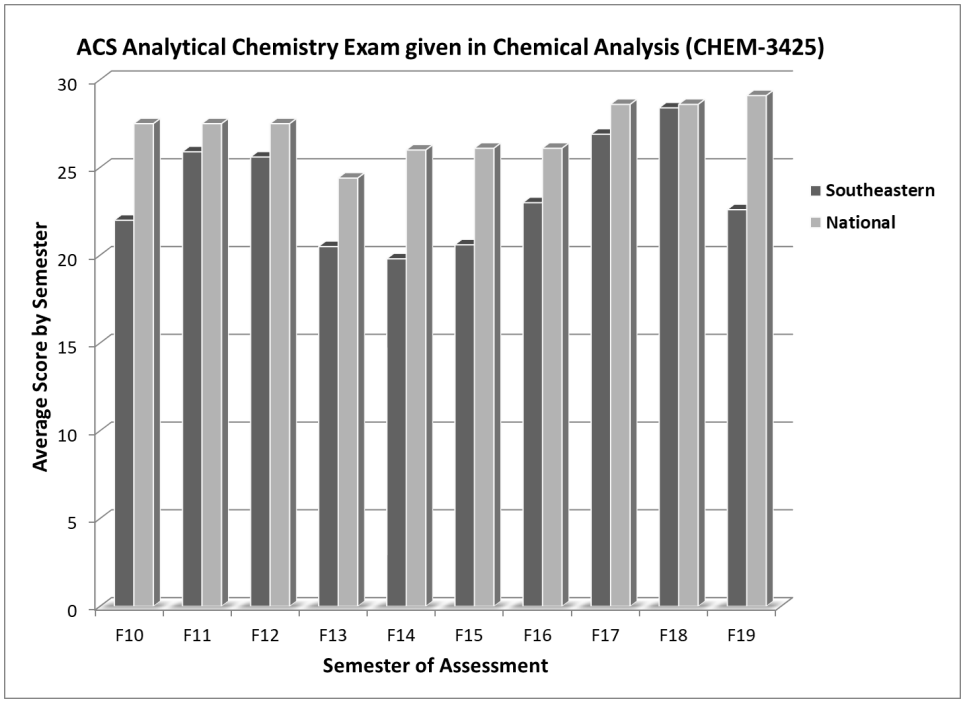


Figure 2. Historical ACS exam data for CHEM-3425.

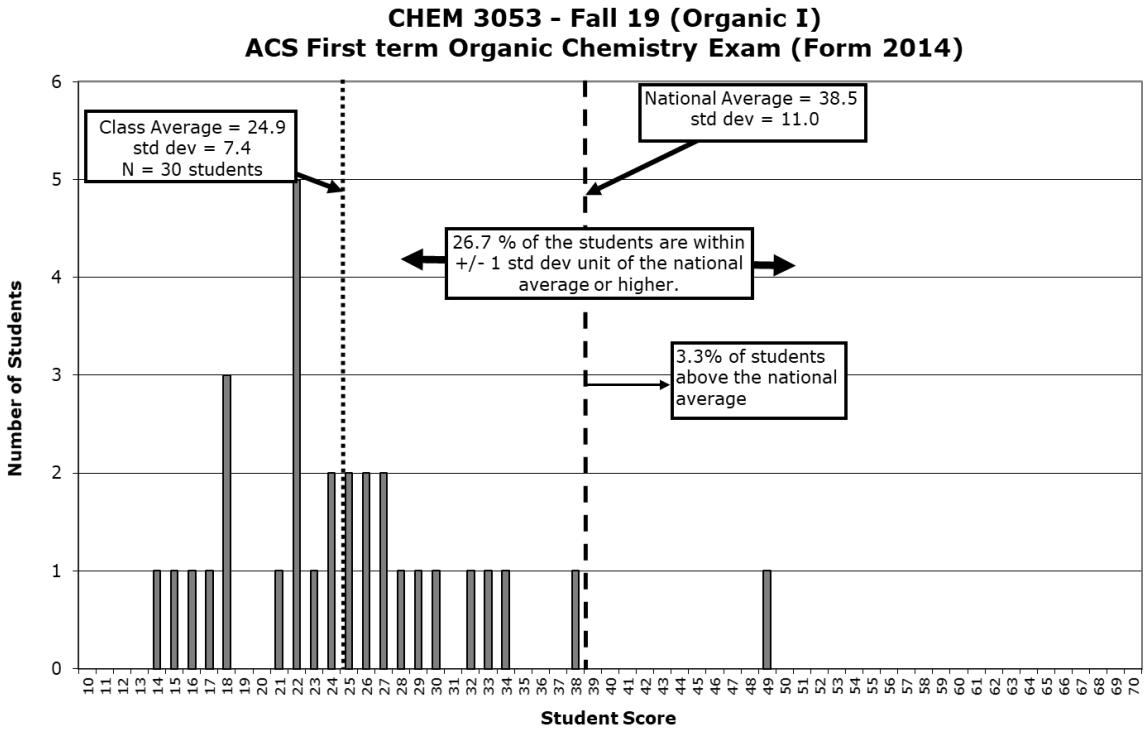


Figure 3. ACS exam for CHEM-3053 in Fall 19.

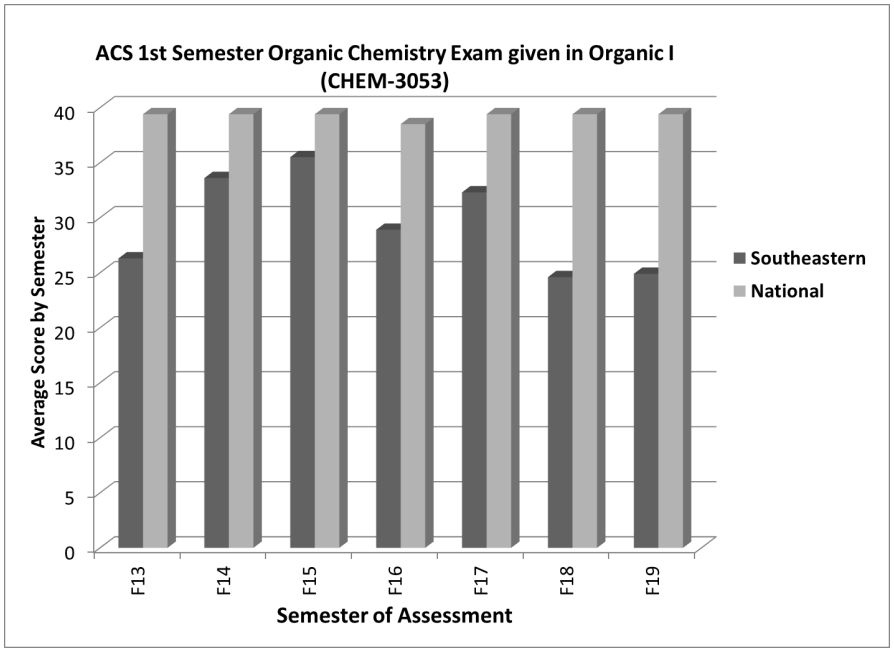


Figure 4. Historical ACS exam performance in CHEM-3053 (Organic I).

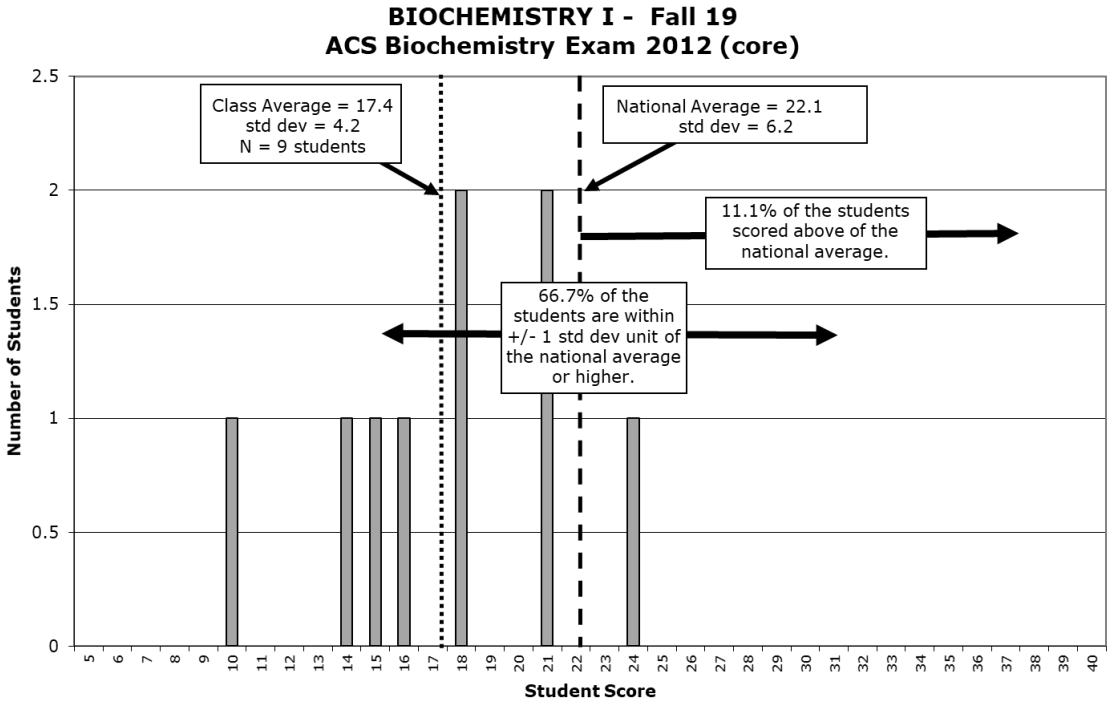


Figure 5. ACS exam performance in CHEM-4115 (Biochemistry I) in Fall 19.

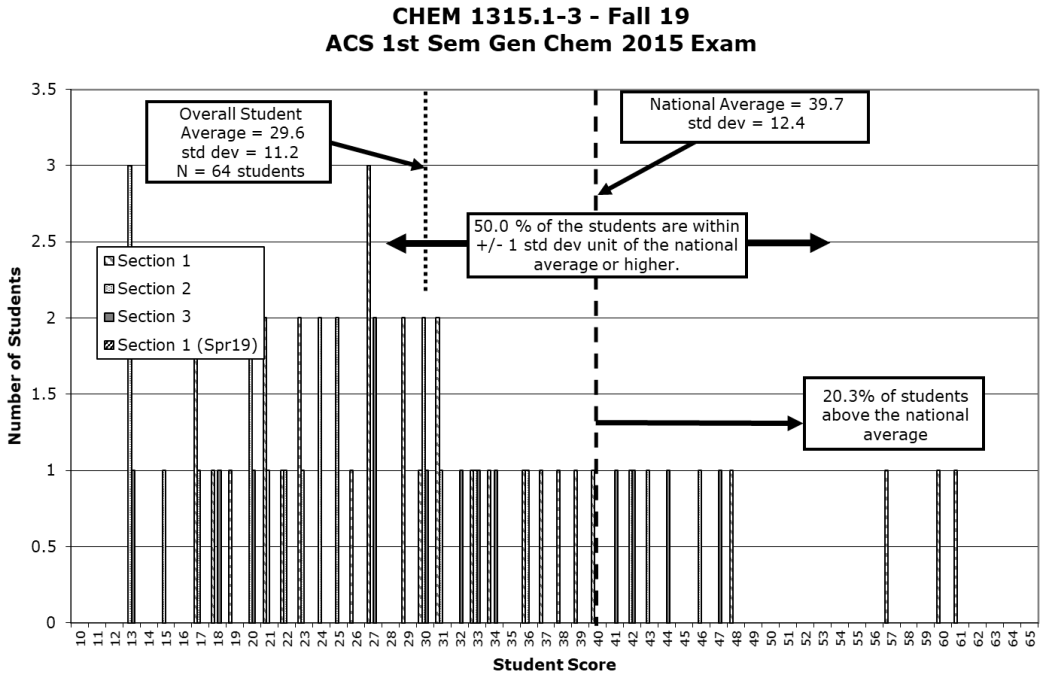


Figure 6. ACS exam performance in CHEM-1315 (Gen Chem I) in AY1920.

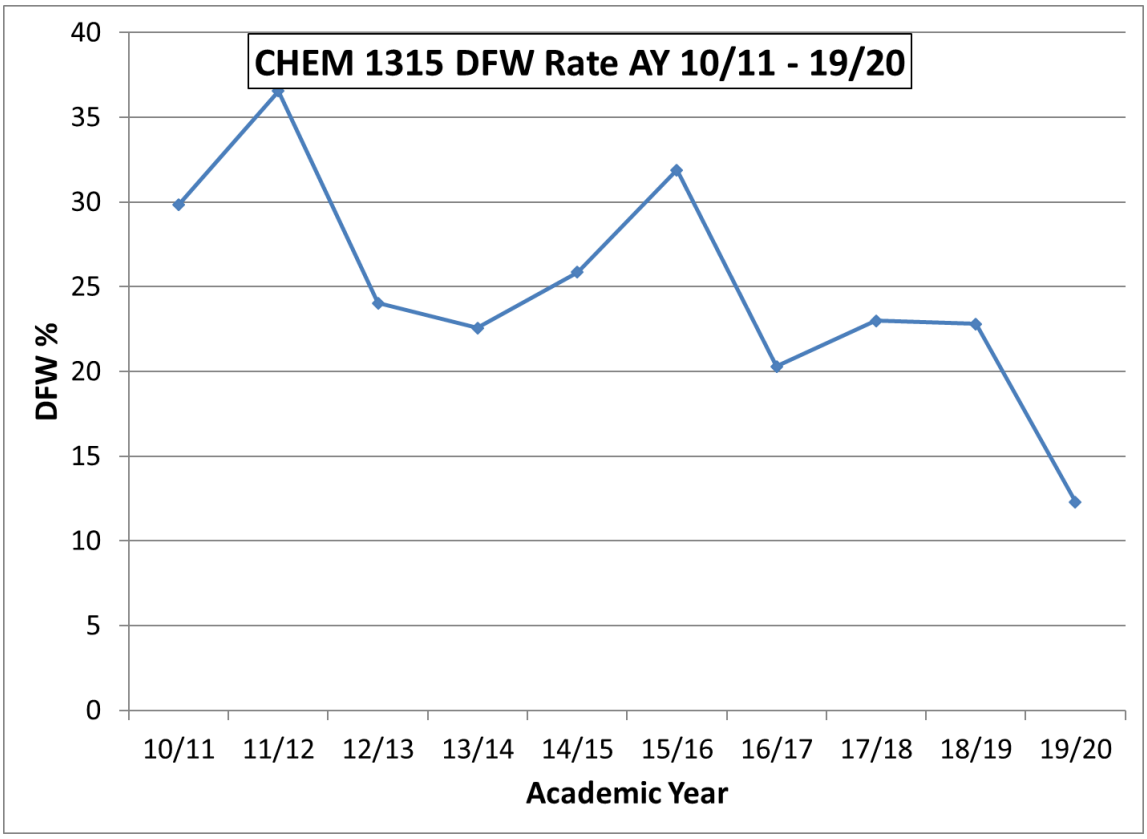


Figure 7. Historic DFW rates in CHEM-1315.

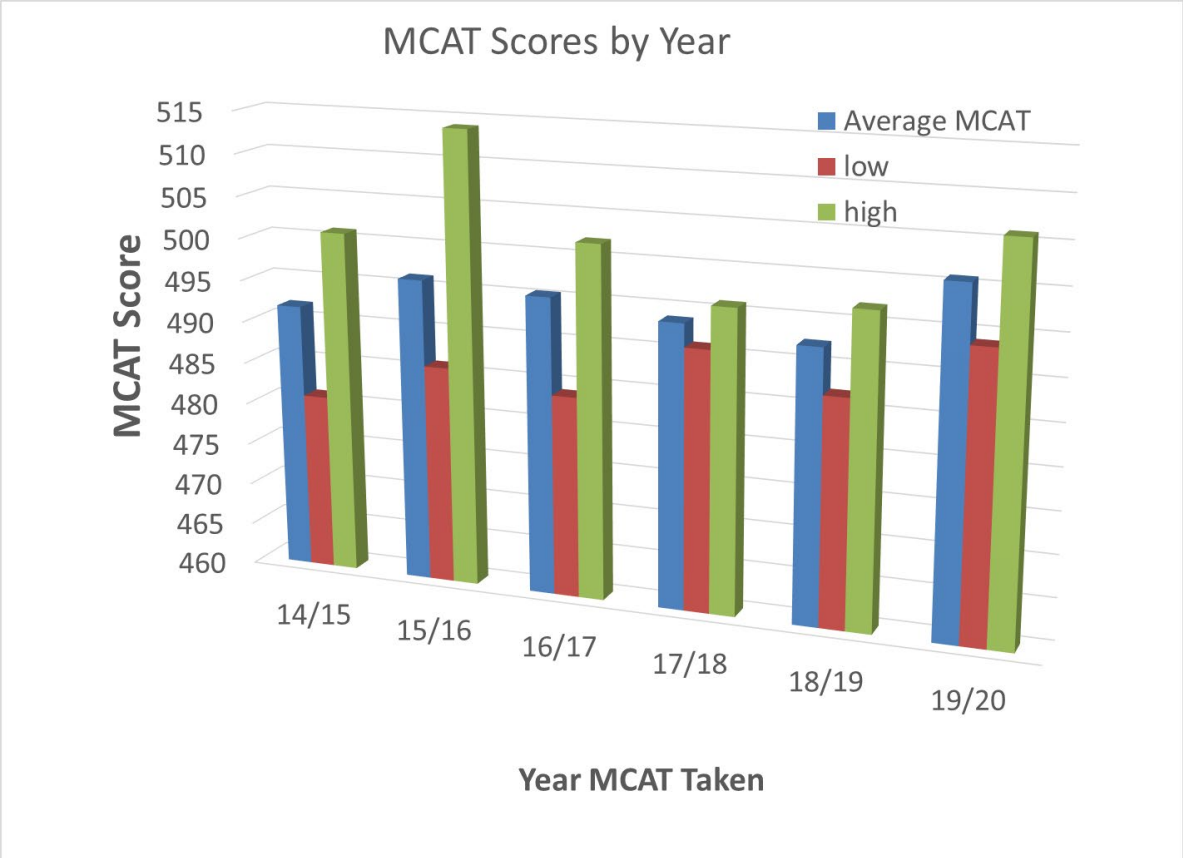


Figure 8. Variation in Composite MCAT score for SE students by year.

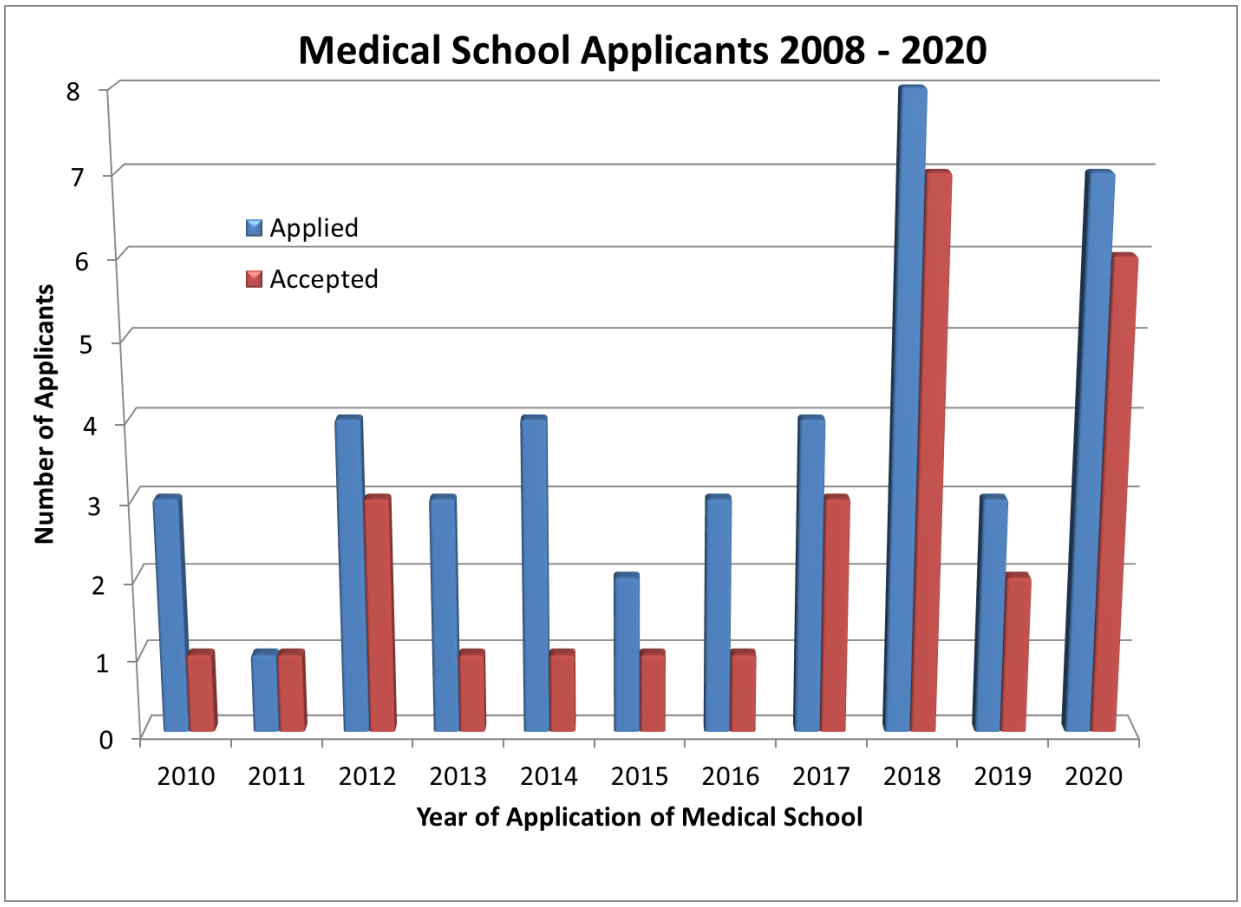


Figure 9. Medical School Applicant to Admission data by Year.

CHEMISTRY PROGRAM OUTCOMES ASSESSMENT REPORT FOR 2018-2019

Tim Smith

SOUTHEASTERN OKLAHOMA STATE UNIVERSITY

EXECUTIVE PROGRAM SUMMARY

Learning Outcome	Measure 1 (# of students assessed)	Measure 2 (# of students assessed)	Measure 3 (# of students assessed)
1	Acceptance into Graduate Programs (8)	ACS Exams (256)	MCAT Exam (2)
2	Critical Analysis of Data in Laboratory (53)		
3	Senior Seminar Presentations (10)		
4	Student Presentations (1)		
5	Student Research (12)	Group Clicker Responses (32)	
6	Safety in Lab Final Exam for CHEM-3425 (9)	Reported Laboratory Incidents	

In general, we feel that our students are achieving their academic goals and showing acceptable target results are met for most of our assessment outcomes. We realize we may have set the targets too high for some courses including the introductory level (CHEM-1315/1415) where many students realize they are not going to be chemistry majors. In general scores this were very similar to those in the previous 5 years. Also, we have strong data to show that the students appear to be getting accepted into desired secondary programs and proceed into their future careers.

We don't have any major changes to propose at this time based on our data. We do acknowledge that some Learning Outcomes need additional measures to better verify the findings.

PROGRAM OUTCOMES ASSESSMENT REPORT	
Department: Chemistry, Computer, and Physical Sciences	
Degree Program: Chemistry	
Report Submitted By: Dr. Tim Smith	**Date of Submission:**
Program Mission Statement: The Department of Chemistry, Computer and Physical Sciences is dedicated to preparing its students to face the challenges and take advantage of the opportunities of the 21st century in an expanding global community by providing excellence in teaching, outstanding academic programs, and relevant research opportunities.	
Goal 1: Prepare students for career opportunities in business, industry, and government not just in the U.S. but around the globe.	
Student Learning Outcome 1	Demonstrate knowledge of chemical concepts, laws, theories, and the ability to use process skills in chemistry through observation, measurement, classification, inference, interpretation, and experimentation (including controlling variables, graphing, and communication).
Acceptance Rate into Graduate and Professional Programs	***The chemistry program serves as a major for students entering a variety of professional programs and graduate programs. Include Medical School, Dental School, Pharmacy School, Optometry School as well as other professional programs.*** ***Three (3) of the three (3) of the graduates that applied to graduate or professional got accepted on their first attempt. We are not reporting students that reapplied or took a gap year to refine their application. This represents 100% admittance percentage. (all AY1819 graduates – 10 students)*** ***The acceptable/ideal target is for 50% of the Chemistry majors applying to a graduate or professional program to be accepted. Target greatly exceeded.*** ***1. Three students applied and where accepted in Doctoral Pharmacy programs. Two at the University of Oklahoma Health Science Center and one Appalachian College of Pharmacy in Oakwood, VA.***
ACS Exam in Analytical Chemistry	***Every student majoring in chemistry is required to take Chemical Analysis (CHEM-3425). In the lecture portion of this course the student studies the concepts, laws, and theories governing analytical chemistry. Nine (9) students took the exam in the Fall 18 as their final exam in CHEM-3425. 55.6% scored above the national average and 88.9% scored within one standard deviation unit of the national average.*** ***The acceptable target is to have 35% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. Target met in both aspects.*** ***See appendix: Figure 1. ACS Exam scores in CHEM-3425 and Figure 2. Historic CHEM-3425 exam scores.***
ACS Organic Chemistry Exams	***Every student majoring in chemistry is required to take Organic Chemistry I (CHEM 3053) and most choose Organic Chemistry II (CHEM 3153) as one of their electives – which is required in 3 of the 4 options for the Chemistry major. In the lecture portion of this two semester sequence in Organic, the student studies the concepts, laws, mechanisms, and theories governing organic chemistry.***

	The acceptable target is to have 25% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. ***In the Fall 18, twenty-five (25) students in CHEM-3053 took the ACS First term Organic Chemistry Exam as their final exam. 16% of the students exceeded the national average and 36% scored within one standard deviation unit of the national average. In the Spring 19, eighteen (18) students enrolled in CHEM-3153 took the ACS Organic Chemistry exam as their final. 11.1% scored above the national average and 44.4% scored within one standard unit of the national average. This data are shown graphically in Figure 3-6.*** ***Target was not met in the Fall 18 or the Spring 19. These are very aggressive targets for typically second year chemistry students. However, this cohort scored at the lower than any group in the past 5 years.***
ACS Exam in Inorganic Chemistry	***CHEM 2113 offers fundamental knowledge of Inorganic Chemistry to the students who completed CHEM 1214 or 1415 with a grade of C or better. Students should sit for a comprehensive exam prepared by the American Chemical Society (ACS) as their final exam.*** ***ACS Inorganic Chemistry Foundation Exam-2016 was offered in Spring 2019 finals. The Chemistry Department target is to have 25% of the students scoring above the national average and 50% of the students scoring within one standard deviation unit or higher of the national average. The results are shown in the Appendix Figure 14.*** ***Among the seven (7) students who took the exam, 42.9% of students were within ±1 standard deviation units of the national average or higher. None of the students have scored above the national average. In conclusion, CHEM 2113 did not meet the Chemistry Department target in Spring 2019.***
ACS Biochemistry Exam Biochemistry I	***Biochemistry I (CHEM-4115) is a Fall chemistry course available only to students who have passed Organic Chemistry I with a grade of C or better. While approximately 50% or more of the students take Organic and General Chemistry at SE, a large percentage take their prerequisite chemistry courses at another institution. CHEM-4115 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Sciences and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry minors, especially combined with a Biology major. Biochemistry I is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry I includes coverage of the basic building blocks of proteins and cells, their functions and nomenclature, simple biochemical calculations (including kinetics) and data interpretation. The course contains a 4-hour laboratory weekly component to provide an introduction to basic biochemical laboratory techniques and to re-enforce lecture concepts.*** ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester and therefore cover broader material in the single semester. For years in CHEM 4115, students were asked to answer only the ACS exam questions covered in the Biochemistry I course, since many of the questions relate to the follow-up Biochemistry II course at SE.*** ***Beginning in Fall 2012, CHEM 4115 students were asked to answer all questions on the 2 semester exam, and their scores were compared with the national norms available for student in 1-semester courses. The scores obtained by the students served as their Final Exam grade, at 10% of their overall grade, and had a direct impact on their final grade unlike some previous years. The weight is relatively low, and several students did not have to do very well to keep the overall grade earned on the other 90% of the grade, so the students were not highly motivated to do well on the ACS exam. The student scores in CHEM-4115 are also compared with the national averages for only the "core 40" questions as recommended by ACS. The coverage of Biochemistry I is not designed to match the "40 Core" question content, but the students do very well on the 20 "non-core" questions because they emphasize techniques and content covered in CHEM 4115. The "core 40"scoring is not used on any other current ACS subject exams.*** ***Twenty (20) students took the ACS Biochemistry Exam in the Fall 18. This data is displayed in a Figure 7 in the Appendix. The acceptable target is to have 25% of the students scoring***

	above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average. ***One target was met in Fall 18 with 55% scoring with one standard deviation unit of the national average, but only 10% scored at or above the national average. Although the cohort was larger than some previous years, many seemed under-prepared or missed classes or turned work in late due to work conflicts. Many of the students scoring far below the national average on the ACS exam had a course 4-exam average between only 50 and 60% and reported having taken 2 or more prerequisite courses at 2 year schools before transferring to Southeastern.***
ACS Biochemistry Exam Biochemistry II	***Biochemistry II (CHEM-4193) is a Spring chemistry course available only to students who have passed Biochemistry I with a grade of C or better. (The course is cross-listed as CHEM-4193: Biochemistry II and BIOL-4193: Metabolism.) Typically approximately 50% of the students who take Biochemistry I will continue on to take Biochemistry II. CHEM-4193 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Science and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry and Biology minors. This course is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry II includes coverage of the basic knowledge of common anabolic and catabolic pathways, the regulation of these pathways, and their relation to energy production or human diseases. Pathways covered include the breakdown and synthesis of carbohydrates, amino acids, lipids, and nucleotides. The course also includes an introduction to basic biochemical methodology and techniques for determining the nature of these pathways and to illustrate the relevance of biochemistry to everyday life and medicine.*** ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester. It provides different norms for 1-semester and 2-semester courses, but uses only 40 of the 60 questions for the 1-semester courses. Beginning in Spring 2013, CHEM 4193 students were asked to answer all questions on the 2 semester exam (rather than just the questions covered in BiochemistryII/Metabolism), and their scores were compared with the national norms available for student in 2-semester courses.*** ***The scores obtained in Spring 2019 by the students had a direct impact on their final grade, counting for 15% of their overall grade as their final exam score, after some curving. In May 2019, to further motivate those who had done poorly on an earlier section exam, if their adjusted score on the ACS standardized exam exceeded their score on a regular exam, it also could replace the lower score.*** ***The scores are also compared with the national averages for department assessment purposes. The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** ***As a part of the 2019 second semester of Biochemistry (CHEM 4193 Biochemistry II) each student was required to take the newly-released American Chemical Society Standardized Exam BC17, an exam described by the source as "Designed for the end of a two-semester sequence in Biochemistry. Includes a few items with content related to laboratory experiments in Biochemistry." In Spring 2019, fourteen (14) students took the new exam. Some topics covered on the exam were not covered in the current edition of the Biochemistry I & II textbook. Unfortunately, nationally only 102 students had taken the exam, so official statistics were not published on-line yet; in May 2019, the temporary national average was 30 out of 60. The results are illustrated in Figure 8.*** ***42.9% of the students scored above the new national average for the 2-semester scores, while 78.6% of the students are within +/- 1 standard deviation of the national average or higher. Therefore, both acceptable targets were met and exceeded.***

ACS First Semester General Chemistry Exam in CHEM-1315	***General Chemistry I (CHEM-1315) is the highest of the three levels of first-semester chemistry courses offered at SE. This course is commonly referred to as "Majors/Pre-Professional Chemistry". CHEM-1315 is the entry point for students who will major in Chemistry and Medical Sciences; for all students meeting general chemistry requirements for entrance into programs of advanced healthcare degrees and a Chemistry minor. It includes nomenclature, atomic and molecular structure, stoichiometry, bonding, states of matter, thermochemistry, acids and bases, and gas laws. The course contains a 4-hour laboratory weekly component. At the beginning of the present decade we came to recognize the importance of assessing student learning not only in the junior and senior level courses, but also in the freshman level Chemistry courses as well. As a part of this, each student in CHEM-1315 has been required to take the American Chemical Society First-Semester General Chemistry Exam starting in Fall 2011. This exam tests the student's knowledge of both theoretical and experimental first semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** ***During the Fall 2018 and Spring 2019 semesters, a total of ninety-one (91) students took the exam. 50.5 percent of the students were within one standard deviation of the national mean or higher, a 7.2 percent improvement over the previous year. 16.5 percent of the students were above the national average, a 3.2 percent improvement over the previous year. Figure 9 illustrates individual student performance on this exam. One previous area of concern had been the %DWF rate for CHEM-1315. Changes in teaching assignments annually yield a different set of faculty teaching this course. Figure 10 shows the %DFW rate annually over the past 9 years for CHEM-1315 (Fall 09/10 – 18/19). DFW rates remain favorable when compared to BIOL-1404 and MATH-1513 which are typically taken by the same students.*** ***In conclusion, the acceptable target (25%) of students scoring above the national average and the acceptable target (55%) of students scoring within one standard deviation unit or higher of the national average were not met but both were an improvement over the previous year. In the case of the 55% target, it is being approached.***
ACS Second Semester General Chemistry Exam in CHEM-1415	***General Chemistry II (CHEM-1415) is the continuation course of CHEM-1315. It also serves as the prerequisite for most upper-level Chemistry courses and a prerequisite for most pre-professional programs. Success in CHEM-1415 is critical for students who will continue to major in Chemistry, Biotechnology, and Medical Sciences. CHEM-1415 emphasizes on kinetics, equilibrium, thermodynamics, electrochemistry, qualitative analysis, organic chemistry, biochemistry, and nuclear chemistry. The course also contains a 4-hour laboratory weekly component.*** ***As was the case with CHEM-1315, we have recognized the importance of assessing student learning in CHEM-1415. As a part of this assessment, each student in CHEM-1415 was required to take the American Chemical Society Second-Semester General Chemistry Exam. This exam also tests the student's knowledge of both theoretical and experimental second semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring with one standard deviation unit or higher of the national average.*** ***In Spring 2019, sixty-two (62) students took the exam. The individual student performances are show in Figure 11. In a very similar fashion to CHEM-1315 the previous Fall, 71.0 percent of the students were within one standard deviation of the national mean or higher and 17.7 percent of the students scored at the national average or higher. The results were a significant variation from the previous year, but these cycles with different cohorts of students are somewhat the norm. The department continues to track the various factors that have contributed to this data. It is critical that Chemistry majors have a proper foundation in General Chemistry in order to be successful in the major. We have placed an emphasis on providing the students with the strongest foundations possible. The DFW rates remained low in CHEM-1415 as shown in Figure 12.*** ***In conclusion, the acceptable target (25%) of scoring above the national average was approached but not met whereas the acceptable target (55%) of scoring within one standard deviation unit or higher of the national average was greatly exceeded.***

ACS Instrumental Analysis Exam In CHEM-3525	***CHEM-3525 not taught in Spring 2019. No data or assessment available.***
ACS Diagnostic of Undergraduate Chemistry Knowledge Exam in CHEM-4951	***The Diagnostic of Undergraduate Chemistry Knowledge (DUCK) exam is designed to be taken at or near the end of a four-year undergraduate curriculum. This was developed by the American Chemical Society's Exams Institute and has comparative national norm data. All items on the exam are part of scenarios that require knowledge from more than one traditional area of chemistry. Thus, the performance of the student on this exam is reflective of their cumulative learning experience in the entire chemistry major. This exam is given during the capstone Chemistry Senior Seminar course, CHEM-4951. Assessment is required for all majors, even students taking Biology Senior Seminar as part of the Medical Sciences track.*** ***The acceptable target is to have 25% of the students scoring above the national average and 60% of the students scoring within one standard deviation unit or higher of the national average.*** ***For the academic year 18/19, a total of ten (10) students took the ACS Diagnostic of Undergraduate Chemistry Knowledge Exam (DUCK). Individual student performances are shown in Figure 13. 60.0% of the students scored within one standard deviation unit of the national average. 10.0 % of the students scored above the national average. Both percentages were lower than the previous year.*** ***In conclusion, the acceptable target of 25% of students scoring above the national average was not met whereas the acceptable target of 60% of students scoring within one standard deviation unit or higher of the national average was met.***
Medical College Admission Test (MCAT)	**The MCAT is a test required for admission into all medical programs, medical doctorate and osteopathic doctorate, in the U.S. The MCAT is a standardized, multiple- choice examination designed to assess the examinees' problem solving, critical thinking, writing skills, and knowledge of science concepts and principles necessary to the study of medicine. Scores are reported in Verbal Reasoning, Physical Sciences, Writing Sample, and Biological Sciences. Chemistry represents anywhere from 35 to 40% of the MCAT by subject area. Students are to have completed a minimum of 20 hours of chemistry (General and Organic Chemistry) at the point of taking the MCAT and most have more than 30 hours at this point. The MCAT is administrated by the Association of Medical Colleges and a student's performance on this critical test is made available to the pre-medical advisory committee at each undergraduate institution.** **The acceptable target is for the 50% of chemistry majors to score 492 or higher on the MCAT. A 492 represents the minimum score required to apply by medical scores in Oklahoma and Texas.** **Our combined average MCAT for 18/19 was a 492.4 for the two (2) students that took the MCAT during this period. The minimum MCAT required to apply to Oklahoma medical school (OUHSC and OSUCOM) is a 492. Fifty percent of the students scored at a level to meet the minimums to apply with individual scores 489 (16th percentile) to 494 (28th percentile. Figure 14 shows the low, high, and average MCAT in comparison to recent years at SE. This cohort was much smaller than previous samples and significantly weaker overall in that no student exceed a 495 score. The acceptable target was meet with 50% of the students scoring above a 492.** **Figure 15 illustrates the applicant to admission numbers to Medical School for the past 10 years. Even though this was a much smaller group seeking to get into Medical School this was offset by the fact that three of our top students applied and where admitted into Pharmacy programs.**
Summary of Assessment Results	**We have a good number of assessment measures that provide national comparative norm data. Several of the courses meet they acceptable targets when the ACS exam was part of the student's grade (final exam). Like most programs, some individual students performed extremely well and some individuals performed poorly. By increasing the standards of "C" higher to proceed into CHEM-1415 and CHEM-3053 and using the ACS exams for our final exams, the number of low performing students is a smaller percentage compared to 10 years ago. The number of students entering graduate and professional programs strongly**

	indicates our students are gaining the fundamental knowledge need to succeed in the major.
Use of Results and Reflection	*One of greatest challenges continues to be dealing with the increasing number of transfer students that come in with their first one- or two-years of chemistry being completed at a junior college that does not have the level of rigor we required for freshman chemistry. While certainly some transfer students have succeeded, others have found the transition to be very difficult. We might consider the implementation of placement or leveling exams to make sure transfer students have skills needed to succeed in the upper level chemistry courses. However, if a student is forced to repeat a course that is already accepted on their transcript by a transfer agreement issues with financial aid will likely occur.*
Student Learning Outcome 2	Show competence in cognitive analysis of chemical information, recognition of organizing principles in information, and proficiency in library and computer skills in obtaining information and analyzing data.
Critical Analysis of Chemical Data	***This outcome is measured in several courses and because of its nature it is difficult to quantitatively measure. The outcome can be seen in two aspects of the department's instruction. The first is in the cognitive analysis of the student's own information collected in the laboratory portion of core and elective courses. The instructional emphasis in the 5-semester hour courses is forty percent on these laboratory-based competencies. Specific requirements are discussed in the paragraphs below. The second aspect of this competency is exhibited in the cognitive analysis of literature information assigned in several of the courses. Several of the 3000 and 4000 level courses include a research paper that requires that the student perform a literature search, organize key scientific information, and prepare a report and/or oral presentation.*** ***The acceptable target is for Organic Chemistry Laboratory (CHEM-3062/3162) is that 75% of the student will earn an A, B, or C in that course. Chemical Analysis (CHEM-3425) also has a significant laboratory component that requires critical analysis of data. The acceptable target for CHEM-3425 is that the student's average laboratory component be 70% or higher of the available points.*** ***In Organic I (CHEM3062-Fall 18) the percentage of students earning an A, B, or C was 91.3% with a total of twenty-three (23) students. In Organic II (CHEM3162-Spring 19) the percentage of students earning an A, B, or C was 71.4% with a total of 21 students. Referring back to the partnered organic chemistry lecture exam scores, this was a weaker cohort of students compared to previous year in Organic and lab performance parallels the student's performance in the lecture.*** ***In Chemical Analysis (CHEM3425), the student's average lab score was 92.8% with a total of nine (9) students. Nine of the nine students in CHEM-3425 for the Fall 18 had a lab average that exceeded 70%. These scores exceeded the acceptable target.***
Critical Analysis of Chemical Data Summary of Assessment Results	**This learning outcome is one of the harder to quantify. Overall student performance in the selected courses demonstrate an acceptable skill set for processing chemical information. It should be noted that all of the students being evaluated are beyond freshman status and many are juniors or seniors by credit hours. These students have frequently developed a strong cognitive analysis skill set due to the complex nature of the CHEM-3000 and -4000 courses.**
Use of Results and Reflection	*These findings illustrate a strength of our students. Our chemistry majors take significantly more lab courses (and hours) than chemistry majors at other institutions in the state and nationally. The increased lab exposure leads to increased student success.*
Student Learning Outcome 3	Demonstrate skill in the synthesis of information by preparing and presenting reports, proposing plans or sets of operations, and/or making derivations of abstract relations.
Senior Seminar Presentations	***These outcomes are assessed in several of our advanced chemistry courses where students are required to write up detailed laboratory reports using both library and computer skills. However, every student taking Senior Seminar is required to do a research project which requires them to use library resources, organize and present their findings in both a poster presentation, a written report, and an oral presentation. It is important to note that while chemistry majors and chemistry major-minor students must take the Chemistry Senior***

	Seminar, some of the interdisciplinary double majors (chemistry-biology) opt to take the Biology Senior Seminar and, therefore, do not appear in the statistics. The chart below shows the number of students who have manifested the proficiencies of Outcomes 2 and 3 in Senior Seminar during the past eight years. The papers are peer-reviewed before either presentation or publication. The chemistry faculty evaluates the poster presentations, the oral reports, and the written reports. The evaluations are used in assigning a grade for each individual student's performance. Generally, it can be said that the chemistry faculty believes that the students' performances on their presentations and reports met the requirements of Outcomes 2 and 3. Since students in the Biology Senior Seminar have to met similar requirements as those in chemistry, it seems reasonable to assume that the interdisciplinary Medical Sciences majors also met the requirements of Outcomes 2 and 3 as well. ***The acceptable target is that 80% of all graduating chemistry majors produce an acceptable senior seminar presentation.*** ***For the academic year 18/19, the number of graduating students were 10. All students demonstrated satisfactory skills in the synthesis of information in their projects and no repeats were required in the Seminar Course (CHEM-4951 or BIOL-4981). The acceptable target was exceeded.***
Summary of Assessment Results	**The track record for students taking our CHEM-4951 remains strong. Rarely do students have to repeat presentations due to a lack of performance. We do have a variable number of students that course the Medical Sciences option that take the Biology Seminar course (BIOL-4981) in lieu of our CHEM-4951 in order to fulfill hour requirements.**
Use of Results and Reflection	*Target is greatly exceeded. Several upper level chemistry courses also require reports and presentations as part of their normal course expectations. Data was not collected for courses other than CHEM-4951.*

Student Learning Outcome 4	Exhibit intellectual honesty, open- mindedness, and objectivity in the accumulation and interpretation of information and form value judgments on ethical issues in the conduct of chemistry and the applications of chemistry in society.
Student Presentation and Publications	**The acceptance of papers for presentation and publication not only demonstrates the students' skills in synthesis of information but also supports the first part of this competency as well. Without the qualities of intellectual honesty, open mindedness, and objectivity they would not be accepted. The same can be said for the students' performance at state, regional and national meetings where they deliver poster and platform presentations.** **The acceptable target is 30% of graduating students perform a student presentation or publications at local, state, or national conferences each year.** **In recent years we have had at least 4 to 10 students making at least that many presentations at Oklahoma, regional or at national meetings. However, we had many Senior-level research-active students graduate during the previous year, so very few were available or willing to present research off-campus in AY18-19.** **For the first time in years, only 1 student (Chemistry-Biology double majors) made 2 off-campus presentations on the same topic. She did an NIH OK-INBRE summer internship at OU-HSC in Oklahoma City, and therefore presented an intern poster at the end of the summer in July 2018. She was also nominated as the sole representative for the Southeastern campus at Oklahoma Research Day at the Capitol in Oklahoma City in March 2019.: Gabrielle P. Ford1, 2, D. Dyer3, and L. Jackson3** **1=Dept. of Chemistry, 2=Dept. of Biological Sciences, Southeastern Oklahoma State University, Durant, OK; 3=Dept. of Microbiology and Immunology, University of**

	Oklahoma Health Sciences Center, Oklahoma City, OK; Faculty Advisor for Capitol event: Dr. Nancy Paiva, Southeastern Oklahoma State University **Poster title: DEFINING THE REGULON OF IRON-REGULATED SMALL RNA NrrF IN NEISSERIA GONORRHOEAE FA1090 WITH NEXT GENERATION ILLUMINA SEQUENCING** **This is far below the acceptable (30%) and are approaching the ideal (50%) targets for students presenting at local, state and national meetings.** **However, since fewer students were taken to external meeting as presenters, a greater effort was made to introduce lower level students to research by taking them to observe poster and oral presentations at state and regional meetings. Dr. Paiva took 2 freshmen and 1 sophomore to the National Fall American Indian Science and Engineering Society (AISES) meeting in Oklahoma City, OK in October 2018. She also used NASA OK Space Grant funds to support the travel, registration and hotel rooms for 14 undergraduates to attend the Annual Spring Oklahoma Pentasectional (statewide) meeting in Norman, OK, in April 2019, attended by over 200 delegates. She also took 4 undergraduate summer interns to observe the NIH OK-INBRE summer intern posters at OU-HSC in Oklahoma City in July 2019, even though Southeastern had no regular interns presenting there this year.** **It is hoped that by exposing these under-classmen to research presentations at an early stage of their education, more will participate in research internships and presentations in the near future.** **Other students did participate in research on or off campus, funded by grants such as such as NSF LSAMP and NASA Oklahoma Space Grant, but declined to present during this year.**
Summary of Assessment Results	***The number of student presentations is down compared to the previous year. We are trying to reverse this trend, but many STEM majors have lucrative non-science summer jobs that they are afraid to take a leave of absence from, or have family obligations.***
Use of Results and Reflection	*The most commonly choose options in the Chemistry major do not require a student research component. Many Pre-Professionals choose to pursue a semester or summer of research to make their application more competitive. We feel the 30% participation is a healthy target for our students.*
Student Learning Outcome 5	Show interpersonal skills that promote the accomplishment of team goals in small groups.
Student participation in research	***The Department of Chemistry, Computer, and Physical Sciences has historically had active research groups. These groups involve chemistry students and faculty who conduct original research, most of which is funded by external grants from places such as the National Institutes of Health (NIH) OKINBRE, the Oklahoma Center for the Advancement of Science (OCAST), National Science Foundation Oklahoma EPSCoR, and the National Aeronautics and Space Administration (NASA) Oklahoma Space Grant and EPSCoR.*** ***During the research process students typically work in teams under the direction of a faculty advisor. The students are intimately involved in accumulating, interpreting, and analyzing information acquired from the experiments they perform. They are required to make value judgments on the validity of the information and experimental processes. In addition, they must be completely open and honest in the collecting and sharing of information with other team members in their respective research group. While not all student researchers enroll in CHEM4990 (Research), any student seeking course credit for research must prepare a written research report explaining what they did, why and how they did it, what their results meant, and also acknowledging any input from other fellow researchers. Some students work as paid summer research interns off campus, and learn to work with other students, postdocs, technicians, and PhD researchers in a fulltime laboratory environment to try to answer very specific research questions, while also writing reports and earning CHEM4990 Research course credit. Not all but many of these student researchers contribute to a public presentation of the research team's results, most commonly in poster format. Our American Chemical Society student chapter (composed of a variety of science majors) also worked together in small groups to accomplish many projects, and also presented a summary of their activities in poster format at their national professional meeting.*** ***The participation in research is done at the discretion of the student. Both chemistry major minor tracks (Professional Chemist and Biochemical Technology) require a research for***

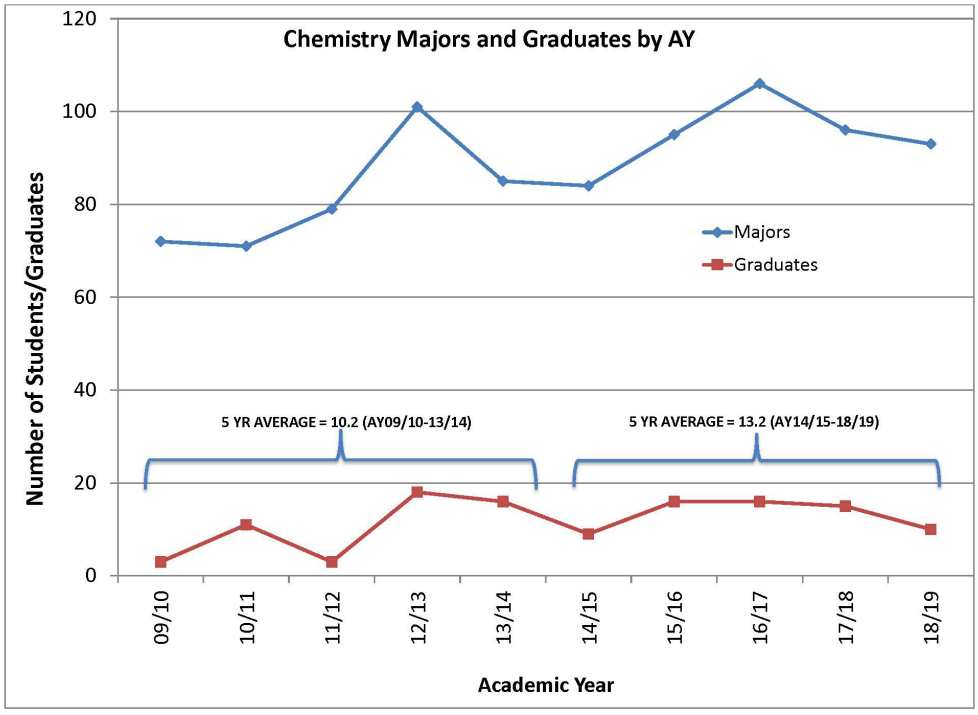
	credit (CHEM4490 24 hours). Students may choose to do this during the academic year or over the summer semester. Opportunities for research exist on the SE campus and at off campus sites. ***The acceptable target is that 50% of all chemistry majors participate in some organized semester long research activity.*** ***In AY 18-19, we had twelve (12) students enroll in either CHEM4990 Research (8 students) or CHEM2212 Introduction to Research (2 students) or research for pay without credit (2 students) in Fall, Spring and/or Summer semesters. This number is much higher than in recent years, and is equal to 80% of the total number of people participating in CHEM Senior Seminar and therefore greatly exceed the acceptable target.*** ***Four students participated in CHEM4990 Research in Fall 2018. Two of these did research on campus, while 2 worked on projects off campus, including internship funded by NIH OK-INBRE, OCAST and NASA OK Space Grant. Two students participated in CHEM4990 Research in Spring 2019. Two of these did research on campus with our 2 newly-hired Chemistry faculty. Two students participated in CHEM2212 Intro To Research in Spring 2019, producing original research data and poster presentations. Four students participated in paid research in Summer 2019, funded by the NIH OK-INBRE SMaRT Freshmen/Sophomore early internship program and NASA OK Space Grant. Two students signed up for 3 credits of CHEM 4990 Research in Summer 2019 and wrote research reports, while the other 2 gained experience but chose not to seek credit and therefore were more flexible in the number of hours worked.***
Group Student Participation With Clicker Questions	***Some of the chemistry courses utilize student response systems (aka Clickers) to gain real time student input over lecture materials. General Chemistry I (CHEM-1315), and Chemical Analysis (CHEM-3425) are such classes in which the student responses given as daily assessment count towards they students course grade. Student responses are most commonly given as individual questions in which a student formulates their response individually. In an effort to promote peer learning in the classroom, students are also given the opportunity to work the problem in small groups of 4 or less. Each student still responds individually after the group discussion on the assessment question. Ideally if peer learning is effective, the student performance should increase with the group responses.*** ***The acceptable target is that there is a positive impact on the group response clickers compared to the individual response clickers. Also the group responses should exceed 80% correct.*** ***In the Fall 18, a total of 110 clicker questions where given in CHEM-1315 to twenty-two (22) students enrolled over 32 days of lecture. Eighty-five of the questions were individual response questions in which the students averaged 75.1% correct responses. Twenty-two questions allow group discussions prior to the student response. Student performance with the group questions averaged 84.4% correct. It should be noted the level of difficulty with the group questions was typically significantly greater than with the individual response questions. The acceptable target was exceeded. More group style questions will be implied in the future to further enhance the peer learning in CHEM-1315.*** ***In the Fall 18, a total of 96 clicker questions where given in CHEM-3425 to eleven (10) students enrolled over 35 days of lecture. Ninety of the questions were individual response questions in which the students averaged 76.3% correct responses. Six questions allow group discussions prior to the student response. Student performance with the group questions averaged 93.8% correct. It should be noted the level of difficulty with the group questions was typically significantly greater than with the individual response questions. The acceptable target was greatly exceeded. More group style questions will be implied in the future to further enhance the peer learning in CHEM-3425.***
Summary of Assessment Results	**Data supports that team skills are an inherit part of the culture in our Chemistry major. Group activities exist in most lecture and lab components of courses. Targets were met for both measures.**
Use of Results and Reflection	*The department can do a better group of preparing students for the possibility of doing a research experience by advising. It is difficult to work in a research experience with transfer students that lack nothing but their major courses and are taking heavy course loads (15-17 hours of upper level biology and chemistry with labs 3-4 days a week).*

	Potentially more data could be collected on the group participation with clickers. However, this is limited by the number of faculty that utilize clickers in their classrooms. Currently only one faculty member is utilizing clickers for daily assessment in chemistry.
Student Learning Outcome 6	Show the ability to anticipate, recognize, and respond appropriately to laboratory hazards or hazardous conditions, and take appropriate safety precautions.
Laboratory Safety	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean of Students and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures.*** ***Instruction on proper safety procedures is provided weekly to every student in every laboratory. The instructors always include relevant instruction at the beginning of every laboratory activity. Students who fail to adhere to the guidelines on any particular activity are immediately corrected in lab and may be dismissed for continuing to ignore those instructions. During the course of the work in the laboratory there are specific requirements for the disposal of excess reagents, waste, or by- products of the chemical operations and the final product. Even "simple" actions such as smelling a chemical vapor, transferring a chemical reagent, weighing a chemical material, storing a chemical product, transporting a chemical material, or reacting to a small chemical spill have prescribed protocols for responses which the students must learn and follow. Besides safety goggles, the students are instructed to wear close-toed shoes and long shorts or pants and to NOT wear contact lenses in the laboratory. The students learn to work in a state of safety consciousness. Some measure of the success of this approach is the lack of any report of any safety violation in the past year. A better measure is the overall safe environment of the majority of laboratory areas which would not be possible if left entirely to the faculty and staff alone.*** ***A laboratory final exam in Chemical Analysis (CHEM-3425) is given at the end the semester Fall semester courses. The lab finals both include fundamental safety questions. The acceptable target is that students performance should exceed 65% on all safety related lab final questions.*** ***Dr. Smith gave 6 safety assessment questions in his lab final exam in Chemical Analysis (CHEM3425) in Fall 18. All eight (8) students enrolled in CHEM-3425 took this assessment. The average student performance on the safety component of the lab final was 4.752/6 correct or (79.2%). The acceptable target on Laboratory Safety was met.***
Reported Laboratory Incidents in Academic Year	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures. Any incidents involving students are reported to Mr. John Williams (Chemical Stockroom Supervisor) who writes and files an incident report. A copy of the incident report is forward to the department chair.***

	The acceptable target is that no major accidents occur that involve medical treatment and three or less accidents that involve the minor medical treatment and/or evaluation by medical professionals. ***No incidents were reported for the entire year. Perfect safety record. The acceptable target was met.***
Summary of Assessment Results	**The lack of accidents is critically important both for a student safety aspect as well as institutional liability. Safety should be a culture that is emphasized from the introductory courses to the senior level courses. The chemistry major and exposure to chemicals has inherit risk that must be addressed to prepare students for the future workplace settings. Our data indicates strong success in this area.**
Use of Results and Reflection	*Laboratory safety is a critically important component to a chemistry major. Simulations and online learning environments propose significant challenges in effectively teaching proper safety skills.*

Program Reflection and Summary	

We recognize the typical student majoring in chemistry has shifted in recent years. Fewer students are pursing science teaching due to lower career salary opportunities. This lead to the elimination of the Science Education major last year. More of our majors are pursing Pre-Professional paths to enter Professional Programs like Medical School or Pharmacy School. These students are very focused on their admittance goals. We continue to be challenged by the lack of student preparation for the average student entering in our CHEM-1315 (General Chemistry I). Our average ACT for this course varies between 20 and 22. However, we have shown some growth for the program. It is not clear what this growth is due to. More importantly we are generating more student success with an increased number of chemistry graduates as the overall undergraduate student population has decreased. The decrease in traditional face-to-face courses enrollment is even steeper and the chemistry program currently offers no online courses. When had seen an upward trend in the number of majors in previous years but that seems to have peaked in 16/17. Our student success of entry into graduate and professional programs is the highest in the last 20 years. Our greatest challenge will be to deal with the shifting student population to online learnings. This is a topic are have ignored for the chemistry program. We can only do so for so long. We also must continue to place a critical role on departmental recruiting to attract majors from within the university and in outreach.



APPENDIX
for
CHEMISTRY REPORT AY1819

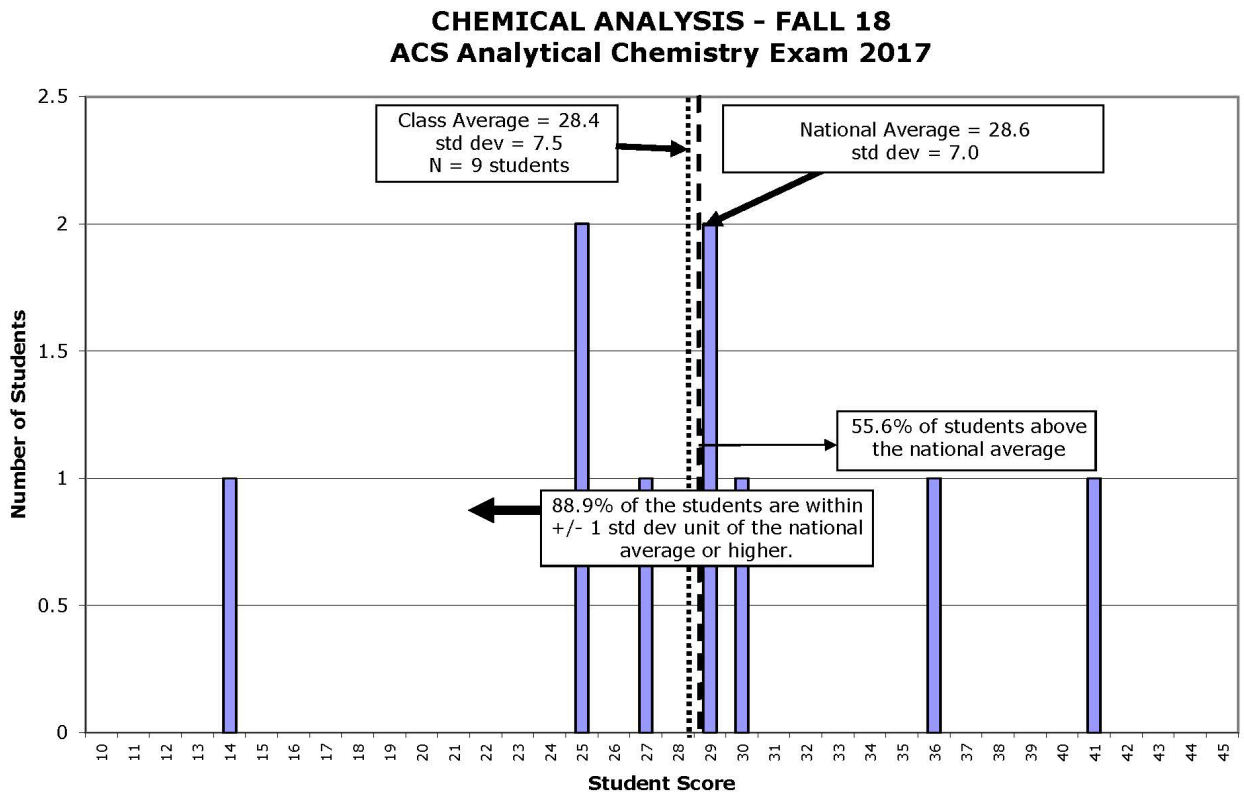


Figure 1. ACS exam for CHEM-3425 Fall 18.

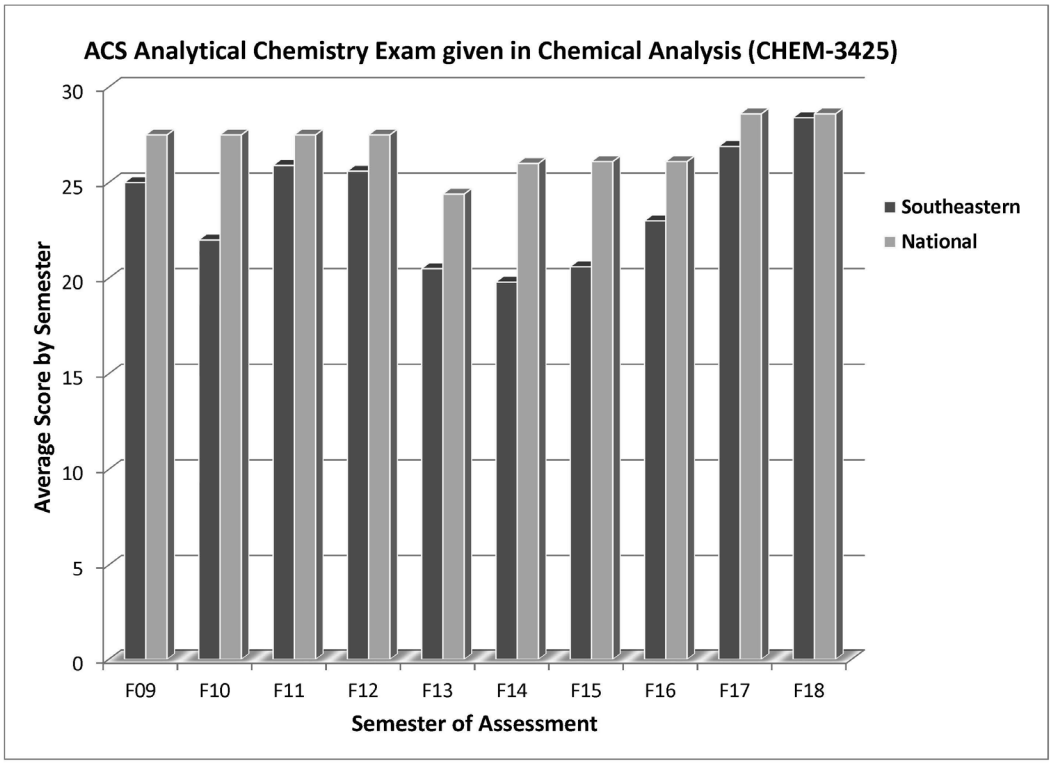


Figure 2. Historical ACS exam data for CHEM-3425.

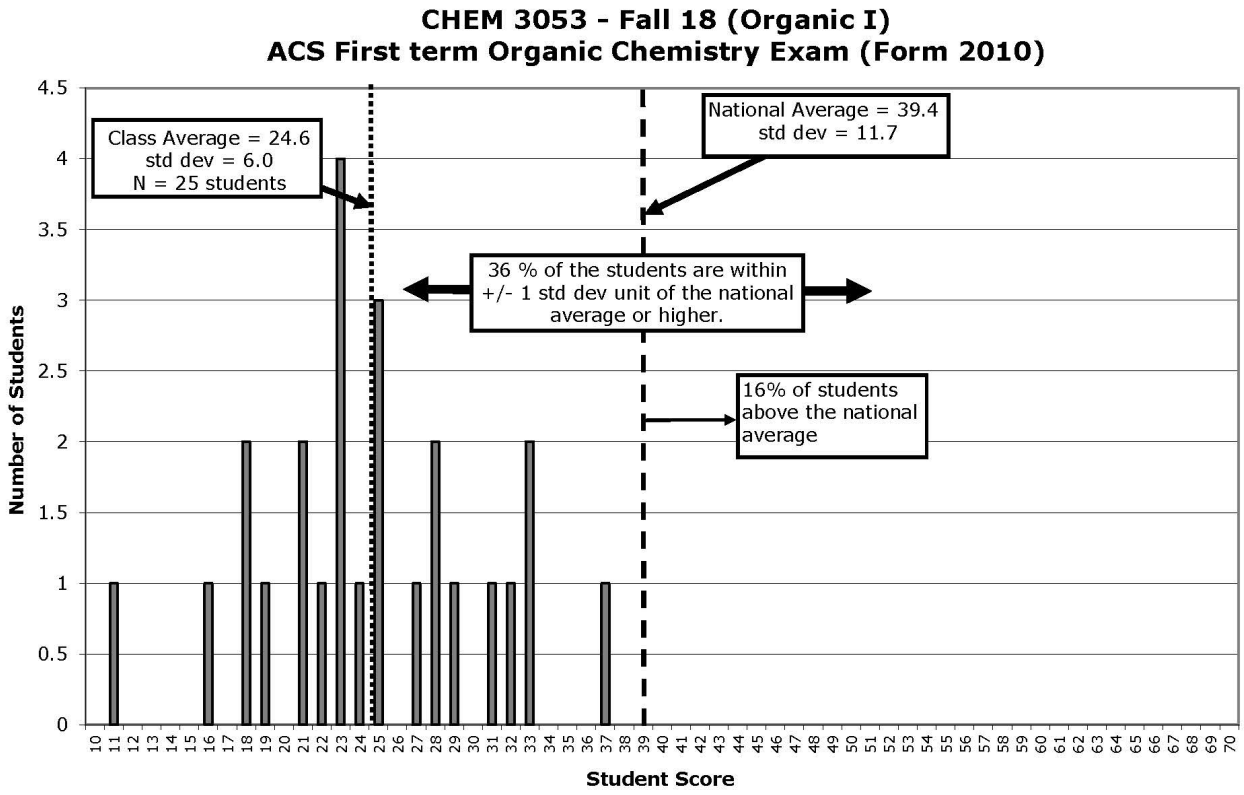


Figure 3. ACS exam for CHEM-3053 in Fall 18.

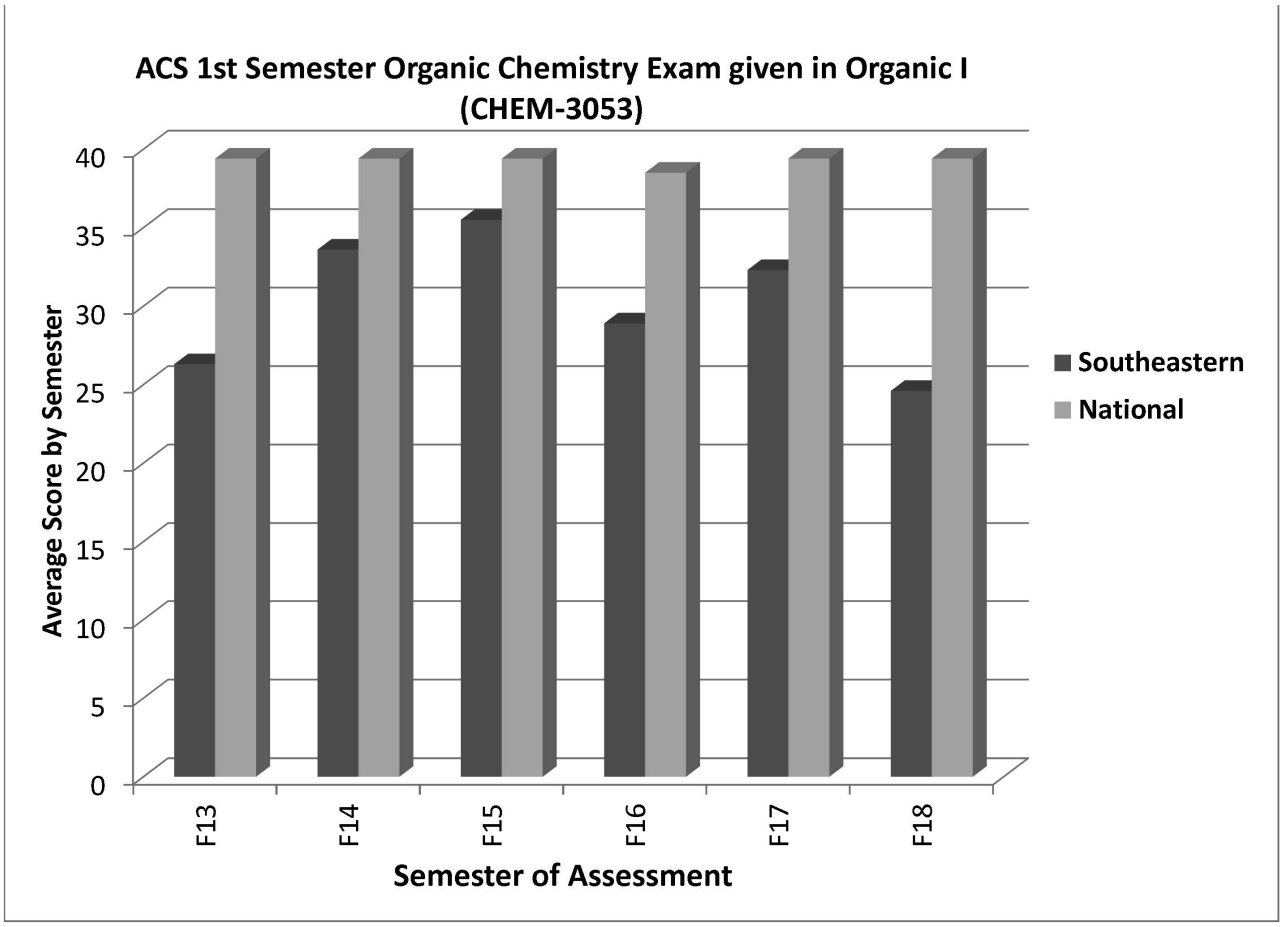


Figure 4. Historical ACS exam performance in CHEM-3053 (Organic I).

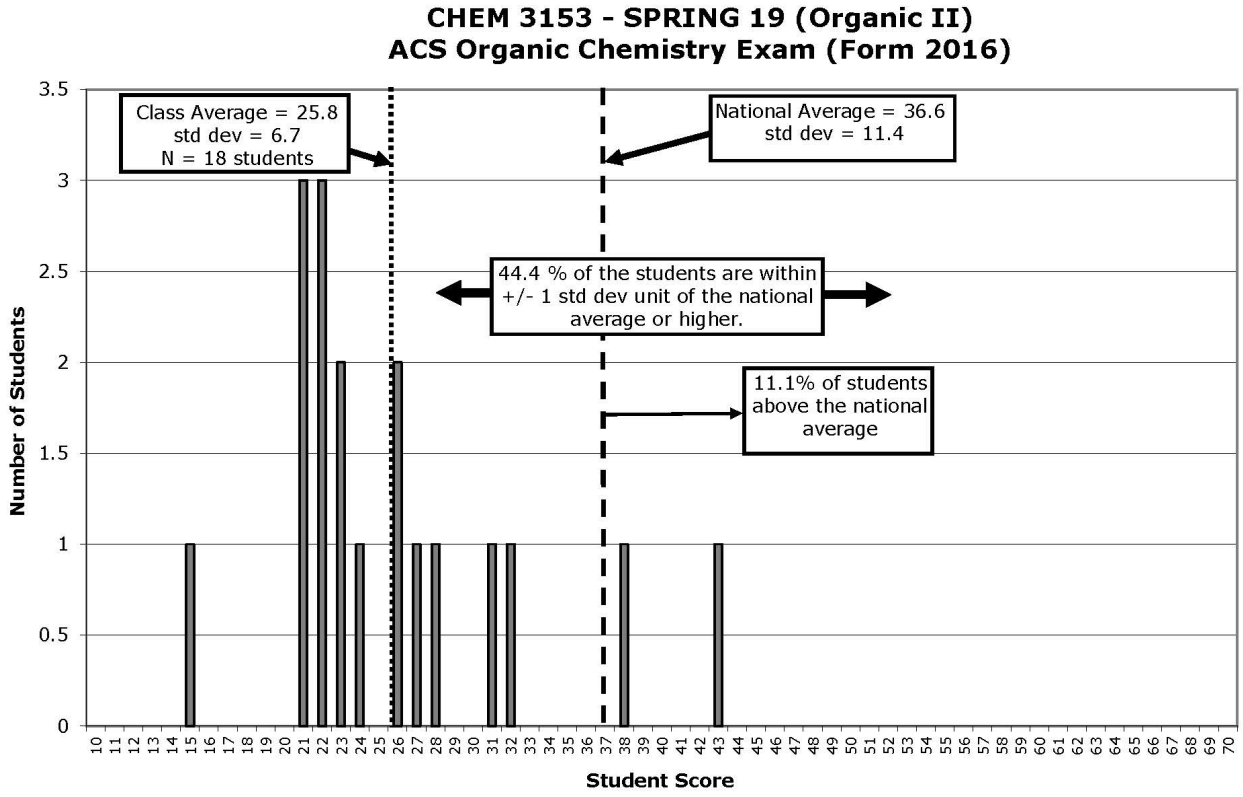


Figure 5. ACS exam for CHEM-3153 in Spring 19.

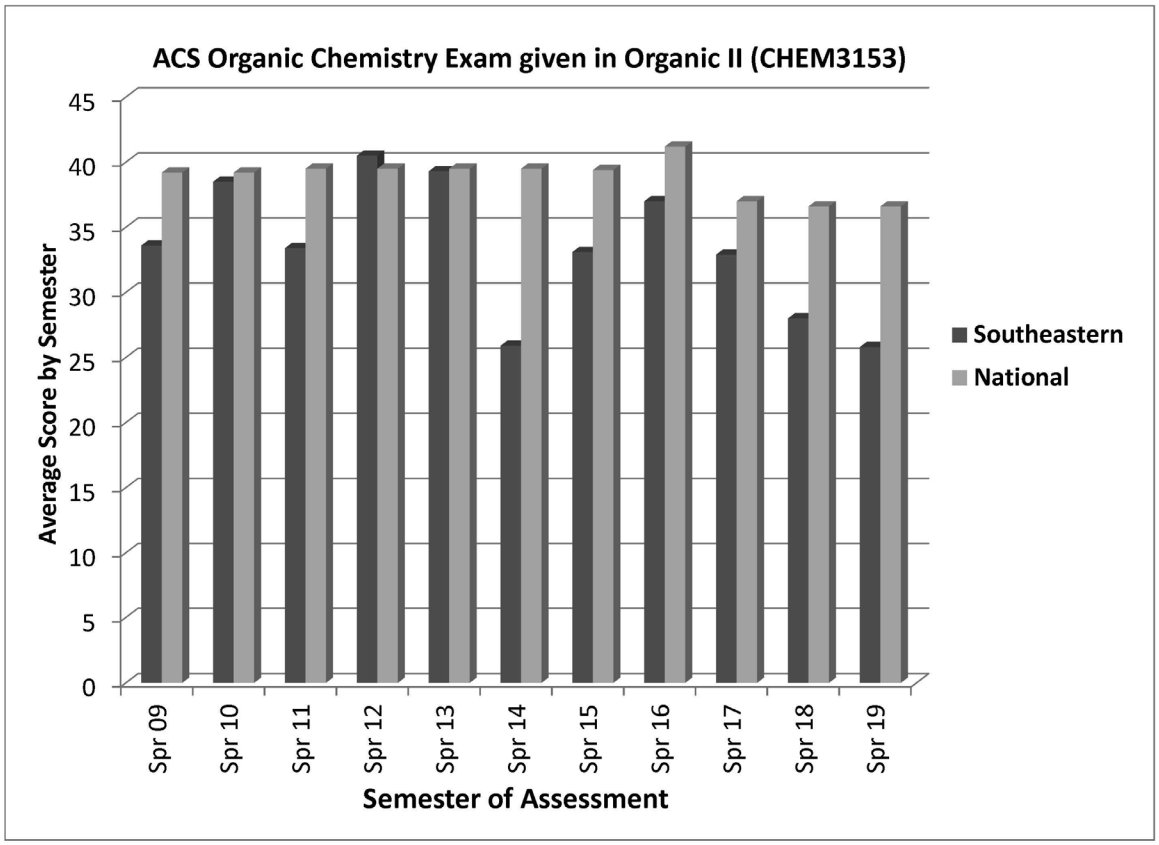


Figure 6. Historical ACS exam performance in CHEM-3153 (Organic II).

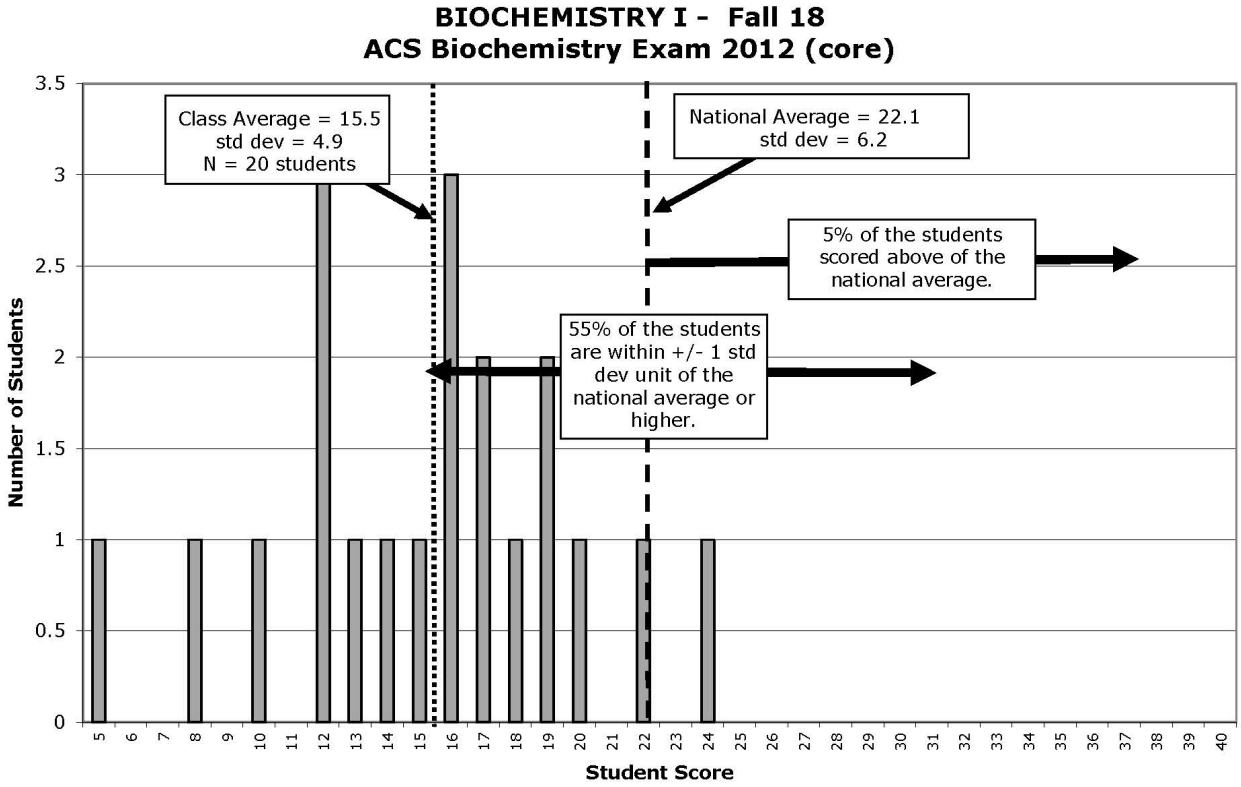


Figure 7. ACS exam performance in CHEM-4115 (Biochemistry I) in Fall 18.

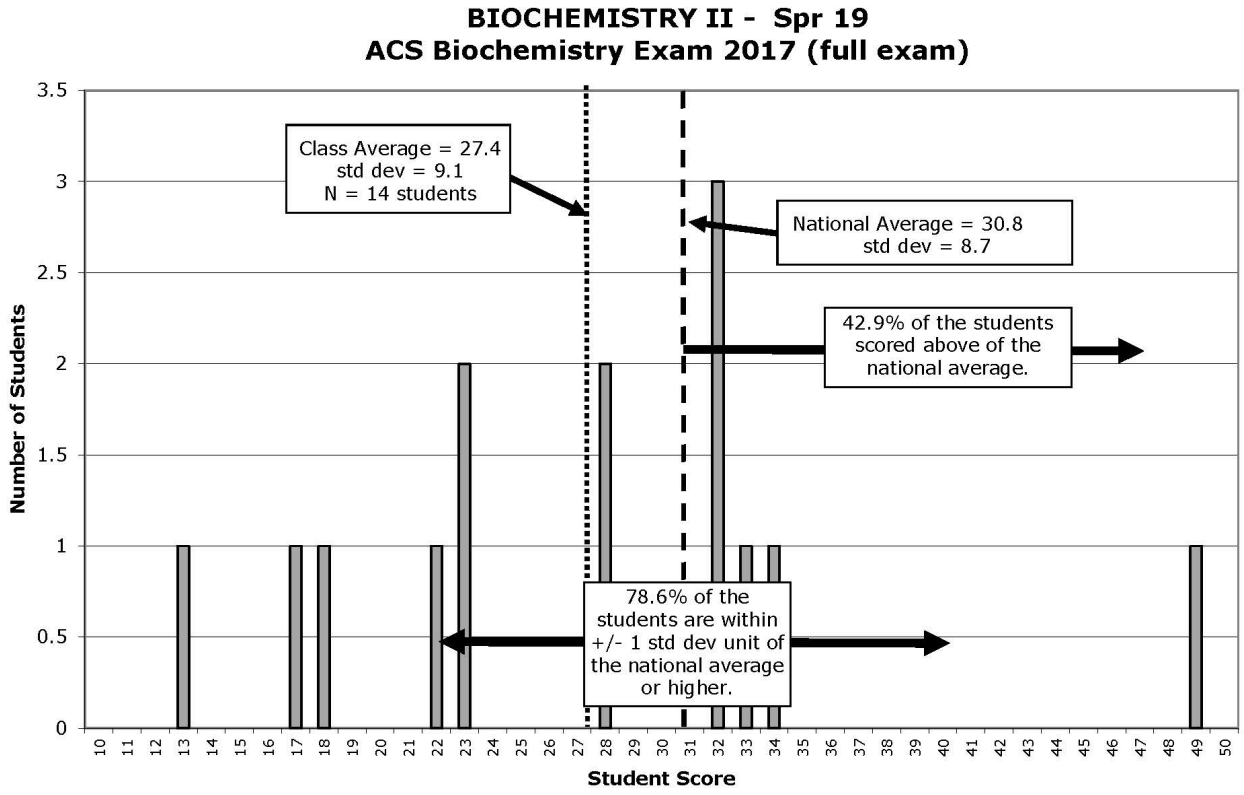


Figure 8. ACS exam performance in CHEM-4193 (Biochemistry II) in Spring 19.

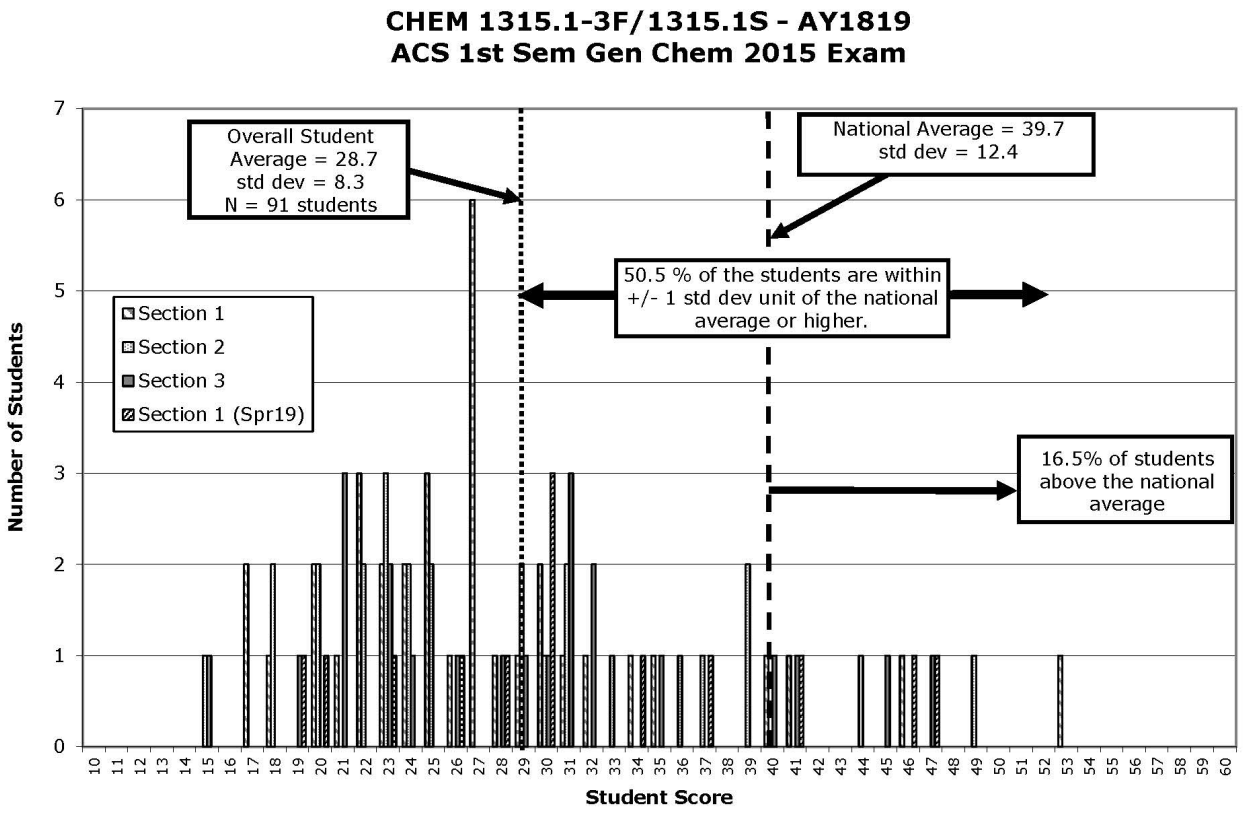


Figure 9. ACS exam performance in CHEM-1315 (Gen Chem I) in AY1819.

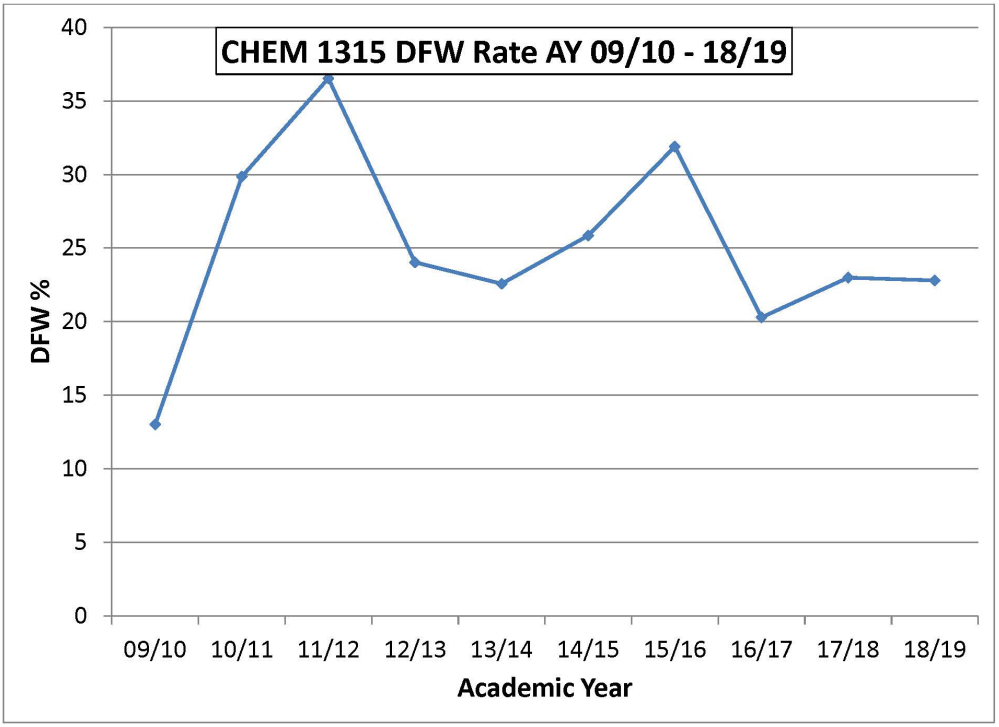


Figure 10. Historic DFW rates in CHEM-1315.

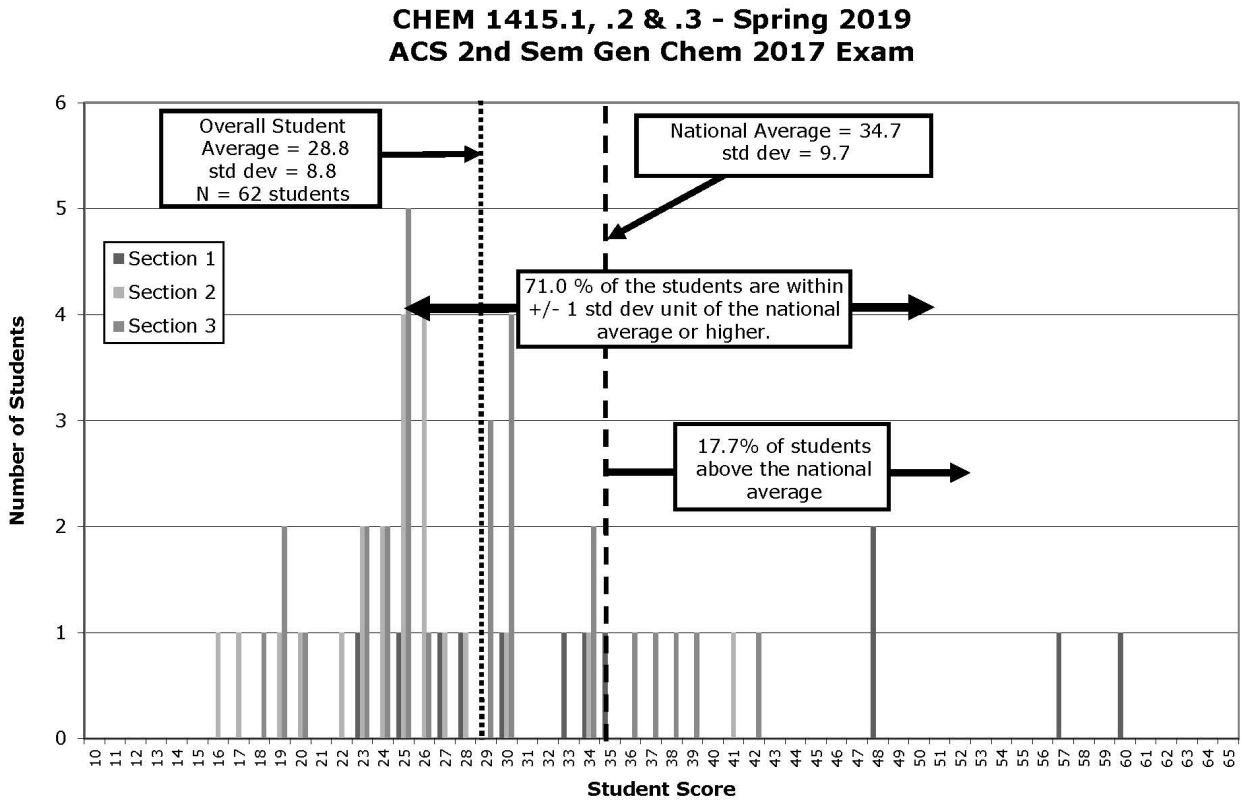


Figure 11. ACS exam performance in CHEM-1415 (Gen Chem II) in Spring 19.

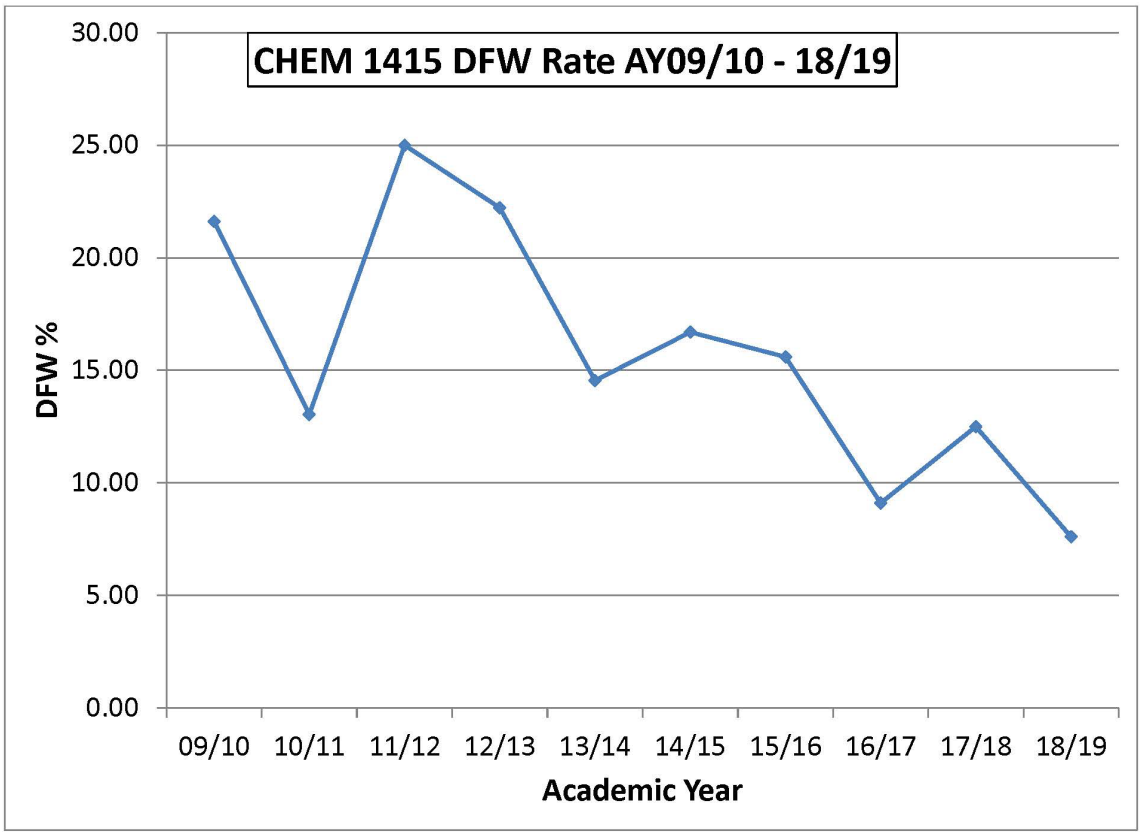


Figure 12. Historic DFW rates in CHEM-1415.

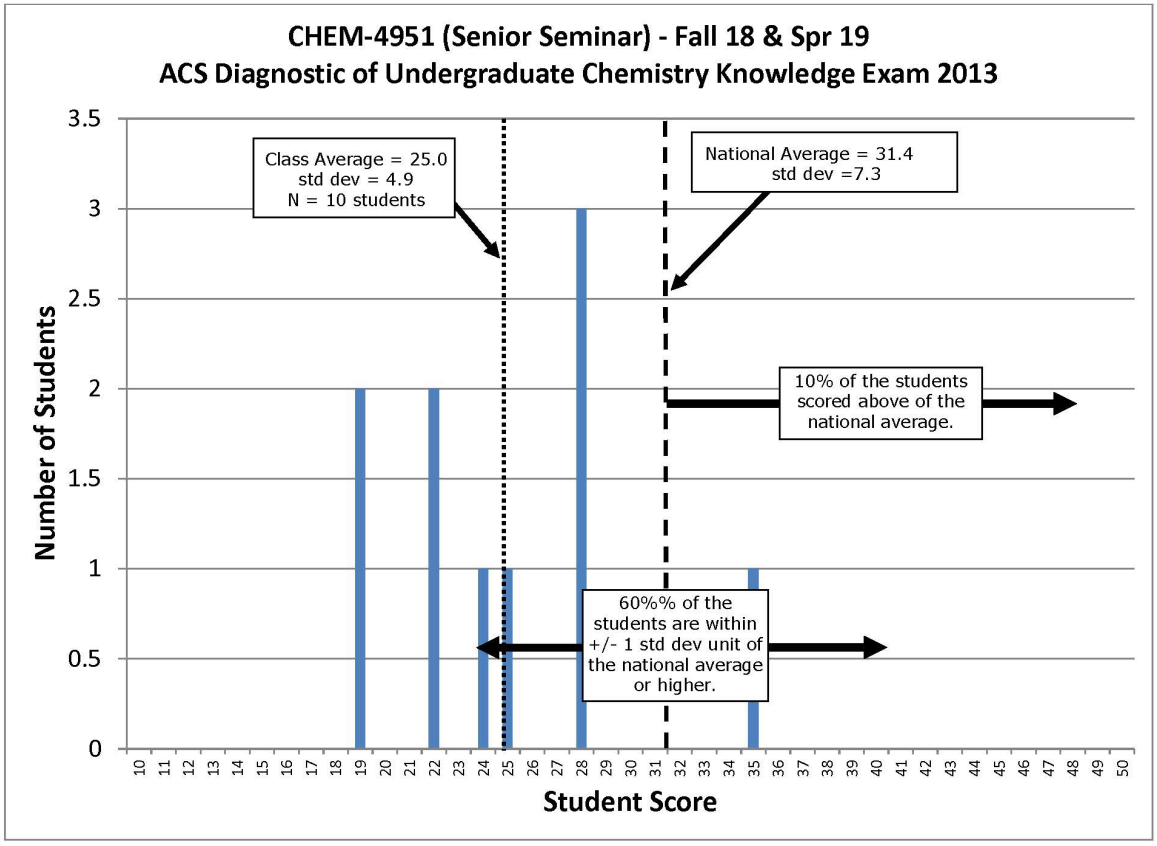


Figure 13. ACS exam performance in CHEM-3525 (Instrumental Analysis) in Spring 18.

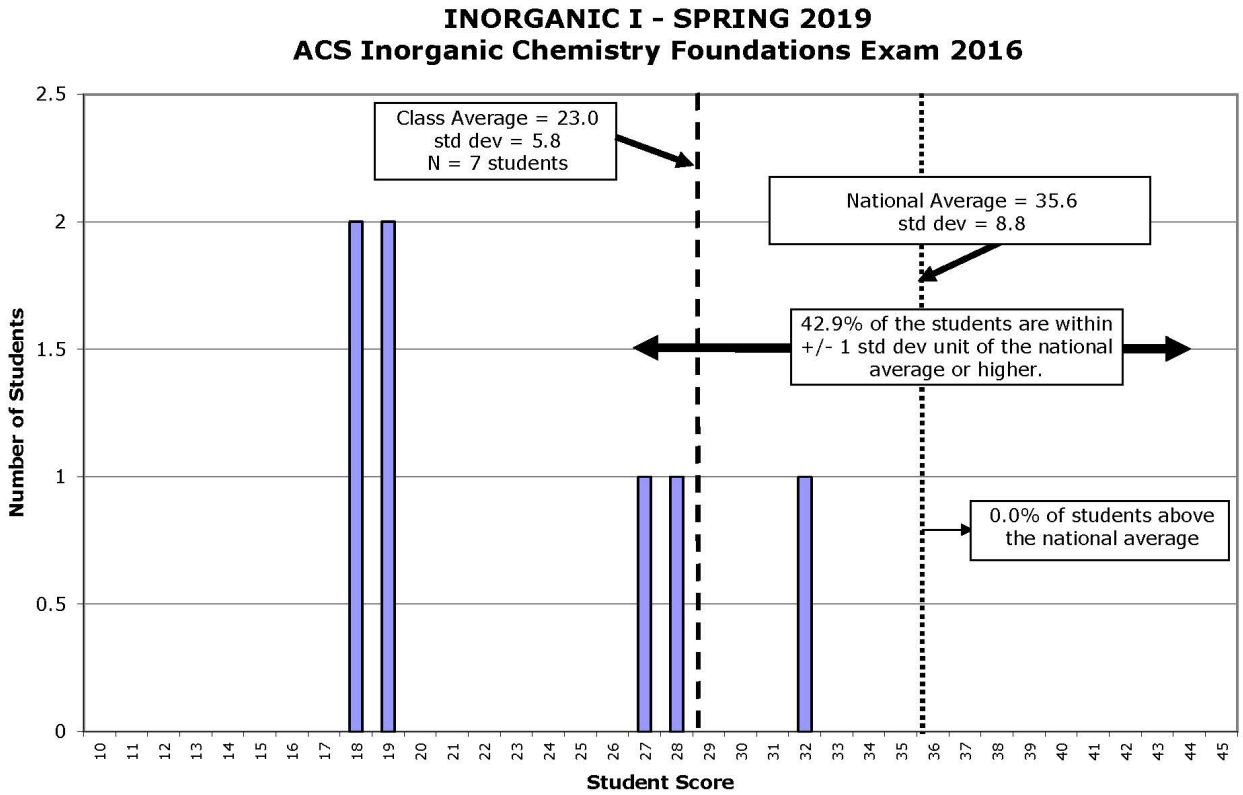


Figure 14. ACS exam performance in CHEM-2113 (Inorganic Chemistry I) in Spring 19.

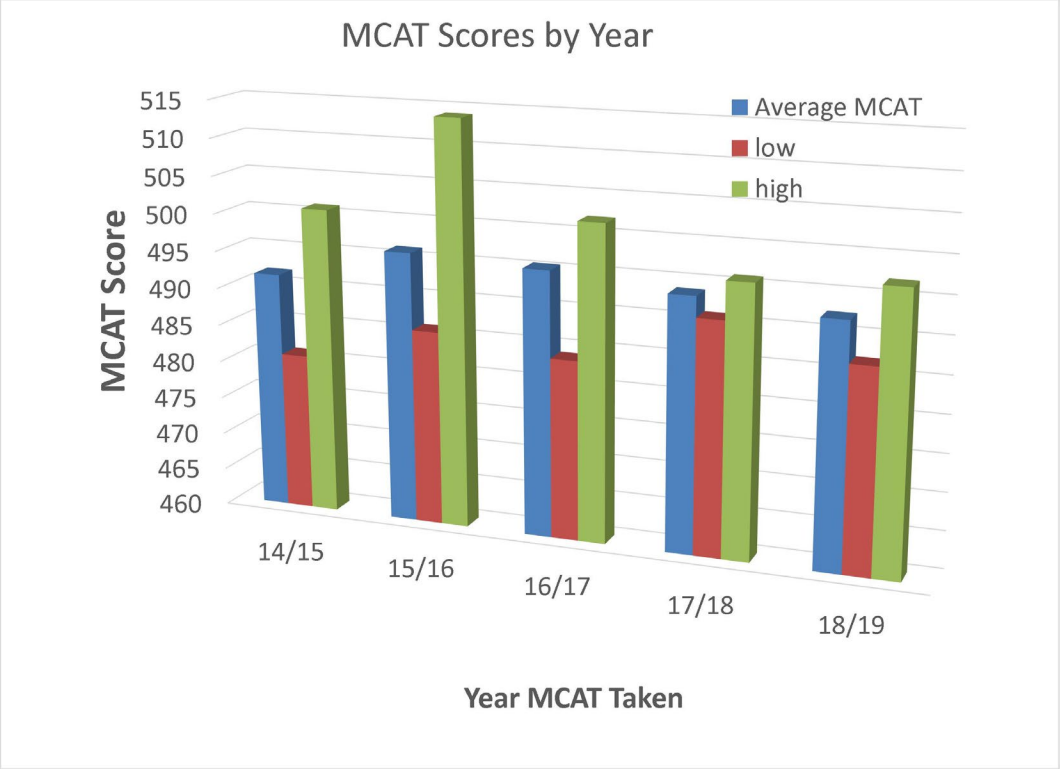


Figure 15. Variation in Composite MCAT score for SE students by year.

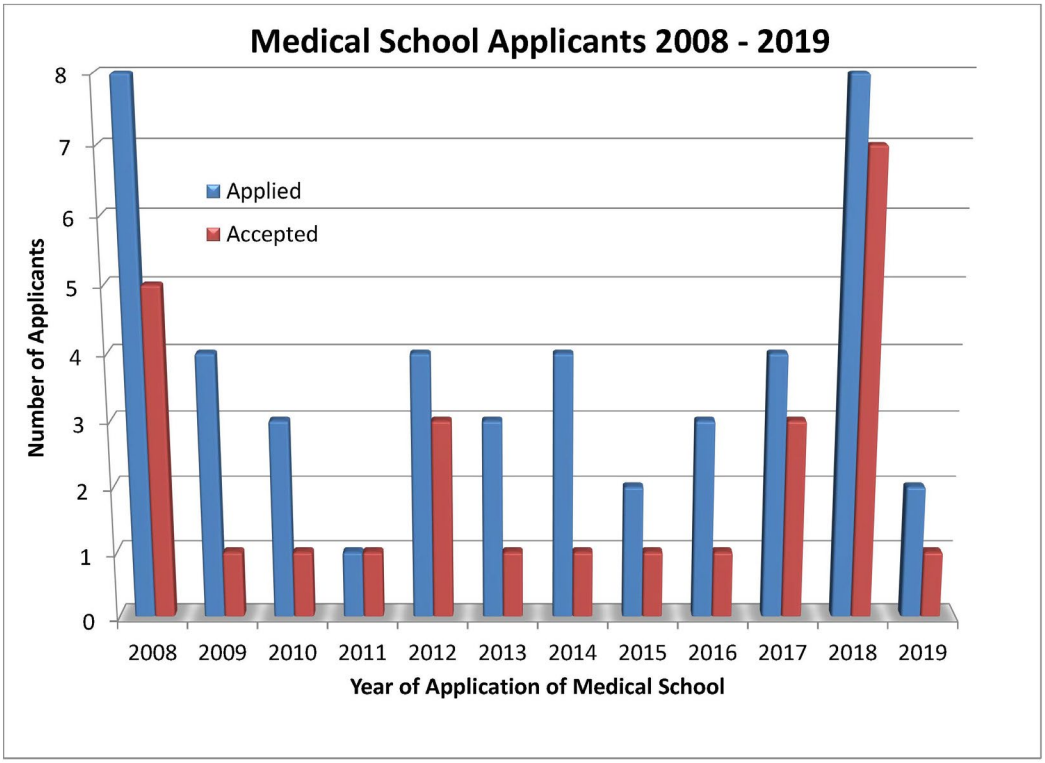


Figure 16. Medical School Applicant to Admission data by Year.

CHEMISTRY PROGRAM OUTCOMES ASSESSMENT REPORT FOR 2017-2018

Tim Smith

SOUTHEASTERN OKLAHOMA STATE UNIVERSITY

EXECUTIVE PROGRAM SUMMARY

Learning Outcome	Measure 1 (# of students assessed)	Measure 2 (# of students assessed)	Measure 3 (# of students assessed)
1	Acceptance into Graduate Programs (8)	ACS Exams (206)	MCAT Exam (4)
2	Critical Analysis of Data in Laboratory (65)		
3	Senior Seminar Presentations (15)		
4	Student Presentations (7)		
5	Student Research (7)	Group Clicker Responses (11)	
6	Safety in Lab Final Exam for CHEM-3062/CHEM-3425 (40)	Reported Laboratory Incidents	

In general, we feel that our students are achieving their academic goals and showing acceptable target results are met for most of our assessment outcomes. We realize we may have set the targets too high for some courses including the introductory level (CHEM-1315/1415) where many students realize they are not going to be chemistry majors. In general scores this were very similar to those in the previous 5 years. Also, we have strong data to show that the students appear to be getting accepted into desired secondary programs and proceed into their future careers.

We don't have any major changes to propose at this time based on our data. We do acknowledge that some Learning Outcomes need additional measures to better verify the findings.

PROGRAM OUTCOMES ASSESSMENT REPORT	
Department: Chemistry, Computer, and Physical Sciences	
Degree Program: Chemistry	
Report Submitted By: Dr. Tim Smith	**Date of Submission: September 17, 2019**
Program Mission Statement: The Department of Chemistry, Computer and Physical Sciences is dedicated to preparing its students to face the challenges and take advantage of the opportunities of the 21st century in an expanding global community by providing excellence in teaching, outstanding academic programs, and relevant research opportunities.	
Goal 1: Prepare students for career opportunities in business, industry, and government not just in the U.S. but around the globe.	
Student Learning Outcome 1	Demonstrate knowledge of chemical concepts, laws, theories, and the ability to use process skills in chemistry through observation, measurement, classification, inference, interpretation, and experimentation (including controlling variables, graphing, and communication).
Acceptance Rate into Graduate and Professional Programs	***The chemistry program serves as a major for students entering a variety of professional programs and graduate programs. Include Medical School, Dental School, Pharmacy School, Optometry School as well as other professional programs.*** ***Seven (7) of the eight (8) of the graduates that applied to graduate or professional got accepted on their first attempt. We are not reporting students that reapplied or took a gap year to refine their application. This represents a 88% admittance percentage. (all AY1718 graduates – 15 students)*** ***The acceptable/ideal target is for 50% of the Chemistry majors applying to a graduate or professional program to be accepted. Target greatly exceeded.*** ***1. One student did not get into dental school.*** ***2. Three students entered graduate programs at Dartmount College, UC San Diego, and Univ of North Texas*** ***3. Four students where accepted and enter into Medical School at Oklahoma State University-College of Osteopathic Medicine.***
ACS Exam in Analytical Chemistry	***Every student majoring in chemistry is required to take Chemical Analysis (CHEM-3425). In the lecture portion of this course the student studies the concepts, laws, and theories governing analytical chemistry. Eleven (11) students took the exam in the Fall 17 as their final exam in CHEM-3425. 36.4% scored above the national average and 81.8% scored within one standard deviation unit of the national average. See table below.*** ***The acceptable target is to have 35% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. Target met.*** ***See appendix: Figure 1. ACS Exam scores in CHEM-3425 and Figure 2. Historic CHEM-3425 exam scores.***
ACS Organic Chemistry Exams	***Every student majoring in chemistry is required to take Organic Chemistry I (CHEM 3053) and most choose Organic Chemistry II (CHEM 3153) as one of their electives – which is required in 3 of the 4 options for the Chemistry major. In the lecture portion of this two semester sequence in Organic, the student studies the concepts, laws, mechanisms, and theories governing organic chemistry.***

	The acceptable target is to have 25% of the students scoring above the national average and 75% of the students scoring within one standard deviation unit or higher of the national average. ***In the Fall 17, twenty-nine (29) students in CHEM-3053 took the ACS First term Organic Chemistry Exam as their final exam. 16% of the students exceeded the national average and 76% scored within one standard deviation unit of the national average. In the Spring 18, twenty-five (25) students enrolled in CHEM-3153 took the ACS Organic Chemistry exam as their final. 11.4% scored above the national average and 72.0% scored within one standard unit of the national average. This data are shown graphically in Figure 3-6.*** ***Target was met in the Fall 17 and closely approached in the Spring 18. There are very aggressive targets for typically second year chemistry students.***
ACS Biochemistry Exam Biochemistry I	***Biochemistry I (CHEM-4115) is a Fall chemistry course available only to students who have passed Organic Chemistry I with a grade of C or better. While approximately 50% or more of the students take Organic and General Chemistry at SE, a large percentage take their prerequisite chemistry courses at another institution. CHEM-4115 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Sciences and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry minors, especially combined with a Biology major. Biochemistry I is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry I includes coverage of the basic building blocks of proteins and cells, their functions and nomenclature, simple biochemical calculations (including kinetics) and data interpretation. The course contains a 4-hour laboratory weekly component to provide an introduction to basic biochemical laboratory techniques and to re-enforce lecture concepts. The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester and therefore cover broader material in the single semester. For years in CHEM 4115, students were asked to answer only the ACS exam questions covered in the Biochemistry I course, since many of the questions relate to the follow-up Biochemistry II course at SE.*** ***Beginning in Fall 2012, CHEM 4115 students were asked to answer all questions on the 2 semester exam, and their scores were compared with the national norms available for student in 1-semester courses. The scores obtained by the students only had a direct impact on their final grade if their adjusted score on the ACS standardized exam exceeded their score on a regular exam, in which case it would replace the lower score; there was no penalty for poor performance on the ACS exam. The student scores in CHEM-4115 are also compared with the national averages. Fifteen (15) students took the ACS Biochemistry Exam in the Fall 17. This data is displayed in Figure 7.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average. Target was met in Fall 17 with 67% scoring with one standard deviation unit of the national average.***
ACS Biochemistry Exam Biochemistry II	***Biochemistry II (CHEM-4193) is a Spring chemistry course available only to students who have passed Biochemistry I with a grade of C or better. (The course is cross-listed as CHEM-4193: Biochemistry II and BIOL-4193: Metabolism.) Typically approximately 50% of the students who take Biochemistry I will continue on to take Biochemistry II. CHEM-4193 is taken as a required course by students pursuing the 2 Chemistry tracks of Interdisciplinary Medical Science and Biochemical Technology, as an elective by students majoring in the other 2 tracks of Chemistry, and as an elective by Chemistry and Biology minors. This course is frequently recommended or required for students seeking entrance into chemistry PhD graduate programs or professional programs leading to advanced healthcare degrees (medical, pharmacy, optometry, dental, medical technology). Biochemistry II includes coverage of the basic knowledge of common anabolic and catabolic pathways, the regulation of these pathways, and their relation to energy production or human diseases. Pathways covered include the breakdown and synthesis of carbohydrates, amino acids, lipids, and nucleotides. The course also includes an introduction to basic biochemical methodology and***

	techniques for determining the nature of these pathways and to illustrate the relevance of biochemistry to everyday life and medicine. ***The American Chemical Society Exams Institute has provided for years a standardized exam which is designed to cover a 2-semester biochemistry course sequence, although it is also used by some 1-semester biochemistry courses at institutes which do not offer a second semester. Beginning in Spring 2013, CHEM 4193 students were asked to answer all questions on the 2 semester exam, and their scores were compared with the national norms available for student in 1-semester courses.*** ***The scores obtained by the students only had a direct impact on their final grade if their adjusted score on the ACS standardized exam exceeded their score on a regular exam, in which case it would replace the lower score; there was no penalty for poor performance on the ACS exam. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** ***As a part of the second semester of Biochemistry (CHEM 4193 Biochemistry II) each student was required to take the American Chemical Society Standardized Exam BC12, an exam described by the source as "Designed for the end of a two-semester sequence in Biochemistry. Includes a few items with content related to laboratory experiments in Biochemistry." In Spring 2018, nine (9) students took the exam. The results are illustrated in Figure 8. 22% of the students scored above the national average for the 2-semester scores, while 67% of the students are within +/- 1 standard deviation of the national average or higher. The acceptable target was met.***
ACS First Semester General Chemistry Exam in CHEM-1315	***General Chemistry I (CHEM-1315) is the highest of the three levels of first- semester chemistry course offered at SE. This course is commonly referred to as "Majors/Pre-Professional Chemistry". CHEM-1315 is the entry point for students who will major in Chemistry and Medical Sciences; for all students meeting general chemistry requirements for entrance into programs of advanced healthcare degrees and a Chemistry minor. It includes nomenclature, atomic and molecular structure, stoichiometry, bonding, states of matter, thermochemistry, acids and bases, and gas laws. The course contains a 4-hour laboratory weekly component.*** ***We have recently begun to recognizing the importance of assessing student learning not only in the junior and senior level courses, but also in their freshman level Chemistry courses as well. As a part of this, each student in CHEM-1315 was required to take the American Chemical Society First- Semester General Chemistry Exam in Fall 2011. This exam tests the student's knowledge of both theoretical and experimental first semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring within one standard deviation unit or higher of the national average.*** ***During the Fall 2018 semester, sixty (60) students took the exam. 43.3 percent of the students were within one standard deviation of the national mean or higher. 13.3 percent of the students were above the national average. Figure 9 illustrates individual student performance on this exam. One previous area of concern had been the %DWF rate for CHEM-1315. Changes in teaching assignments annually yield a different set of faculty teaching this course. Figure 10 shows the %DFW rate annually over the past 8 years for CHEM-1315 (Fall 09/10 – 17/18). DFW rates are remain favorable compared to BIOL-1404 and MATH-1513 which are typically taken by the same student.*** ***In conclusion, the acceptable target (25%) of scoring above the national average and the acceptable target (55%) of scoring within one standard deviation unit or higher of the national average was not met.***
ACS Second Semester General Chemistry Exam in CHEM-1415	***General Chemistry II (CHEM-1415) is the continuation course of CHEM-1315. It also serves as the prerequisite for most upper-level Chemistry courses and a prerequisite for most pre-professional programs. Success in CHEM-1415 is critical for students who will continue to major in Chemistry, Biotechnology, and Medical Sciences. CHEM-1415 emphasizes on kinetics, equilibrium, thermodynamics, electrochemistry, qualitative analysis, organic chemistry,***

	biochemistry, and nuclear chemistry. The course also contains a 4-hour laboratory weekly component. ***As was the case with CHEM-1315, we have recognized the importance of assessing student learning in CHEM-1415. As a part of this assessment, each student in CHEM-1415 was required to take the American Chemical Society Second-Semester General Chemistry Exam. This exam also tests the student's knowledge of both theoretical and experimental second semester chemistry. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 25% of the students scoring above the national average and 55% of the students scoring with one standard deviation unit or higher of the national average.*** ***In Spring 2018, only thirty-nine (39) students took the exam. The individual student performances are show in Figure 11. Only two sections of CHEM-1415 were offered due to the lower student enrollment. In a very similar fashion to CHEM-1315 the previous Fall, 43.6 percent of the students were within one standard deviation of the national mean or higher. A much lower 5.1 percent of the students scored at the national average or higher. The results were quite disappointing. However, this was largely the same group of tepid students from the previous Fall semester. The department continues to track the various factors that have contributed to this data. It is critical that Chemistry majors have a proper foundation in General Chemistry in order to be successful in the major. We have placed an emphasis on providing the students with the strongest foundations possible. The DFW rates remained low in CHEM-1415 as shown in Figure 12.*** ***In conclusion, the acceptable target (25%) of scoring above the national average was not met whereas the acceptable target (55%) of scoring within one standard deviation unit or higher of the national average was closer than the previous semester.***
ACS Instrumental Analysis Exam In CHEM-3525	***Instrumental Analysis (CHEM-3525) is only a required course in the Chemistry major-minor: Profession Chemist option. Historical less than 50% of the SE Chemistry majors take CHEM-3525. As more majors are choosing the Medical Sciences opinion the enrollment in CHEM-3525 continues to decrease. This course has both lecture and laboratory components involving basic electronics, computer control of chemical instrumentation, spectral, electrochemical and chromatographic methods of analysis, and laboratory automation. While the lecture portion deals with the theoretical concepts of instrumentation, the laboratory portion is very similar to analytical chemistry except that more sophisticated instrumentation is used.*** ***As a part of CHEM-3525 each student is required to take the American Chemical Society Standardized Exam in Instrumental Analysis as their final exam. This exam tests the student's knowledge of both theoretical and experimental instrumental analysis. The scores obtained by the students have a direct impact on their final grade. The scores are also compared with the national averages.*** ***The acceptable target is to have 35% of the students scoring above the national average and/or 75% of the students scoring within one standard deviation unit or higher of the national average.*** ***Each student taking Instrumental Analysis (CHEM-3525) is required to take the American Chemical Society Standardized Exam in Instrumental Analysis as their final exam. This exam assesses the student's knowledge of both theoretical and experimental concepts of instrumental analysis as applied to analytical chemistry. The scores are also compared with the national averages. In Spring 18, only three (s) students took the ACS Instrumental Analysis exam. Individual student scores are shown in Figure 13. Sixty-seven percent of the CHEM-3525 students were within one standard deviation of the national mean or higher).*** ***In conclusion, the acceptable target of 35% above the national average and 75% within one standard deviation unit was approached, but was not met.***
ACS Diagnostic of Undergraduate Chemistry Knowledge Exam in CHEM-4951	***The Diagnostic of Undergraduate Chemistry Knowledge (DUCK) exam is designed to be taken at or near the end of a four-year undergraduate curriculum. This was developed by the American Chemical Society's Exams Institute and has comparative national norm data. All items on the exam are part of scenarios that require knowledge from more than one traditional area of chemistry, so students are less likely to segment their knowledge into such***

	areas and be successful on this exam. This performance on this exam is reflect of the cumulative learning experience in the entire chemistry major. This exam will be given during the capstone Chemistry Senior Seminar course, CHEM-4951. Assessment is required for all majors, even students taking Biology Senior Seminar as part of the Medical Sciences track. ***The acceptable target is to have 25% of the students scoring above the national average and 60% of the students scoring within one standard deviation unit or higher of the national average.*** ***For the academic year 17/18, a total of 15 students took the ACS Diagnostic of Undergraduate Chemistry Knowledge Exam (DUCK). Individual student performances are shown in Figure 14. 66.7% of them scored within 1 standard deviation unit of the national average. 13.3 % of the students scored above the national average.*** ***In conclusion, the acceptable target was exceeded for students scoring within one standard deviation unit of the national average.***
Medical College Admission Test (MCAT)	**The MCAT is a test required for admission into all medical programs, medical doctorate and osteopathic doctorate, in the U.S. The MCAT is a standardized, multiple- choice examination designed to assess the examinees' problem solving, critical thinking, writing skills, and knowledge of science concepts and principles necessary to the study of medicine. Scores are reported in Verbal Reasoning, Physical Sciences, Writing Sample, and Biological Sciences. Chemistry represents anywhere from 35 to 40% of the MCAT by subject area. Students are to have completed a minimum of 20 hours of chemistry (General and Organic Chemistry) at the point of taking the MCAT and most have more than 30 hours at this point. The MCAT is administrated by the Association of Medical Colleges and a student's performance on this critical test is made available to the pre-medical advisory committee at each undergraduate institution.** **The acceptable target is for the 50% of chemistry majors to score 492 or higher on the MCAT. A 492 represents the minimum score required to apply by medical scores in Oklahoma and Texas.** **Our combined average MCAT for 17/18 was a 493.8 for the four (4) students that took the MCAT during this period. The minimum MCAT required to apply to Oklahoma medical school (OUHSC and OSUCOM) is a 492. Seventy-five percent of the students scored at a level to meet the minimums to apply with individual scores 491 (21st percentile) to 496 (35rd percentile. The student's average percentile on Biological and Biochemical Foundations of Living Systems was a 32.5% and for Chemical and Physical Foundations of Biological Systems was 46.0%, which mains favorable to the chemistry component. Figure 14 shows the low, high, and average MCAT in comparison to recent years at SE. This cohort was significantly weaker overall in that no student exceed a 500 score. However, the acceptable target was exceeded with 75% of the students scoring above a 492.**
Summary of Assessment Results	**We have a good number of assessment measures that provide national comparative norm data. Several of the courses meet they acceptable targets when the ACS exam was part of the student's grade (final exam). Like most programs, some individual students performed extremely well and some individuals performed poorly. By increasing the standards of "C" higher to proceed into CHEM-1415 and CHEM-3053 and using the ACS exams for our final exams, the number of low performing students is a smaller percentage compared to 10 years ago. The number of students entering graduate and professional programs strongly indicates our students are gaining the fundamental knowledge need to succeed in the major.**
Use of Results and Reflection	*One of greatest challenges is dealing with the increasing number of transfer students that come in with their first one- or two-years of chemistry being completed at a junior college that does not have the level of rigor we required for freshman chemistry. While certainly some transfer students have succeeded, others have found the transition to be very difficult. We might consider the implementation of placement or leveling exams to make sure transfer students have skills needed to succeed in the upper level chemistry courses. However, if a student is forced to repeat a course that is already accepted on their transcript by a transfer agreement issues with financial aid will likely occur. This is one of the first years our student met the target with 60% of the cohort scored within one standard deviation unit of the national average for the ACS Diagnostic of Undergraduate*

	Chemistry Knowledge Exam given in our Senior Seminar course. We view this as a positive change in student demonstration of knowledge in field.
Student Learning Outcome 2	Show competence in cognitive analysis of chemical information, recognition of organizing principles in information, and proficiency in library and computer skills in obtaining information and analyzing data.
Critical Analysis of Chemical Data	***This outcome is measured in several courses and because of its nature it is difficult to quantitatively measure. The outcome can be seen in two aspects of the department's instruction. The first is in the cognitive analysis of the student's own information collected in the laboratory portion of core and elective courses. The instructional emphasis in the 5-semester hour courses is forty percent on these laboratory-based competencies. Specific requirements are discussed in the paragraphs below. The second aspect of this competency is exhibited in the cognitive analysis of literature information assigned in several of the courses. Several of the 3000 and 4000 level courses include a research paper that requires that the student perform a literature search, organize key scientific information, and prepare a report and/or oral presentation.*** ***The acceptable target is for Organic Chemistry Laboratory (CHEM-3062/3162) is that 75% of the student will earn an A, B, or C in that course. Chemical Analysis (CHEM-3425) also has a significant laboratory component that requires critical analysis of data. The acceptable target for CHEM-3425 is that the student's average laboratory component be 70% or higher of the available points.*** ***In Organic I (CHEM3062-Fall 17) the percentage of students earning an A, B, or C was 93.1% with a total of twenty-nine (29) students. In Organic II (CHEM3162-Spring 18) the percentage of students earning an A, B, or C was 88.0% with a total of 25 students. This again was a very strong cohort in Organic and lab performance parallels the student's performance in the lecture. In Chemical Analysis (CHEM3425), the student's average lab score was 81.3% with a total of eleven (11) students. Nine of the eleven students in CHEM-3425 for the Fall 17 had a lab average that exceeded 70%. These scores exceeded the acceptable target.***
Critical Analysis of Chemical Data Summary of Assessment Results	**This learning outcome is one of the harder to quantify. Overall student performance in the selected courses demonstrate an acceptable skill set for processing chemical information. It should be noted that all of the students being evaluated are beyond freshman status and many are juniors or seniors by credit hours. These students have frequently developed a strong cognitive analysis skill set due to the complex nature of the CHEM-3000 and -4000 courses.**
Use of Results and Reflection	*These findings illustrate a strength of our students. Our chemistry majors take significantly more lab courses (and hours) than chemistry majors at other institutions in the state and nationally. The increased lab exposure leads to increased student success.*
Student Learning Outcome 3	Demonstrate skill in the synthesis of information by preparing and presenting reports, proposing plans or sets of operations, and/or making derivations of abstract relations.
Senior Seminar Presentations	***These outcomes are assessed in several of our advanced chemistry courses where students are required to write up detailed laboratory reports using both library and computer skills. However, every student taking Senior Seminar is required to do a research project which requires them to use library resources, organize and present their findings in both a poster presentation, a written report, and an oral presentation. It is important to note that while chemistry majors and chemistry major-minor students must take the Chemistry Senior Seminar, some of the interdisciplinary double majors (chemistry-biology) opt to take the Biology Senior Seminar and, therefore, do not appear in the statistics. The chart below shows the number of students who have manifested the proficiencies of Outcomes 2 and 3 in Senior Seminar during the past eight years. The papers are peer-reviewed before either presentation or publication. The chemistry faculty evaluates the poster presentations, the oral reports, and the written reports. The evaluations are used in assigning a grade for each individual student's performance. Generally, it can be said that the chemistry faculty believes that the students' performances on their presentations and reports met the requirements of***

	Outcomes 2 and 3. Since students in the Biology Senior Seminar have to met similar requirements as those in chemistry, it seems reasonable to assume that the interdisciplinary Medical Sciences majors also met the requirements of Outcomes 2 and 3 as well. ***The acceptable target is that 80% of all graduating chemistry majors produce an acceptable senior seminar presentation.*** ***For the academic year 17/18, the number of graduating students were 15. All students demonstrated satisfactory skills in the synthesis of information in their projects and no repeats were required in the Seminar Course (CHEM-4951 or BIOL-4981). The acceptable target was exceeded.***
Summary of Assessment Results	**The track record for students taking our CHEM-4951 remains strong. Rarely do students have to repeat presentations due to a lack of performance. We do have a variable number of students that course the Medical Sciences option that take the Biology Seminar course (BIOL-4981) in lieu of our CHEM-4951 in order to fulfill hour requirements.**
Use of Results and Reflection	*Target is greatly exceeded. Several upper level chemistry courses also require reports and presentations as part of their normal course expectations. Data was not collected for courses other than CHEM-4951.*

Student Learning Outcome 4	Exhibit intellectual honesty, open- mindedness, and objectivity in the accumulation and interpretation of information and form value judgments on ethical issues in the conduct of chemistry and the applications of chemistry in society.
Student Presentation and Publications	***The acceptance of papers for presentation and publication not only demonstrates the students' skills in synthesis of information but also supports the first part of this competency as well. Without the qualities of intellectual honesty, open-mindedness, and objectivity they would not be accepted. The same can be said for the students' performance at state, regional and national meetings where they deliver poster and platform presentations.*** ***The acceptable target is 30% of graduating students perform a student presentation or publications at local, state, or national conferences each year.*** ***Six (6) chemistry majors or double majors presented at least 9 formal poster presentation in Oklahoma or at national meetings in AY17-18, co-authored with Chemistry faculty, other Chemistry majors, or off-campus researchers. A sevenh presented a talk co-authored with Biological Sciences faculty. Although in some cases the poster titles may be similar, generally the posters were altered between presentations, to incorporate new data or to adapt to the specific requirements and audience at each meeting. This total number of students (7 out of 15 total graduates) represent 47% of the number of graduating students and therefore we have met the acceptable (30%) and are approaching the ideal (50%) targets for students presenting at local, state and national meetings. Other students did participate in research on or off campus, but declined to present during this year.*** ***A list of poster and oral presentations and presenter names and meetings is included in the supporting documents in Table 1. The university has made severe cuts to travel funding, especially for out-of-state travel support for faculty. However, externally supported programs using federal funds continued to support both student and faculty sponsor travel (such as NSF LSAMP and NASA Oklahoma Space Grant), and NIH OK-INBRE provides a new travel grant program which helped offset some cuts. Presentation sites included the usual annual OKINBRE Summer 2017 Intern poster presentations at OUHSC in OKC, the Fall OK-LSAMP (OKAMP) statewide meeting in Stillwater, OK, the annual 2018 Oklahoma Research Day in Enid, OK, the annual 2018 Oklahoma Research Day at the OK Capitol (1 student per campus) and the National American Chemical Society meeting in Spring 2018 in New Orleans, and the National Fall 2017American Indian Science and Engineering Society (AISES) meeting in***

	Denver, CO. Not all events are judged, but Payton Whitehead won First Place in his category and $500 at the Oklahoma Research Day at the OK Capitol and Matt Maxwell won an award for his talk at the Fall OK-LSAMP (OKAMP) statewide meeting. This illustrates that our students are not merely showing up, they can excel, as judged by independent reviewers.
Summary of Assessment Results	***The number of student presentations is down compared to the previous year. The on-campus BrainStorm Spring poster session no longer occurs, and the statewide OK Research Day in Spring has been at very distant locations and has suffered from poor scheduling and limited space for posters, so participation of the Chemistry Department in those events is at or near zero. Four students were taken to the Spring National ACS meeting, which can be a very valuable professional experience, but this was because NASA and LSAMP funds were available and the dates of the ACS meeting fell during our spring break so no classes were missed. Most students and faculty are hesitant to miss class times to present during the regular semesters. Also, the number of Southeastern students applying to the 8-10 week summer REU internships and similar programs in and out of state was far below that of past years. We are trying to reverse this trend, but many STEM majors have lucrative non-science summer jobs that they are afraid to take a leave of absence from, or have family obligations.***
Use of Results and Reflection	*The most commonly choose options in the Chemistry major do not require a student research component. Many Pre-Professionals choose to pursue a semester or summer of research to make their application more competitive. We feel the 30% participation is a healthy target for our students.*
Student Learning Outcome 5	Show interpersonal skills that promote the accomplishment of team goals in small groups.
Student participation in research	***The Department of Chemistry, Computer, and Physical Sciences has historically had active research groups. These groups involve chemistry students and faculty who conduct original research, most of which is funded by external grants from places such as the National Institutes of Health (NIH) OK-INBRE, the Oklahoma Center for the Advancement of Science (OCAST), National Science Foundation Oklahoma EPSCoR, and the National Aeronautics and Space Administration (NASA) Oklahoma Space Grant and EPSCoR.*** ***During the research process students typically work in teams under the direction of a faculty advisor. The students are intimately involved in accumulating, interpreting, and analyzing information acquired from the experiments they perform. They are required to make value judgments on the validity of the information and experimental processes. In addition, they must be completely open and honest in the collecting and sharing of information with other team members in their respective research group. While not all student researchers enroll in CHEM-4990 (Research), any student seeking course credit for research must prepare a written research report explaining what they did, why and how they did it, what their results meant, and also acknowledging any input from other fellow researchers. Some students work as paid summer research interns off- campus, and learn to work with other students, postdocs, technicians, and PhD researchers in a full- time laboratory environment to try to answer very specific research questions, while also writing reports and earning CHEM-4990 Research course credit. Not all but many of these student researchers contribute to a public presentation of the research team's results, most commonly in poster format. Our American Chemical Society student chapter (composed of a variety of science majors) also worked together in small groups to accomplish many projects, and also presented a summary of their activities in poster format at their national professional meeting.*** ***The participation in research is done at the discretion of the student. Both chemistry major-minor tracks (Professional Chemist and Biochemical Technology) require a research for credit (CHEM-4490 2-4 hours). Students may choose to do this during the academic year or over the summer semester. Opportunities for research exist on the SE campus and at off-campus sites.*** ***The acceptable target is that 50% of all chemistry majors participate in some organized semester long research activity.*** ***In AY 17-18, we had seven (7) students enroll in either CHEM4990 Research (5 students) or CHEM2212 Introduction to Research (2 students) in Fall, Spring and/or Summer semesters,***

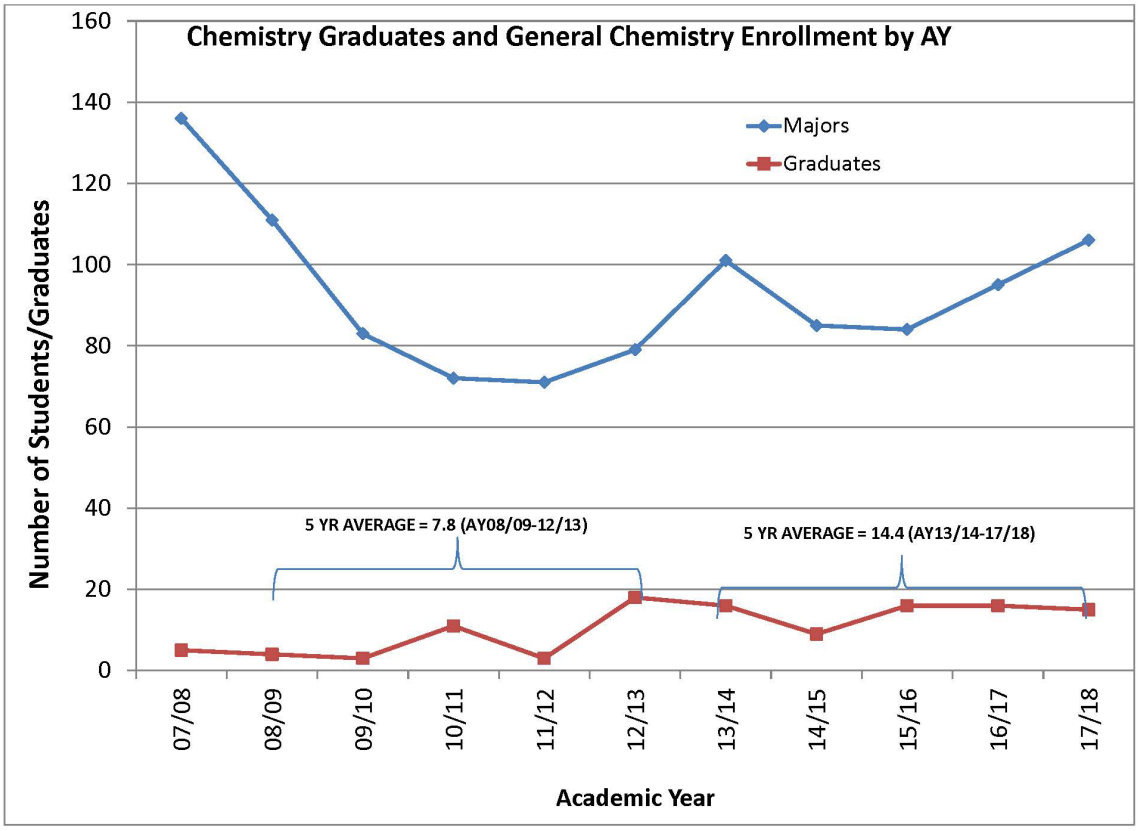
	and all were either Chemistry majors or Biology/Chemistry double-majors. All 5 of the CHEM4990 Research students graduated in December 2017 or May 2018. This total number (7) for CHEM4990 and CHEM2212 enrollment is down from the previous 2 years' total enrollments of 10 and 11 in these 2 classes, but higher or comparable to previous years. 4 of the research experiences occurred under direct supervision of faculty at Southeastern, one worked on a collaborative grant project at a local aerospace manufacturing company, one earned credit for biomedical research carried out at OU-HSC in Oklahoma City, and one earned credit for chemical research carried out at a research institute in Germany. ***7 students is only 47% of the 15 graduating, just short of the 50% goal. However, several of the graduating seniors had already earned CHEM4990 (or BIOL4990) credit in previous semesters and presented their results during this year or previous years. Also, at least 3 other chemistry majors participated in full-time off-campus summer 2017 internships at Washington University, UCLA and a local manufacturing company, but did not request CHEM4990 credit for these experiences, and others may have also participated without seeking credit. Therefore, the goal of 50% of seniors participating in a semester of research was indeed met.***
Group Student Participation With Clicker Questions	***Some of the chemistry courses utilize student response systems (aka Clickers) to gain real time student input over lecture materials. Chemical Analysis (CHEM-3425) is one such class in which the student responses given as daily assessment count towards they students course grade. Student responses are most commonly given as individual questions in which a student formulates their response individually. In an effort to promote peer learning in the classroom, students are also given the opportunity to work the problem in small groups of 4 or less. Each student still responds individually after the group discussion on the assessment question. Ideally if peer learning is effective, the student performance should increase with the group responses.*** ***The acceptable target is that there is a positive impact on the group response clickers compared to the individual response clickers. Also the group responses should exceed 80% correct.*** ***In the Fall 17, a total of 86 clickers where given in CHEM-3425 to eleven (11) students enrolled over 31 days of lecture. Eighty of the questions were individual response questions in which the students averaged 71.99% correct responses. Six questions allow group discussions prior to the student response. Student performance with the group questions averaged 90.17% correct. It should be noted the level of difficulty with the group questions was typically significantly greater than with the individual response questions. The acceptable target was greatly exceeded. More group style questions will be implied in the future to further enhance the peer learning in CHEM-3425.***
Summary of Assessment Results	**Data supports that team skills are an inherit part of the culture in our Chemistry major. Group activities exist in most lecture and lab components of courses.**
Use of Results and Reflection	*The department can do a better group of preparing students for the possibility of doing a research experience by advising. It is difficult to work in a research experience with transfer students that lack nothing but their major courses and are taking heavy course loads (15-17 hours of upper level biology and chemistry with labs 3-4 days a week). Potentially more data could be collected on the group participation with clickers. However, this is limited by the number of faculty that utilize clickers in their classrooms.*
Student Learning Outcome 6	Show the ability to anticipate, recognize, and respond appropriately to laboratory hazards or hazardous conditions, and take appropriate safety precautions.
Laboratory Safety	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean of Students***

	and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures. ***Instruction on proper safety procedures is provided weekly to every student in every laboratory. The instructors always include relevant instruction at the beginning of every laboratory activity. Students who fail to adhere to the guidelines on any particular activity are immediately corrected in lab and may be dismissed for continuing to ignore those instructions. During the course of the work in the laboratory there are specific requirements for the disposal of excess reagents, waste, or by- products of the chemical operations and the final product. Even "simple" actions such as smelling a chemical vapor, transferring a chemical reagent, weighing a chemical material, storing a chemical product, transporting a chemical material, or reacting to a small chemical spill have prescribed protocols for responses which the students must learn and follow. Besides safety goggles, the students are instructed to wear close-toed shoes and long shorts or pants and to NOT wear contact lenses in the laboratory. The students learn to work in a state of safety consciousness. Some measure of the success of this approach is the lack of any report of any safety violation in the past year. A better measure is the overall safe environment of the majority of laboratory areas which would not be possible if left entirely to the faculty and staff alone.*** ***Laboratory final exams in Chemical Analysis (CHEM-3425) and Organic Chemistry I Laboratory (CHEM-3052) are given at the end the semester Fall semester courses. These lab finals both include fundamental safety questions. The acceptable target is that students performance should exceed 65% on all safety related lab final questions.*** ***Dr. Wasmund gave a series of safety assessment questions in her lab final exam for all 3 sections of CHEM3062 (Organic Chemistry I laboratory) in the Fall 17 semester. A total of 27 students took the same assessment yielding an average score of 80.8% correct.*** ***Dr. Smith gave 6 safety assessment questions in his lab final exam in Chemical Analysis (CHEM3425) in Fall 17. All 11 students enrolled in CHEM-3425 took this assessment. The average student performance on the safety component of the lab final was 4.7/6 correct or (78.8%). The acceptable target on Laboratory Safety was met.***
Reported Laboratory Incidents in Academic Year	***This is a very difficult outcome to quantitatively assess. However, it is important to note that every chemistry student must view laboratory safety videos and receive basic instruction on laboratory safety before being allowed in a chemistry laboratory. The instruction includes how to handle various solvents, poisons, acids, and bases. It is also mandatory that all students wear protective eye goggles in the laboratory and demonstrate safe laboratory practices while engaged in laboratory work. If a laboratory accident occurs that requires emergency medical treatment, the Chemistry Stockroom Manager, who is our chief safety officer in the department, must file a written report regarding the particulars of the accident and subsequent treatment of the victim. The report is then forwarded to the Dean and other administrators as necessary. If deemed necessary, the Faculty Chemical Stockroom and Safety Review Committee may be convened to review safety procedures. Any incidents involving students are reported to Mr. John Williams (Chemical Stockroom Supervisor) who writes and files an incident report. A copy of the incident report is forward to the department chair.*** ***The acceptable target is that no major accidents occur that involve medical treatment and three or less accidents that involve the minor medical treatment and/or evaluation by medical professionals.*** ***No incidents were reported for the entire year. Perfect safety record. The acceptable target was met.***
Summary of Assessment Results	**The lack of accidents is critically important both for a student safety aspect as well as institutional liability. Safety should be a culture that is emphasized from the introductory courses to the senior level courses. The chemistry major and exposure to chemicals has inherit risk that must be addressed to prepare students for the future workplace settings. Our data indicates strong success in this area.**

Use of Results and Reflection	*Laboratory safety is a critically important component to a chemistry major. Simulations and online learning environments propose significant challenges in effectively teaching proper safety skills.*

Program Reflection and Summary	

We recognize the typical student majoring in chemistry has shifted in recent years. Fewer students are pursing science teaching due to lower career salary opportunities. This lead to the elimination of the Science Education major last year. More of our majors are pursing Pre-Professional paths to enter Professional Programs like Medical School or Pharmacy School. These students are very focused on their admittance goal. We are still challenged by the lack of student preparation for the average student entering in our CHEM-1315 (General Chemistry I). Our average ACT for this course varies between 20 and 22. However, we have shown some growth for the program with the introduction of the Biochemical Technology major option. More importantly we are generating more student success with an increased number of chemistry graduates as the overall undergraduate student population has decreased. The decrease in traditional face-to-face courses enrollment is even steeper and the chemistry program currently offers no online courses. When have seen an upward trend in the number of majors in each of the past 4 years. Our student success of entry into graduate and professional programs is the highest in the last 20 years. Our greatest challenge will be to deal with the shifting student population to online learnings. This is a topic are have ignored for the chemistry program. We can only do so for so long.



APPENDIX
for
CHEMISTRY REPORT AY1718

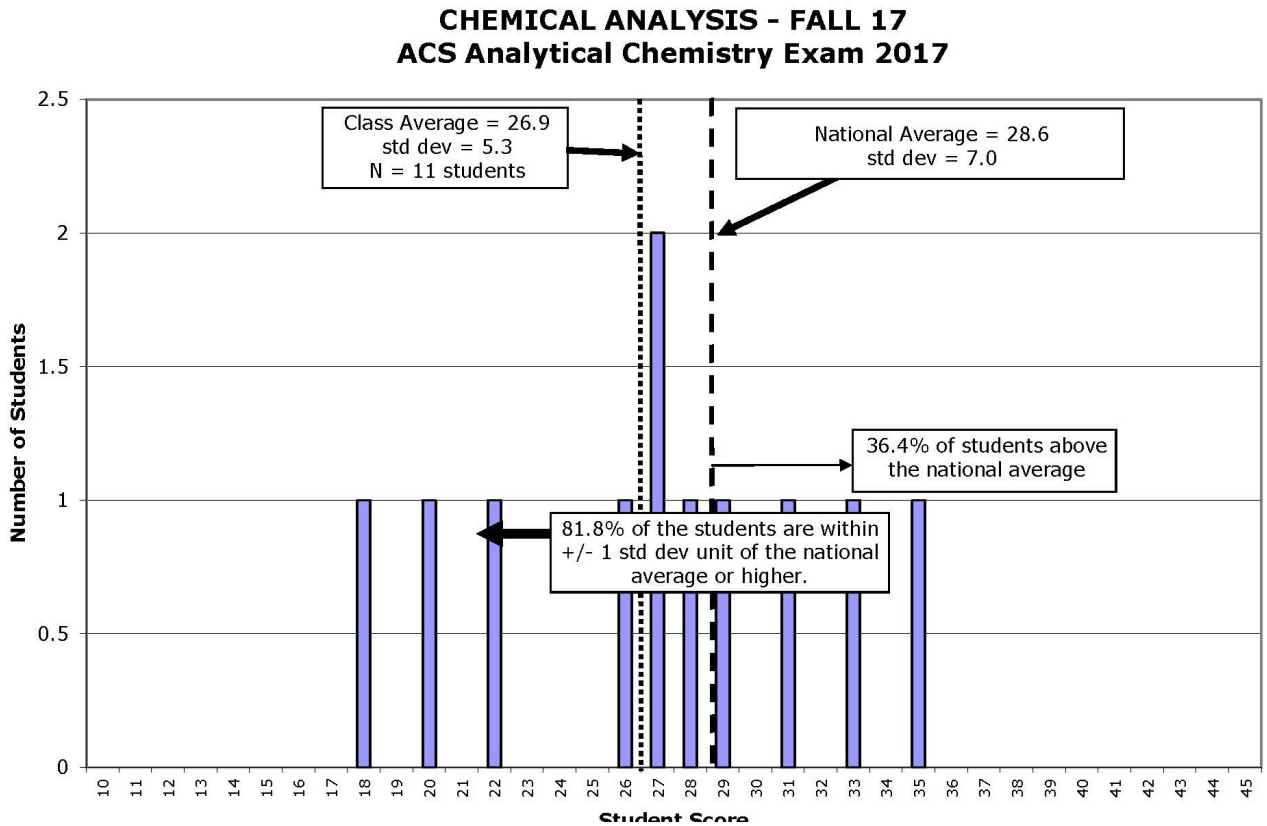


Figure 1. ACS exam for CHEM-3425 Fall 17.

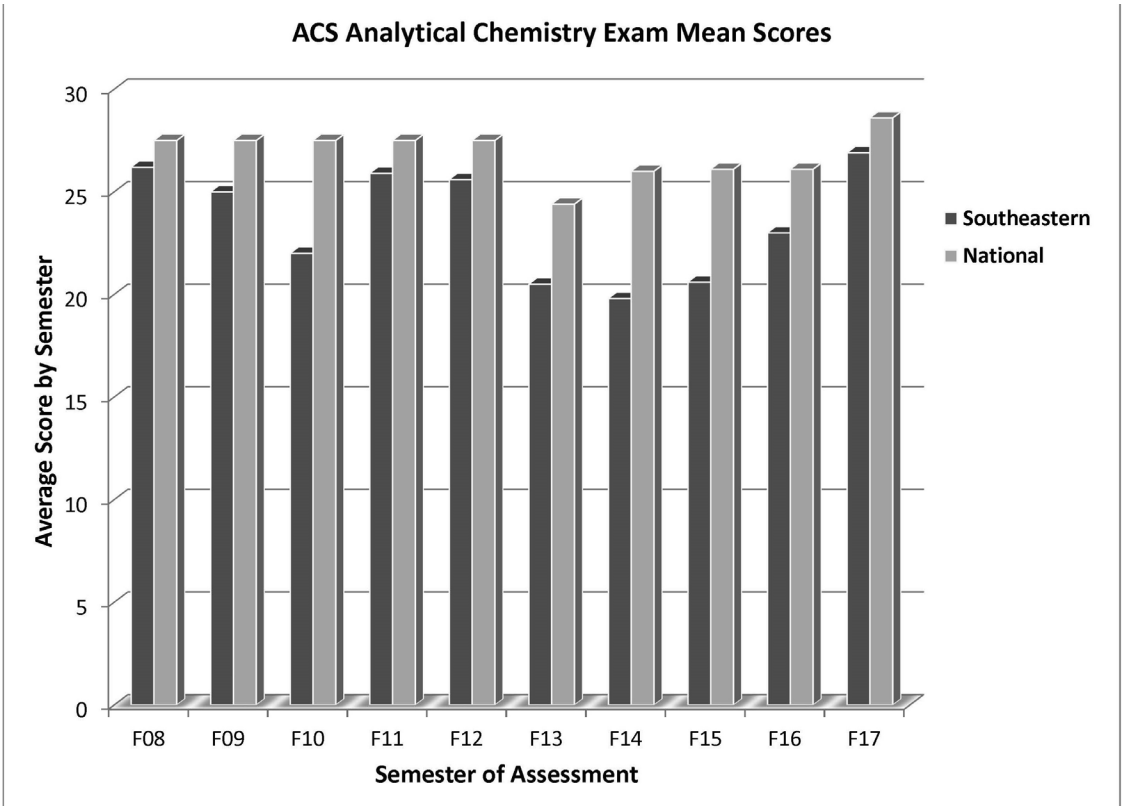


Figure 2. Historical ACS exam data for CHEM-3425.

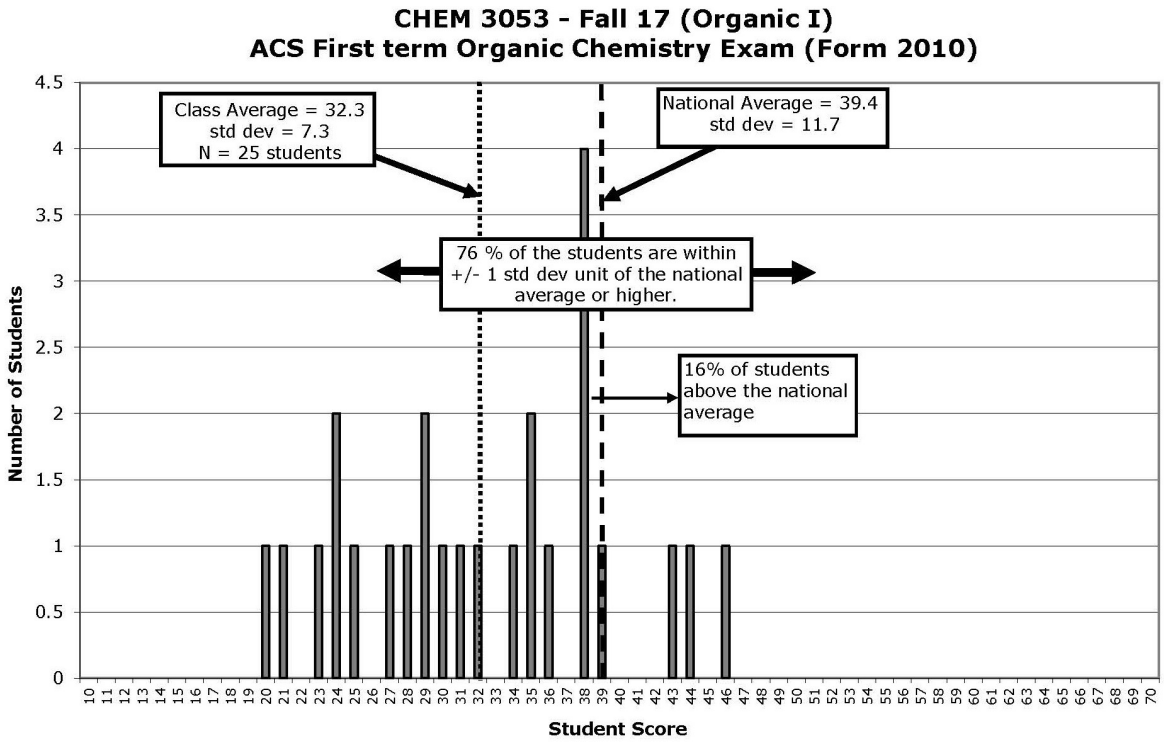


Figure 3. ACS exam for CHEM-3053 in Fall 17.

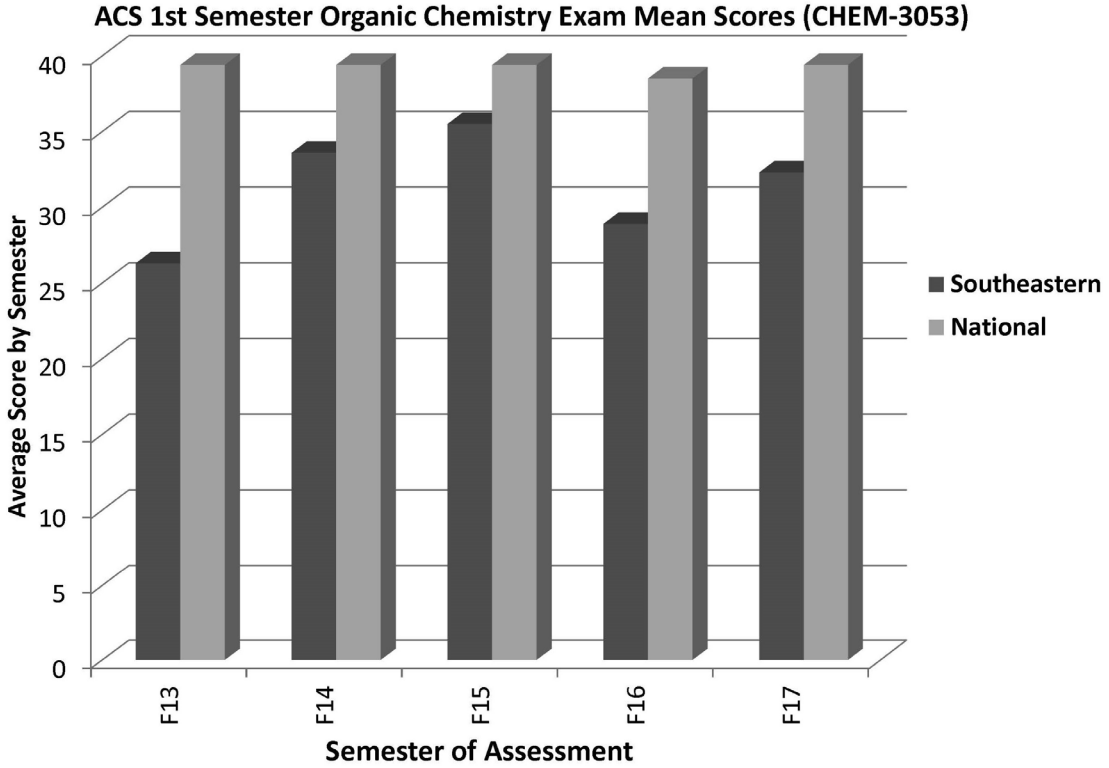


Figure 4. Historical ACS exam performance in CHEM-3053 (Organic I).

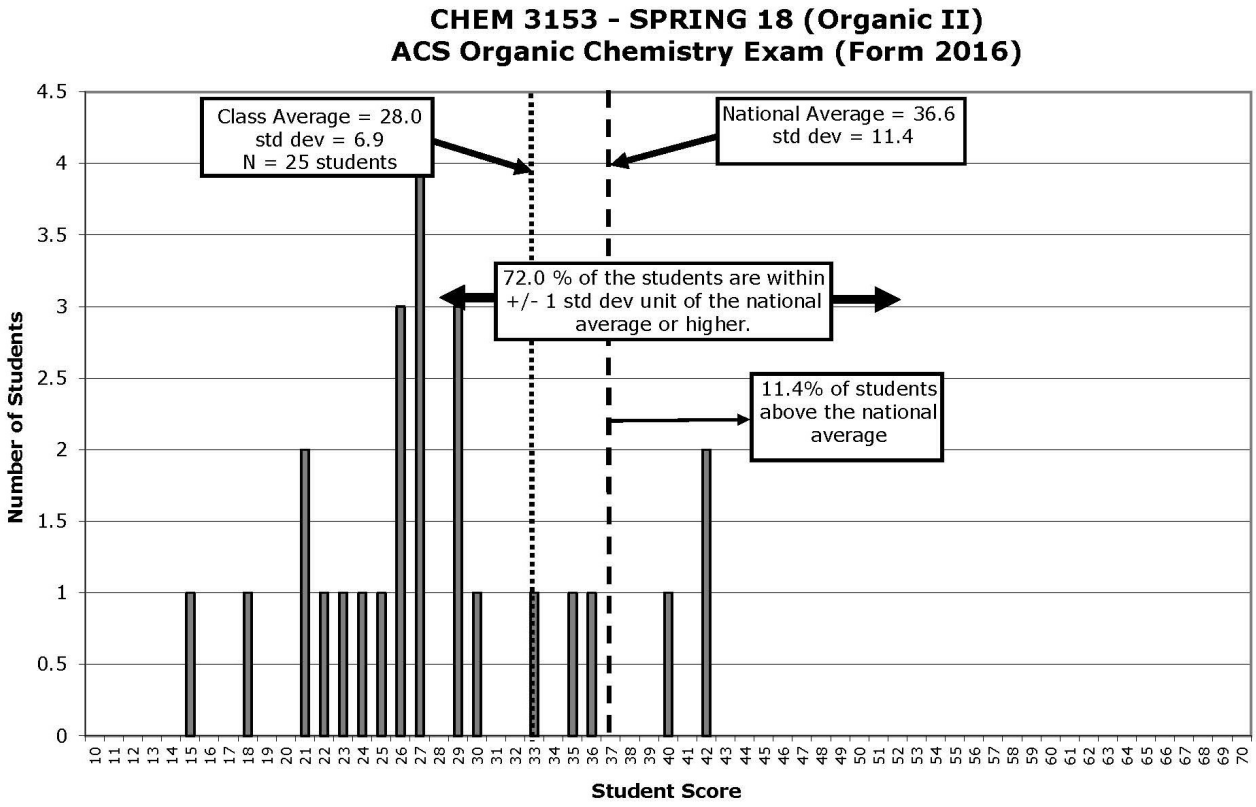


Figure 5. ACS exam for CHEM-3153 in Spring 18.

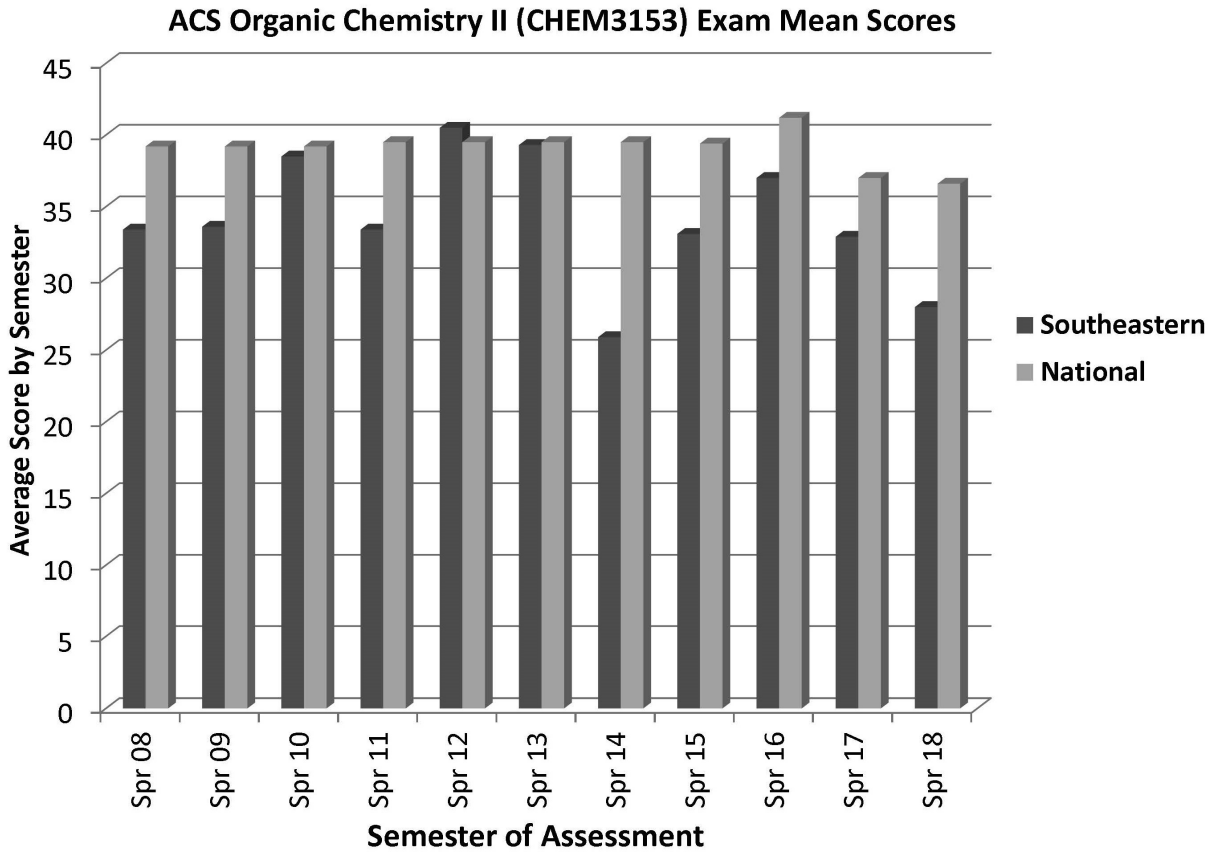


Figure 6. Historical ACS exam performance in CHEM-3153 (Organic II).

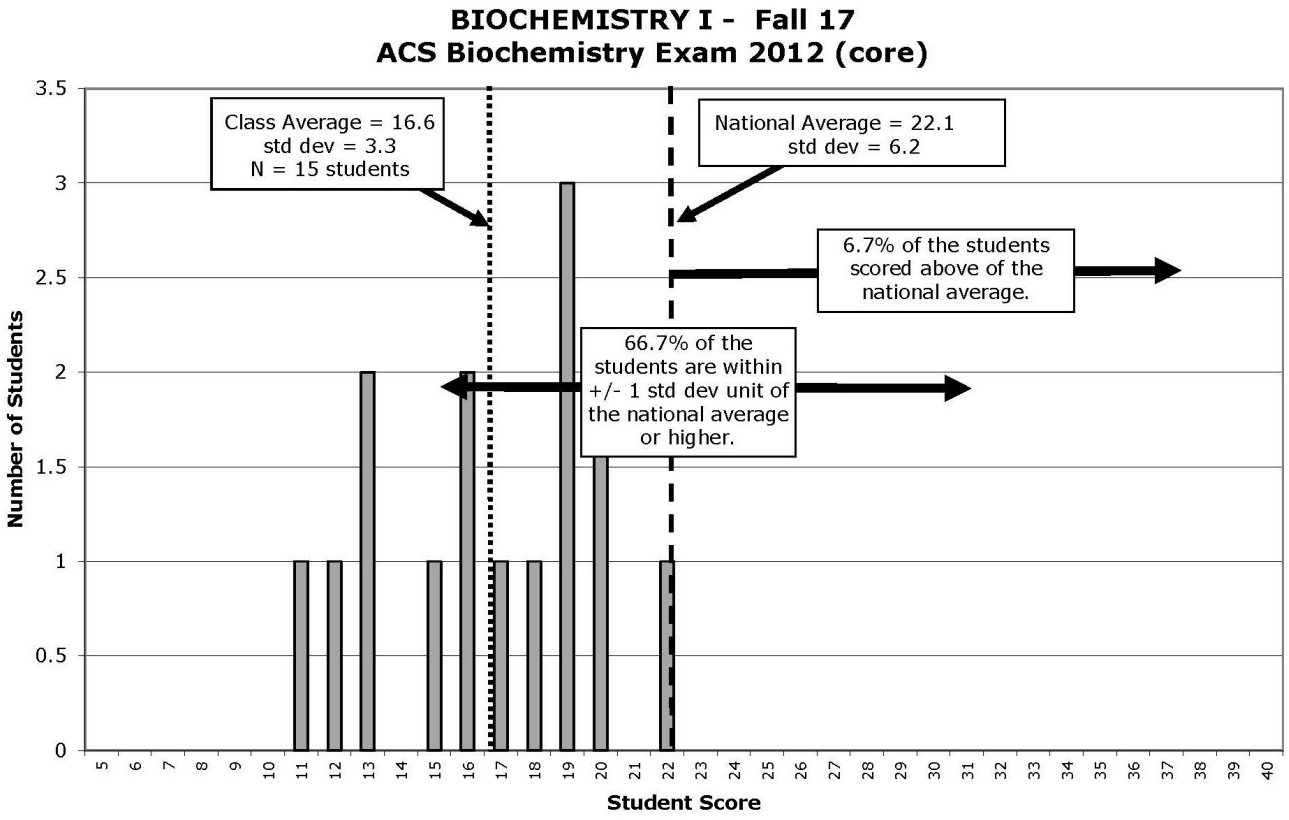


Figure 7. ACS exam performance in CHEM-4115 (Biochemistry I) in Fall 17.

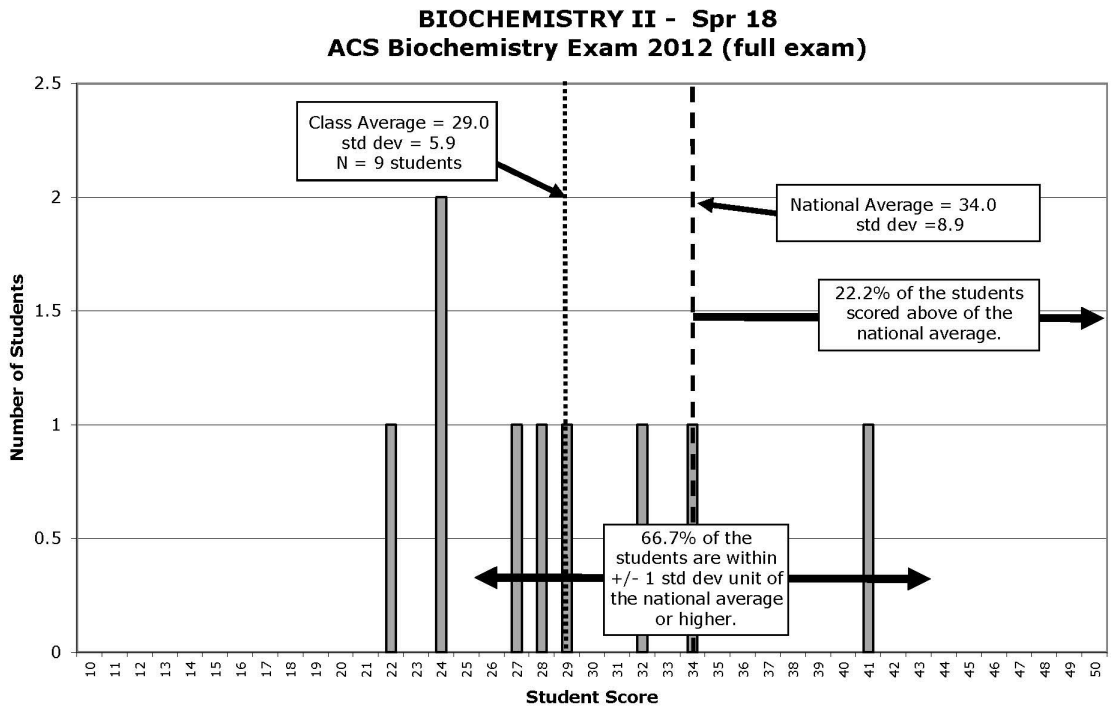


Figure 8. ACS exam performance in CHEM-4193 (Biochemistry II) in Spring 18.

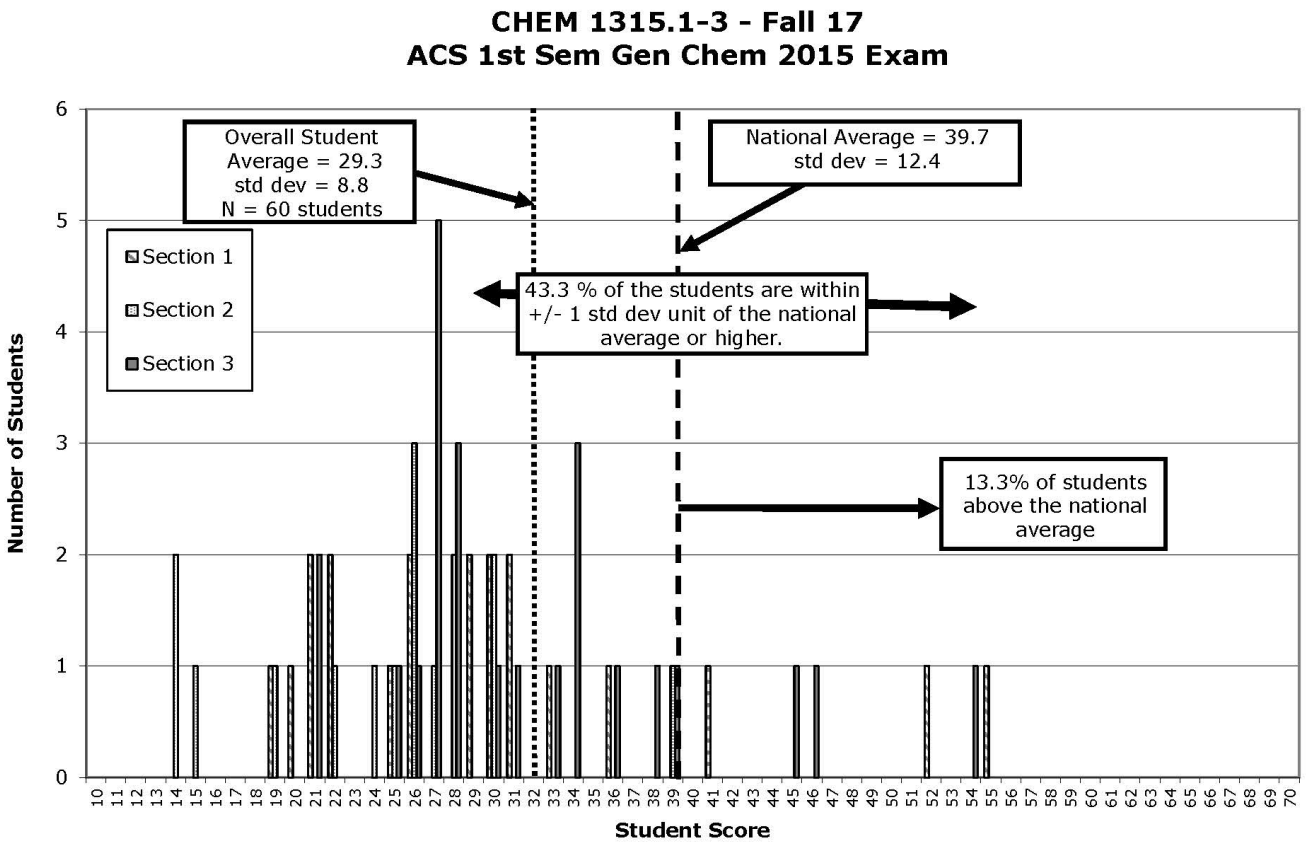


Figure 9. ACS exam performance in CHEM-1315 (Gen Chem I) in Fall 17.

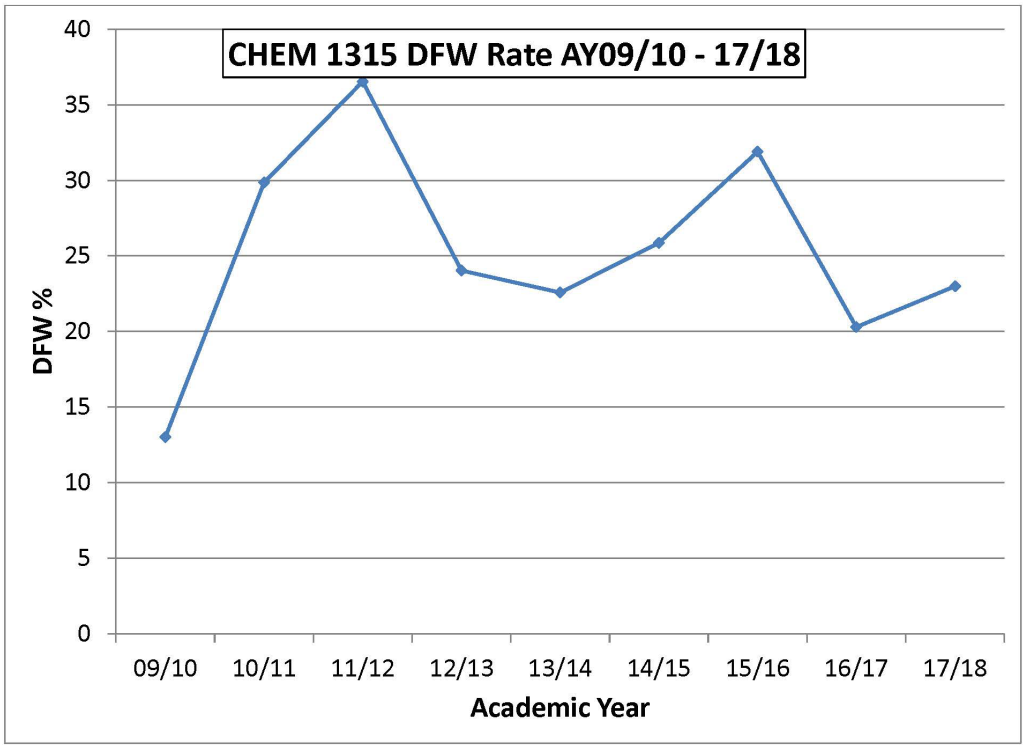


Figure 10. Historic DFW rates in CHEM-1315.

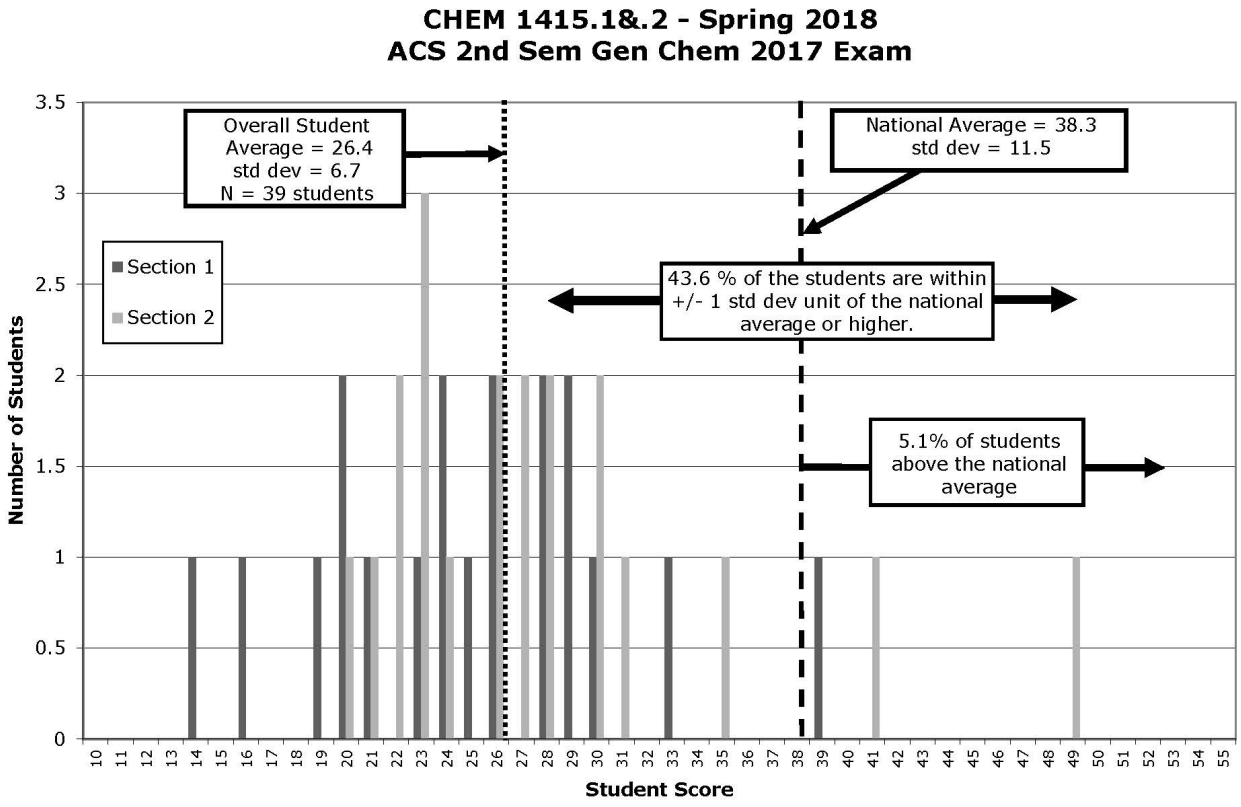


Figure 11. ACS exam performance in CHEM-1415 (Gen Chem II) in Spring 18.

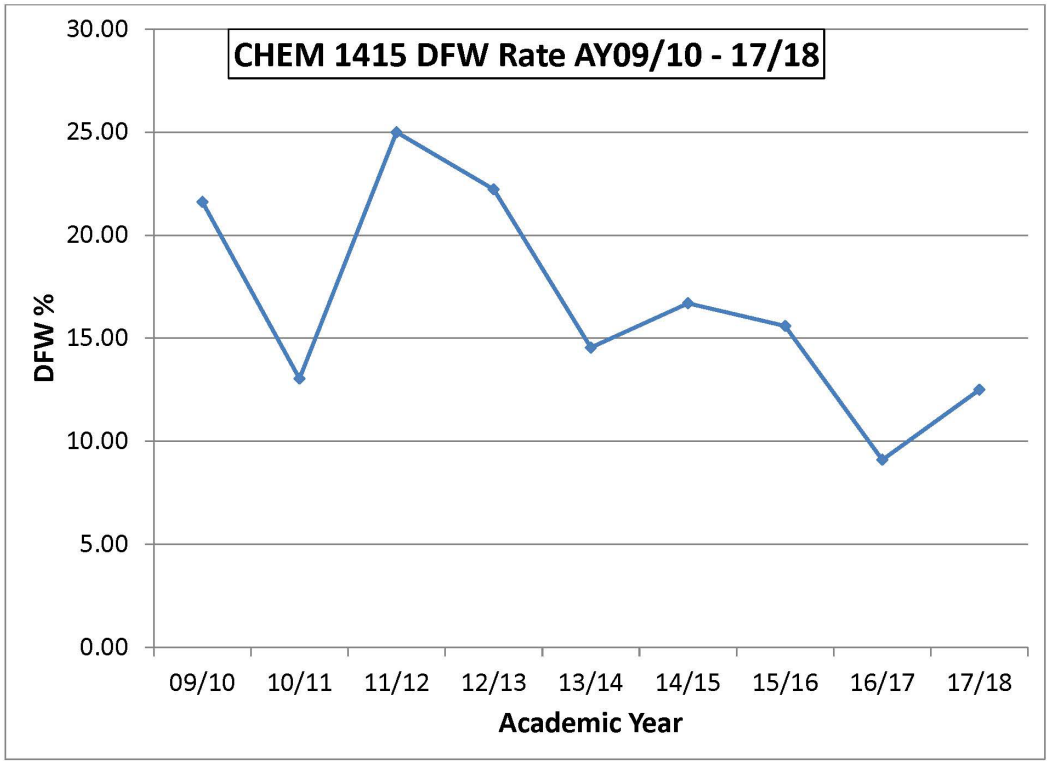


Figure 12. Historic DFW rates in CHEM-1415.

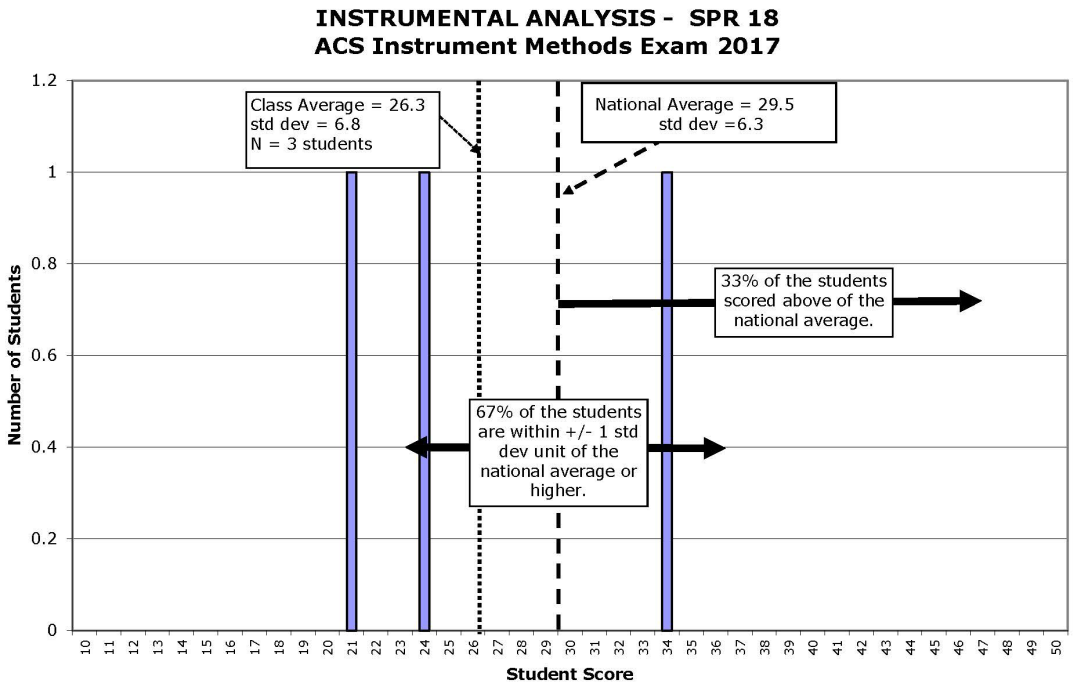


Figure 13. ACS exam performance in CHEM-3525 (Instrumental Analysis) in Spring 18.

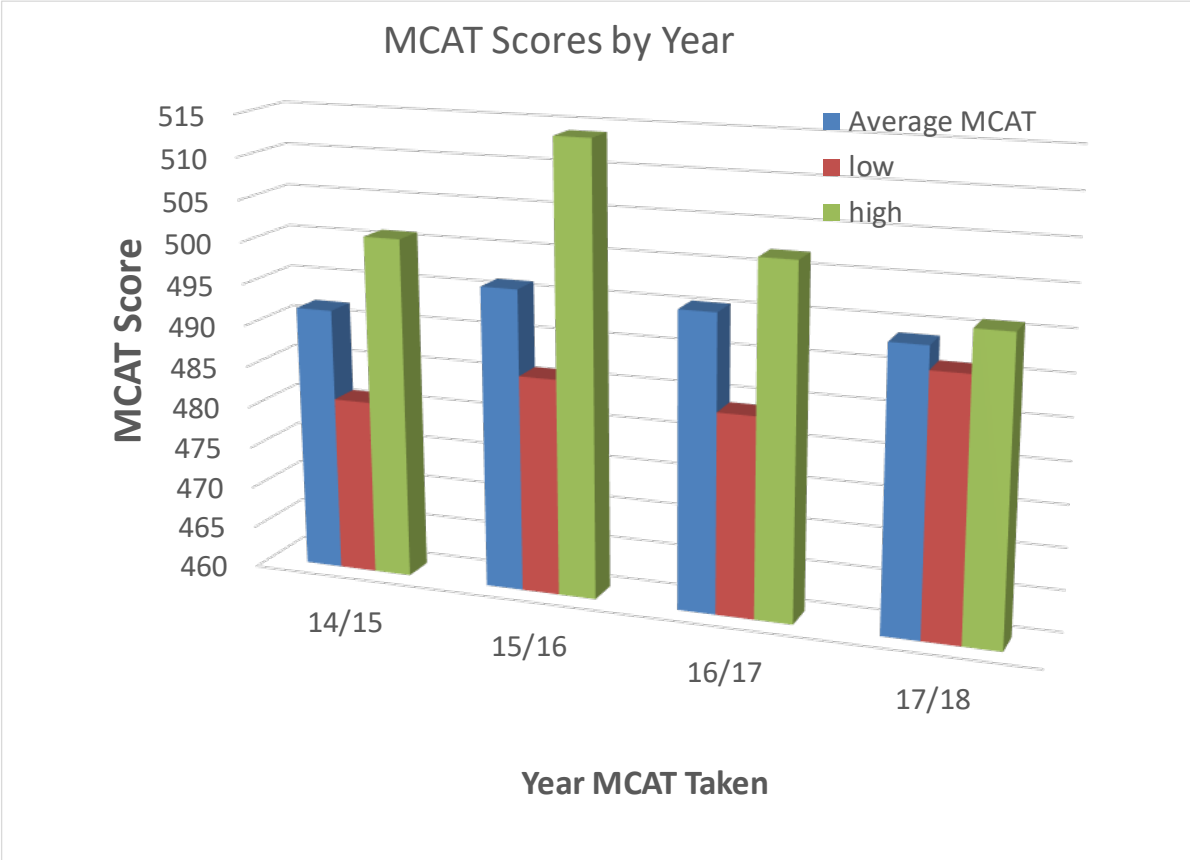


Figure 14. Variation in Composite MCAT score for SE students by year.

Table 1. Student Research Presentations for Chemistry in AY1718

Research Presentations list for CHEM AY1718 Assessment Report
OK-INBRE (NIH) 2017 Summer Research Intern poster session, OU-Health Sciences Center, July 12, 2017, Oklahoma City, OK:

"Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR)", **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.

"Novel Epidermal Growth Factor Receptor Targeted Peptide Conjugates For Near-Ir Imaging". **Paige Thomas{1},** G. Pathuri{2}, and H. Gali{2}
{1}School of Arts and Sciences, Southeastern Oklahoma State University,
{2}Department of Pharmaceutical Sciences, The University of Oklahoma Health Science Center

American Indian Science and Engineering Society (AISES) National meeting, Research Intern poster session (4oth annual meeting): September 22, 2017, Denver, CO:

1) "Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR)", **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.
2) "Comparison of Growth and Energy Content of Spirodela polyrhiza and Lemna minor, Two Potential Biofuel Sources." **Ryan M. Robinson**, P. Sharp, D.S. McKim, and N.L. Paiva.
3) "Overexpression of YAP1-TFE3/FAM118B fusion genes." **Casey R. Love** (1,2), Frank Szulzewsky(2), Eric Holland(2); 1. Chemistry, Southeastern Oklahoma State Univ, Durant, OK. 2. Fred Hutchinson Cancer Research Center, Seattle, WA.

Research Day at the Capitol 2018, March 26-27, 2018, **Oklahoma City, OK:**
"Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR)", **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.
Payton Whitehead was selected to represent Southeastern and won First Place in the Regional University/Community College competition (and $500 cash) for his poster presentation.

American Chemical Society national meeting, Spring 2018, March 17-21, 2018, New Orleans, LA.:
1) CHED ACS Student Affliliates "Successful Chapter" poster, "Chemistry at Southeastern Oklahoma State Univeristy"; **Casey Love, Dyani Shores, Elizabeth Whitlow, and Payton Whitehead** presenting.
2) CHED-Undergraduate research posters- Biochemical Technology: "Comparison of growth and energy content of *Spriodela polyrhiza* and *Lemna minor*, two potential biofuel sources." **Ryan M. Robinson, Payton S. Whitehead**, Patrick W. Sharp, Steve McKim, Nancy L. Paiva.
3) CHED-Undergraduate research posters-Biochemistry: "Overexpression of YAP1-TFE3/FAM118B fusion genes." **Casey R. Love** (1, 2), Frank Szulzewsky(2), Eric Holland(2)
1. Chemistry, Southeastern Oklahoma State Univ, Durant, OK, United States.
2. Fred Hutchinson Cancer Research Center, Seattle, WA, United States.

Additional poster and oral presentations were made by interdisciplinary majors (including **Matt Maxwell** and **Payton Whitehead**) at the annual Louis Stokes Alliance for Minority Participation (OK-LSAMP or "OKAMP") research meeting at Oklahoma State University in September 2017, at the statewide Oklahoma Research Day in Enid, OK, in March 2018, but titles and authors were not provided.

APPENDIX IV

Student Evaluation of Instruction

STUDENT EVALUATION OF INSTRUCTION: Please respond thoughtfully and honestly. Mark your answers on the Scantron Sheet by selecting one choice from A through E. Please use a pencil only.

A= Strongly Disagree, B= Disagree, C=Neutral, D= Agree, E= Strongly Agree

1. The instructor started the class on time.
2. The instructor used the entire class period for instruction.
3. The instructor's presentation caused me to think in-depth about this subject.
4. The instructor seemed to display adequate knowledge of the subject matter.
5. The instructor related the course material to practical situations.
6. The instructor explained concepts clearly so that students seemed to understand.
7. The instructor encouraged active involvement of the students in the classroom.
8. The instructor was enthusiastic about the subject matter in this course.
9. The instructor focused on topics related to this course.
10. The instructor seemed to be well prepared.
11. The instructor was effective in establishing rapport with the students as individuals.
12. The instructor was willing to help students outside of class time.
13. The instructor displayed a courteous and considerate attitude toward students.
14. The instructor provided adequate opportunities for students to ask questions.
15. The methods used for evaluating student work were reasonable.
16. Examinations covered material or skills emphasized in the course.
17. The exam questions were clearly stated.
18. The instructor returned the graded examinations promptly.
19. Adequate time was allowed for completing examinations.
20. The pace of the course was appropriate.
21. The amount of background assumed by the instructor was appropriate.
22. Homework assignments helped me understand the subject.
23. Expectations and grade standards for this course were clearly stated.
24. The learning objectives of this course were clearly stated.
25. This course required me to think, not just memorize.

(More Questions On Back)

26. Overall, I would rate this as a valuable course.
27. Overall, I would rate the teaching ability of the instructor as excellent.
28. I would take another course with this instructor.
29. The textbook was helpful for understanding this subject.
30. My anticipated grade in this course will likely be a(n) _____.
    A-(A), **B-**(B), **C-**(C), **D-**(D), **E-**(F)
31. The number of hours I prepared for this course on average is____hours weekly. **A**-(0-3), **B**-(4-6), **C**-(7-10), **D**-(10-15), **E**-(16 or more).
32. The percent of lectures I have missed is _____.
    A-never missed, **B**-less than 5%, **C**-less than 10%, **D**-More than 15%, **E**-More than 25%

Provide written comments for the three questions below. These comments will be typed into a Word document before they are shared with the instructor and department chair so that *your identity will remain confidential*.

33. What did you like most about this course?

34. What did you like least about this course?

35. What one thing would be most helpful to improve this course?

Course		CHEM-1004		CHEM-1114.1		CHEM 1315.1		CHEM-1315.2		CHEM-1315.3		Depart Average			
Semester		F19		F19		F19		F19		F19		F19			
Instructor		SM		SM		NP		SG		TS					
# students		14		16		20		16		12				78	
	Question #		delta		delta		delta		delta		delta				
The instructor started the class on time.	1	5.00	0.46	5.00	0.46	3.95	-0.59	4.63	0.09	4.24	-0.30	4.54	Std Dev	0.372067	
The instructor used the entire class period for instruction.	2	5.00	0.51	4.88	0.39	4.05	-0.44	4.57	0.08	3.98	-0.51	4.49			
The instructor's presentation caused me to think in-depth about this subject	3	4.46	0.28	4.28	0.10	3.65	-0.53	4.50	0.32	4.16	-0.02	4.18			
The instructor seemed to display adequate knowledge of the subject matter.	4	4.93	0.39	4.75	0.21	4.14	-0.40	4.70	0.16	4.24	-0.30	4.54			
The instructor related the course material to practical situations.	5	4.72	0.43	4.45	0.16	3.80	-0.49	4.44	0.15	4.20	-0.09	4.29			
The instructor explained concepts clearly so that students seemed to understand.	6	4.58	0.56	3.95	-0.07	3.62	-0.40	4.31	0.29	3.74	-0.28	4.02			
The instructor encouraged active involvement of the students in the classroom.	7	4.32	0.12	4.45	0.25	3.82	-0.38	4.51	0.31	3.93	-0.27	4.20			
The instructor was enthusiastic about the subject matter in this course.	8	4.86	0.40	4.75	0.29	4.09	-0.37	4.76	0.30	3.85	-0.61	4.46			
The instructor focused on topics related to this course.	9	4.86	0.41	4.63	0.18	4.09	-0.36	4.57	0.12	4.20	-0.25	4.45			
The instructor seemed to be well prepared.	10	4.86	0.38	4.68	0.20	4.05	-0.43	4.70	0.22	4.20	-0.28	4.48			
The instructor was effective in establishing rapport with the students as individuals.	11	4.32	0.23	4.30	0.21	3.90	-0.19	4.25	0.16	3.65	-0.44	4.09			
The instructor was willing to help students outside of class time.	12	4.79	0.36	4.38	-0.05	4.14	-0.29	4.70	0.27	4.20	-0.23	4.43			
The instructor displayed a courteous and considerate attitude toward students.	13	4.79	0.36	4.67	0.24	4.00	-0.43	4.70	0.27	4.07	-0.36	4.43			
The instructor provided adequate opportunities for students to ask questions.	14	4.72	0.36	4.41	0.05	3.90	-0.46	4.70	0.34	4.20	-0.16	4.36			
The methods used for evaluating student work were reasonable	15	4.86	0.37	4.82	0.33	4.00	-0.49	4.63	0.14	4.24	-0.25	4.49			
Examinations covered material or skills emphasized in the course.	16	4.72	0.27	4.69	0.24	4.10	-0.35	4.57	0.12	4.24	-0.21	4.45			
The exam questions were clearly stated.	17	4.79	0.36	4.75	0.32	4.15	-0.28	4.34	-0.09	4.14	-0.29	4.43			
The instructor returned the graded examinations promptly.	18	5.00	0.45	4.94	0.39	4.14	-0.41	4.63	0.08	4.07	-0.48	4.55			
Adequate time was allowed for completing examinations.	19	4.93	0.34	4.94	0.35	4.19	-0.40	4.70	0.11	4.24	-0.35	4.59			
The pace of the course was appropriate.	20	4.39	0.17	4.70	0.48	3.63	-0.59	4.57	0.35	3.89	-0.33	4.22			
The amount of background assumed by the instructor was appropriate.	21	4.72	0.45	4.68	0.41	4.06	-0.21	4.19	-0.08	3.66	-0.61	4.27			
Homework assignments helped me understand the subject.	22	4.46	0.19	4.54	0.27	4.05	-0.22	4.35	0.08	3.92	-0.35	4.27			
Expectations and grade standards for this course were clearly stated.	23	4.93	0.40	4.92	0.39	4.09	-0.44	4.57	0.04	4.24	-0.29	4.53			
The learning objectives of this course were clearly stated.	24	4.93	0.47	4.75	0.29	4.05	-0.41	4.63	0.17	3.99	-0.47	4.46			
This course required me to think, not just memorize.	25	4.93	0.46	4.75	0.28	3.89	-0.58	4.69	0.22	4.24	-0.23	4.47			
Overall, I would rate this as a valuable course.	26	5.00	0.62	4.39	0.01	3.65	-0.73	4.69	0.31	4.44	0.06	4.38			
Overall, I would rate the teaching ability of the instructor as excellent.	27	4.72	0.38	4.42	0.08	3.85	-0.49	4.66	0.32	4.20	-0.14	4.34			
I would take another course with this instructor.	28	4.79	0.44	4.35	0.00	3.82	-0.53	4.75	0.40	4.20	-0.15	4.35			
The textbook was helpful for understanding this subject.	29	4.04		3.80		3.51		3.98		3.26					
My anticipated grade in this course will likely be a(n) _____. A-(A), B-(B), C-(C), D-(D), E-(F)	30	2.34		2.02		1.82		1.74		1.77					
The number of hours I prepared for this course on average is____hours weekly. A-(0-3), B-(4-6), C-(7-10), D-(10-15), E-(16 or more).	31	2.47		2.01		2.49		2.01		2.44					
The percent of lectures I have missed is _____. A-never missed, B-less than 5%, C-less than 10%, D-More than 15%, E-More than 25%	32	2.94		1.85		2.20		1.94		1.75					

	Course	CHEM-3053.1		CHEM-3425.1		CHEM-4115.1		CHEM-4333.1		CHEM-4951.1		Depart Average
	Semester	F19		F19		F19		F19		F19		F19
	Instructor	JZ		TS		NP		SG		SM		
	# students	29		17		8		2		3		59
											Std Dev	0.403976757
	Question #											Average Score
The instructor started the class on time.	1	4.49	-0.13	4.70	0.08	4.66	0.04	5.00	0.38	5.00	0.38	4.62
The instructor used the entire class period for instruction.	2	4.56	-0.07	4.70	0.07	4.66	0.03	4.50	-0.13	5.00	0.37	4.63
The instructor's presentation caused me to think in-depth about this subject	3	4.08	-0.28	4.70	0.34	4.25	-0.11	5.00	0.64	5.00	0.64	4.36
The instructor seemed to display adequate knowledge of the subject matter.	4	4.38	-0.15	4.70	0.17	4.41	-0.12	5.00	0.47	5.00	0.47	4.53
The instructor related the course material to practical situations.	5	3.92	-0.33	4.64	0.39	4.16	-0.09	5.00	0.75	5.00	0.75	4.25
The instructor explained concepts clearly so that students seemed to understand.	6	3.55	-0.45	4.58	0.58	3.92	-0.08	4.50	0.50	5.00	1.00	4.00
The instructor encouraged active involvement of the students in the classroom.	7	4.32	-0.17	4.76	0.27	4.25	-0.24	5.00	0.51	5.00	0.51	4.49
The instructor was enthusiastic about the subject matter in this course.	8	4.36	-0.16	4.70	0.18	4.41	-0.11	5.00	0.48	5.00	0.48	4.52
The instructor focused on topics related to this course.	9	4.42	-0.10	4.70	0.18	4.17	-0.35	5.00	0.48	5.00	0.48	4.52
The instructor seemed to be well prepared.	10	4.25	-0.19	4.70	0.26	4.25	-0.19	5.00	0.56	5.00	0.56	4.44
The instructor was effective in establishing rapport with the students as individuals.	11	4.25	-0.16	4.64	0.23	4.25	-0.16	4.50	0.09	5.00	0.59	4.41
The instructor was willing to help students outside of class time.	12	4.48	-0.08	4.64	0.08	4.41	-0.15	5.00	0.44	5.00	0.44	4.56
The instructor displayed a courteous and considerate attitude toward students.	13	4.46	-0.11	4.64	0.07	4.54	-0.03	5.00	0.43	5.00	0.43	4.57
The instructor provided adequate opportunities for students to ask questions.	14	4.42	-0.11	4.58	0.05	4.54	0.01	5.00	0.47	5.00	0.47	4.53
The methods used for evaluating student work were reasonable	15	4.33	-0.14	4.52	0.05	4.54	0.07	5.00	0.53	5.00	0.53	4.47
Examinations covered material or skills emphasized in the course.	16	4.39	-0.06	4.64	0.19	3.91	-0.54	5.00	0.55	5.00	0.55	4.45
The exam questions were clearly stated.	17	4.27	-0.07	4.64	0.30	3.53	-0.81	5.00	0.66	5.00	0.66	4.34
The instructor returned the graded examinations promptly.	18	4.32	-0.08	4.64	0.24	3.79	-0.61	5.00	0.60	5.00	0.60	4.40
Adequate time was allowed for completing examinations.	19	4.56	-0.04	4.76	0.16	4.25	-0.35	4.50	-0.10	5.00	0.40	4.60
The pace of the course was appropriate.	20	3.67	-0.44	4.52	0.41	4.25	0.14	5.00	0.89	5.00	0.89	4.11
The amount of background assumed by the instructor was appropriate.	21	3.95	-0.32	4.58	0.31	4.42	0.15	4.50	0.23	5.00	0.73	4.27
Homework assignments helped me understand the subject.	22	3.85	-0.15	4.09	0.09	4.25	0.25	3.00	-1.00	5.00	1.00	4.00
Expectations and grade standards for this course were clearly stated.	23	4.22	-0.25	4.70	0.23	4.54	0.07	5.00	0.53	5.00	0.53	4.47
The learning objectives of this course were clearly stated.	24	4.32	-0.21	4.76	0.23	4.54	0.01	5.00	0.47	5.00	0.47	4.53
This course required me to think, not just memorize.	25	4.23	-0.17	4.76	0.36	3.91	-0.49	5.00	0.60	5.00	0.60	4.40
Overall, I would rate this as a valuable course.	26	4.34	0.04	4.28	-0.02	3.79	-0.51	5.00	0.70	5.00	0.70	4.30
Overall, I would rate the teaching ability of the instructor as excellent.	27	4.01	-0.26	4.76	0.49	3.82	-0.45	4.50	0.23	5.00	0.73	4.27
I would take another course with this instructor.	28	4.11	-0.16	4.40	0.13	4.15	-0.12	5.00	0.73	5.00	0.73	4.27
The textbook was helpful for understanding this subject.	29	3.66		3.97		3.89		3.50		4.00		
My anticipated grade in this course will likely be a(n) _____. A-(A), B-(B), C-(C), D-(D), E-(F)	30	1.90		2.35		1.77		1.00		1.00		
The number of hours I prepared for this course on average is____hours weekly. A-(0-3), B-(4-6), C-(7-10), D-(10-15), E-(16 or more).	31	2.70		2.71		2.39		2.00		2.00		
The percent of lectures I have missed is _____. A-never missed, B-less than 5%, C-less than 10%, D-More than 15%, E-More than 25%	32	2.55		2.38				2.00		1.50		

Consultant's Report

Dr. Kim Simons, Emporia State University

To prepare the report, I have read the Self-Study, reviewed the SE catalog (chemistry programs), SE website (chemistry), met with each chemistry faculty (Dr. Tim Smith, Dr. Steve McKim, Dr. Nancy Paiva, Dr. Srimal Garusinghe, and Mr. Bradley Corbett), and met with undergraduates in the program (Asuncion Rubio, Cooper McKinney, Rachel Wynn, and Nick White).

August 2022

1. The chemistry program is administered by the Department of Chemistry, Computer and Physical Science. The program includes various baccalaureate tracks: B.S. Chemistry, B.S. Professional Chemist, B.S. Chemistry/Medical Sciences, and B.S. Biochemical Technology. There are five full-time chemistry faculty and a laboratory manager. The chemistry program also supports programs in Biology, Fisheries and Wildlife, Occupational Safety and Health, and Health and Physical Education majors and the newly developing nursing program. The program is housed in the science building.

2. Appraisal of Program Components
   a. Program goals, objectives, and student outcomes.

      The goal and student outcomes are specific, clear, and appropriate.

   b. Compatibility with the SE Mission.

      The goal of the chemistry program is consistent with and enhances the mission of Southeastern Oklahoma State University.

   c. Curriculum

      The chemistry program has a traditional course sequencing with foundation courses (General Chemistry 1 and 2), depth/development courses (Organic Chemistry 1 and 2, Inorganic Chemistry, Analytical Chemistry) and upper-level coursework (Biochemistry, Physical Chemistry, Instrumental Analysis, Nuclear Chemistry) with undergraduate research options. The sequence and pre-requisites of courses are reasonable (see Chapter III and Appendix II of the Self-Study, and the online SE catalog).

      Since the last program review, the faculty have developed new courses. Basic chemistry is an introductory chemistry course for occupational safety and biology-wildlife majors. Chemical literature was developed for chemistry majors.

      Class enrollment and number of graduates is addressed in more detail in section m.

      With declining enrollment, consider a new or expanding an existing introductory/general education course that prepares students for the rigor of general chemistry 1. This course should make students aware of career opportunities and teach students how to study. If students are not entering the university as prepared as students in the past, the course could give them the skills to continue in the chemistry course sequencing. The advisors in the student advising center should know about this course so they are able to direct potential students. This course could be available to students who are doing poorly in general chemistry 1 (a course that starts 2-4 weeks into the semester).

In the last 10 years, there was an Oklahoma-statewide review of general chemistry 1 and 2 outcomes. Articulation agreements have benefited the program with shared expectations for the introductory chemistry courses.

To simplify accounting of the program, consider having two majors: B.S. Chemistry (with various concentrations) and B.S. Chemistry/Medical Sciences. Consider a B.A. chemistry route that shares core chemistry courses and emphasizes laboratory experience. This would be a career-ready degree to take advantage of laboratory technician positions in the region.

Of the four students I interviewed (all completing their final year at SE next year), all preferred face-to-face instruction in their major courses with the option of online courses for non-major courses.

d. Faculty

All faculty have doctoral degrees in their teaching fields (see Appendix I of the Self-Study). As expected for tenured faculty, the four faculty have a tremendous amount of teaching experience. The amount of scholarship each faculty member conducts varies.

The workload of faculty is consistent with other schools of similar size. Faculty teach four courses per semester. Without support (teaching assistants), this requires a tremendous effort. For many faculty, scholarship and service are sacrificed to maintain pedagogical standards. The SCH of faculty in the chemistry program **exceeds** the university average by ~50% (see Table 10A of the Self-Study).

Considering we are recently emerging from confines of COVID-19, it is difficult to gauge initiative. There are grants being submitted and approved to support research endeavors so there is initiative.

Faculty service seems good (see Table11, Self-Study), but it would be useful to compare to other departments or other institutions and on a per-faculty basis.

In general, morale was very good (compared to Emporia State University). In the conversations from each faculty separately, there were challenges. The faculty are collegial with everyone having different strengths and foci. At ESU, there is a constant threat of programs being “eliminated” or faculty being “cut” if enrollments continue to decline. So, the administration of SE is maintaining good morale.

e. Operational Procedures and program processes

The chair of the department (Dr. Smith) once advised 85% of the students and now, advises 50% of the students with other faculty helping. Advising of incoming students is the responsibility of a center. Since faculty mentioned they are willing to work with the advising center, it is essential the center communicate with faculty and listen to the advice of faculty. The faculty should regularly meet with the student advising center to maintain student preparedness (proper course sequencing and advancement through the program in four years), determine appropriate scheduling of courses, and educate/inform advisors (there are many different programs with different requirements and different career trajectories). Likewise, this is an opportunity for the advising center to share concerns with faculty.

Faculty noted the department secretary answers many questions for faculty and students. The department is fortunate to have a knowledgeable and helpful department administrator (Jackie Bearden).

There is a good system for ordering and paying for chemicals. The stockroom manager Bradley Corbett finds product online and then, Jackie Bearden completes the transaction.

The grants office changed personnel recently so there have been issues with grant applications and grant reporting. It is a challenge to navigate the requirements of federal, state, and private grants, so again, communication between faculty and administration is important.

The laboratory manager (Bradley Corbett) coordinates safety operations with EH&S. Chemical waste disposal and routine safety inspections are routinely conducted.

f. Department coordination and faculty involvement

There was mention of limited faculty involvement but the issue, I think, is a matter of dissemination of information. Because there is limited discretionary spending, there will be little input on matters of budget. However, faculty should be aware of the budget even if there are not decisions to be made. Historically, there are faculty meetings with the chair and chemistry faculty (2-3 per academic year?), but a regular monthly meeting to share administrative projects and details of the department budget is encouraged.

Overall, the department coordination is good since it is evident the budget is being managed, students are being advised, and courses are being taught at appropriate frequencies.

g. Students (abilities, attrition, attitude, achievement, post-grad success)

Reviewing the "current student survey" (Table 6 of the Self-Study), the average chemistry major rated the quality of education within the major better than outside the major. However, there were some students who ranked general SE instruction better than major instruction. It would be good to investigate why this is the case because improving instruction would help with retention (see section m). Part of this perception could be caused by facilities that need updating (see section j).

There are no students who are athletes in the survey (which is very different from my institution). Is this because the sports program is not very big (so it is expected there are not any athletes in the survey size group), or one cannot be an athlete and navigate the chemistry program (practice/course times?). I also noted there are few students who are working full-time (which his very different from my institution). It is good not many students who responded are working full-time because this can detract from student success, especially in a rigorous chemistry program.

Of the four students I interviewed, all came to SE with the intention of majoring in the sciences. All chose SE due to proximity and inexpensive tuition. All had favorable opinions of advising at every stage of their time at SE. One of the students was an athlete. It was noted that lab times could be scheduled in the morning to avoid conflict in scheduling with athletic training. None of the students thought the facilities limited their success.

The alumni survey (Table 7 of the Self-Study) is very favorable for the department. >83% of those who completed the survey thought they were well or at least adequately prepared for their current position. The alumni survey also reported that lab training was needed for success in the chemistry workforce or post-graduate education (there were 8 statements emphasizing lab experience). Therefore, online education/online laboratories would likely have hurt their success.

The office of institutional research (or whoever creates the tables) should order the tables the same way. Table 7A has "very well" on the right and Table 7B has "strongly agree" on the left. Second, I would compare to average university statistics. For instance, if 54.2% of alumni thought the major "very well" prepared them for work, how does this compare to average major? Report the difference from the university average (+/-).

h. Assessment

The assessment reports are excellent (Appendix III of the Self-Study). There is numerical evidence of program success. There are triggers in place to investigate or manage issues if student performance does not meet expectations.

The ACS standardized exams provide useful metrics. In the case of analytical chemistry, physical chemistry, and biochemistry, I have noted the content of the exam does not relate to the content of the course at most schools, so there should be some discretion when analyzing the information (SE versus national) on these courses.

On any ACS exam, a good class may have a lower average score if the exam statistics were dominated by a school with more rigorous entrance requirements (e.g., Princeton). Importantly, the scores should correlate with course grades. The overall course grade should not be dominated the ACS score (maybe at most 25%), but at the same time, students who do poorly on the ACS exam should not be receiving an A for their final grade. Given the DFW rates, I do not think this is the case, but the ACS exam statistics were not separated per faculty or compared to final course grades.

SLO 4 is a good outcome, but there are no measures (direct or indirect) of its assessment. Consider assignments to address ethics/plagiarism or discussions about ethics in science, followed by some assessment. In every course when plagiarism is an issue, have clear expectations and share examples of plagiarism. To help detect plagiarism, use turn-it-in (part of Canvas) on **all** submitted reports from students. Report all instances of plagiarism. In assessment, decide on a "trigger" point (e.g., less than 5% of assignments) similar those assessment thresholds established for ACS exams.

For SLO 6, consider sharing expectations of safety in all laboratory classes (which is likely the status quo) and follow this with simple safety quiz (the results of the quiz could be reported for assessment). In addition, keep records of safety violations (not just those involving health) with simple reporting (this may be the case). For example, Bradley Corbett receives notifications from EH&S when routine safety inspections find issues. Those could be recorded. The good record keeping would help identify repeated violations could be addressed.

i. Resources (financial, library, academic)

Given the retention rate in the chemistry major, consider better institutional support of tutoring. Reward faculty meeting with students during office hours. Find majors and

pay them adequately to have regular tutoring during the evening and weekend. This will not only benefit the chemistry major but other programs that rely on chemistry courses.

Since departmental operating expenses are not keeping pace with inflation, allow the department to institute lab fees. KBOR (Kansas Board of Regents) has established fee limits and explicit requirement the lab fees are provided to the department to maintain and enhance laboratory courses. Without this revenue stream, the Emporia State University chemistry program would exhaust normal funding half-way through the year. If audited, we can show how each dollar benefits the students since lab fee funds are in separate accounts. Also, account balances and transactions are shared monthly with all chemistry faculty.

SciFinder is an important resource that is not used much by institutions on the size of SE. $6,000-plus cost is not sustainable. Undergraduate-focused programs need to lobby for a price that is commensurate with its value. Another option is having departments pay or require ACS membership (student members has some access to SciFinder).

j. Facilities

If Southeastern Oklahoma State University wants to maintain any science programs, it is essential that the science building is renovated. One cause of dropping enrollment is because students have much better high school chemistry laboratories compared to those at SE. Not only are aesthetic improvements required, but the chemistry laboratories need technical upgrades. This is vital to the education *and safety* of students, staff, and faculty. The laboratories were last upgraded in the 1960s -- 50 years ago even though hoods have lifespans of 20 years.

There is a substantial amount of money that will be used for renovation (more than $1.5 million?). Since it will not likely cover all desired upgrades, faculty and administration should convene to triage the needs. There will be a better outcome if more are involved (chair, chemistry faculty, facilities). The elevator alone may cost $300,000.

Hoods operate more efficiently (upkeep and electricity costs) when they are closer to the top of the building. In my opinion, the plans should have labs on the top two floors. Place classrooms on the first floor. This has the advantage that most students enter the building more frequently to attend lecture (lecture is often three times a week and laboratory is once) so there would be less stair/elevator traffic if classrooms were on the first floor.

What is the reason for adding additional space for a stockroom? This will add considerable cost to the renovation. Dispose of old chemicals (those not used in the last 2 years) and there should not be much space needed for chemical storage. If there is space required in a new “outside” wing, only place excess solvents or corrosive chemicals in this annex.

Classrooms seemed fine. I prefer tables and chairs rather than old-style student desks, but this is a matter of personal choice. There was a long and narrow classroom that should be reconfigured (S202). ESU has a larger chemistry program (more faculty and more students). However, ESU chemistry only has three classrooms (two hold 48 students and one holds 16). I think having 6 or more classrooms is too much to

maintain (technology and furniture) *unless the classrooms are extensively used by other programs*.

SE has a wealth of individual research space (perhaps double compared to ESU). There are certainly issues with infrastructure, but if every bench is covered (stored material? unshelved supplies?), this will impact research productivity and potentially, student recruitment. Develop a plan to organize.

k. Relative program costs and effective use of resources

This is a very important part of the program review. However, the institution (and standards of reporting to the Oklahoma State Regents for Higher Education) has not provided the information to make any objective conclusions. ESU operates with $24K on chemistry-related purchases (this includes both annual operating expenses and lab fees). SE operates with $33K. However, the SE budget includes SciFinder.

Cameron University with ~3100 undergraduates (compared to ~3050 undergraduates at SE), there is a budget of $46K. This is considerably larger than SE.

Nonetheless, the sizes of the ESU, Cameron, and SE budgets are on the same scale. From my experience, the size of the budget demands effective use of resources. Given what is needed to run the teaching laboratories, there is not room for misappropriation of funds.

l. Administrative/Institutional support of the program

There has been neglect of the facilities. This must be addressed in the next year.

As mentioned earlier, I recommend tutoring is institutionalized (see the ACES program at ESU for a model of what works well).

m. Size of classes, total enrollment of the program and number of graduates

Across the nation, there is a decline in student enrollment. Eight years ago, SE and ESU had 120 students in the fall sections of chemistry 1. This year, ESU will have 80 and SE will have 40. Marketing and admissions should conduct a study to identify the causes. Has the science and math education changed in high schools in the last decade? Is there a stronger attraction to UO or OSU that has developed in the last decade? Is the advising center unknowingly steering students away from the sciences because of the perception of difficulty and goal to improve retention?

The department has developed a good rotation of courses (Table 4C, Self-Study). Since SCH production is robust, an under-enrolled course that is permitted to continue is warranted. Having a chemistry baccalaureate program benefits the whole university and region (pre-medical preparation and the need for chemistry technicians).

75% of jobs being advertised require a 4-year college degree but only 40% applicants are qualified. Why is enrollment dropping? A changing job market? High school counselors are not promoting SE? Colleges need to respond and adapt to the changing mindset. Collect data (salaries of alumni at different stages of their career) and share with prospective students and high school advisors. There is overwhelming evidence that a college education is the best investment a high school graduate could make.

3. Overall Program Quality

   The overall program quality is very good. The major detractors are the need for faculty (organic chemist) and facilities. These are addressed in the recommendations.

4. Recommendations
   a. I agree that hiring an organic chemist has high priority. Given the SCH production, I think an additional faculty member beyond an organic chemist is warranted.

      The school of business at SE has advocated successfully for salaries above $115K for newly hired assistant professors. In the search for an organic chemist, I would imagine SE will face an outcome similar to last year (all viable approved candidates rejecting the offer) because the salary being offered is too low. In the last decade, the ESU chemistry program has conducted 14 searches with all but 2 successful. However, the faculty start at ESU, gain experience, and leave after 3-4 years. Constant turnover is a burden on the program. Science faculty (especially organic chemists) have options besides teaching *unless* the university can hire someone who wants to be in the region.

   b. I agree that renovating space is a high priority. See section j above.

   c. There should be lecture capture and technology in classrooms. Work with faculty to make sure updates benefit teaching. Some faculty may not want a large LCD in the middle of the board. So having different technology in different classrooms might work well for the variety of teaching styles of faculty. Students (4 interviewed) all thought classroom facilities met the need.

   d. I agree that computers in faculty offices should be able to run the latest version of windows and office.

   e. Before updating instrumentation, record use of instruments (research and teaching) and create a plan on how instrumentation should be used in teaching labs. Just as the articulation of general chemistry 1 and general chemistry 2 content was useful in developing student education (ensuring students are prepared for the next chemistry course), articulation of instrumentation use in laboratory courses would benefit the entire program. Instruments should be chosen that fit the need, whether that is fast and simple data collection for 16 individual students in organic chemistry lab or precise and controlled for a student research project. Students (4 interviewed) all thought instrumentation met the need.

   f. Ideally, there should be coordination of recruiting efforts with everyone contributing in various ways to advertise the chemistry program. In reality, there are obstacles, such as lack of support to create brochures or difficulty changing the website. There is a disconnect with faculty performance and any form of salary reward. The Chair should emphasize the contribution to recruiting for tenure and promotion, but the administration (Dean, Provost, President) needs to provide some direction. Students (4 interviewed) mentioned the importance of their high school teachers. I would recommend promoting the chemistry program with regional high school science teachers (invite teachers to SE, covering travel costs, to tour the science facilities and see student success stories).

g. I agree with coordination there should be coordination of advising efforts. It could be as simple as assigning a faculty member to review enrolled students and offer advice (either to the student or the advising center). Students (all 4 interviewed) had no issues with advising.

h. Encouraging research is a good recommendation. It has the same challenges as encouraging faculty to be involved in recruiting. There is lack of incentives. There are obstacles (lack of resources, difficulty in submitting grant applications). I think the incentive should come in the form of course release for the completion of some agree-upon, tangible output. Consider allowing the stockroom manager (if credentials are sufficient) to teach introductory chemistry labs. Use this to reward faculty who are working with students on research projects (course release).

In conclusion, I was grateful to have a detailed self-study. It was clear the authors spent time to assemble the data and the self-evaluation was honest and helpful. I enjoyed meeting with each faculty (including Mr. Corbett) individually. I could sense that each everyone cares deeply for the success of the program. I especially appreciate the immediate and useful responses from the Chair of the Department, Dr. Smith.

Department of Chemistry, Computer, and Physical Sciences

Program Review: Chemistry – 2022

Response to Review's Recommendation by Chemistry faculty

Reviewer's Recommendations are stated first followed by the department's response for each recommendation **in bold**.

a. I agree that hiring an organic chemist has high priority. Given the SCH production, I think an additional faculty member beyond an organic chemist is warranted. The school of business at SE has advocated successfully for salaries above $115K for newly hired assistant professors. In the search for an organic chemist, I would imagine SE will face an outcome similar to last year (all viable approved candidates rejecting the offer) because the salary being offered is too low. In the last decade, the ESU chemistry program has conducted 14 searches with all but 2 successful. However, the faculty start at ESU, gain experience, and leave after 3-4 years. Constant turnover is a burden on the program. Science faculty (especially organic chemists) have options besides teaching unless the university can hire someone who wants to be in the region.

   The faculty strongly agree that hiring a tenure-track organic chemist is a top priority. A faculty search is currently underway. The salary offered is beyond the control of the Chemistry program. Ultimately, the salary is determined by Human Resources and approved by the President. We realize our salaries are not highly competitive but are helpless to change that fact. The department has consistently asked for higher salaries in recent searches.

b. I agree that renovating space is a high priority.

   Most laboratories and classrooms have not had any major renovation since the 1966 Annex addition to the Science building. Renovating labs has now reached the point of necessity for the safety of our students. We strongly agree with the reviewer. The budget for the component has already been presented in the 2022 and renovations plans are being drafted by the architects. The cost will be depend on the extent of the renovations but should exceed $4 million on the Science Building.

c. There should be lecture capture and technology in classrooms. Work with faculty to make sure updates benefit teaching. Some faculty may not want a large LCD in the middle of the board. So having different technology in different classrooms might work well for the variety of teaching styles of faculty. Students (4 interviewed) all thought classroom facilities met the need.

   The Science Building has lecture capture capabilities in 4 of the 6 classrooms. Only two rooms recently received the new Polycom video camera and microphone system, which made Zoom presentations and lecture captures much higher quality. Two rooms have pieced together systems by CCPS using low quality components. Shawn Ridenour said the cost of the Polycom camera-microphone systems are around $1500/room but that cost is changing frequently. We added a new TouchScreen high-resolution TV to S-333 at the faculty's request and covered

this with CCPS funds. The Cares funding provided the same TVs to S-117 and S-217 in the Fall 2022. These new TouchScreen TVs allow faculty to write directly onto a PowerPoint and any Zooming students can view the image directly as opposed to using a PowerPoint combined with a chalkboard. So far, the majority of faculty are in favor of the new technology. We have left the chalkboards in some classrooms for those faculty not making the technology transition.

We would like to request funds to add the PolyCom video-microphone systems to our remaining for four classrooms and add a new LG TouchScreen to S-102 to replace the aging LCD projector-SmartBoard which is low resolution. The estimate cost for these additions would be $10,000 based on today's cost.

d. I agree that computers in faculty offices should be able to run the latest version of windows and office.

All faculty office had their CPUs replaced in the Fall 2022 by SE's IT department. This concern has been temporarily addressed. However, it is important that SE IT department again establish a rotation that allows faculty to utilize current technology in their offices with the routine replacement of CPUs.

e. Before updating instrumentation, record use of instruments (research and teaching) and create a plan on how instrumentation should be used in teaching labs. Just as the articulation of general chemistry 1 and general chemistry 2 content was useful in developing student education (ensuring students are prepared for the next chemistry course), articulation of instrumentation use in laboratory courses would benefit the entire program. Instruments should be chosen that fit the need, whether that is fast and simple data collection for 16 individual students in organic chemistry lab or precise and controlled for a student research project. Students (4 interviewed) all thought instrumentation met the need.

The department has established user log-books for the FT-IR and the NMR spectrometers. We have the ability to track other instrument use based on class laboratory activities by the semester. However, some currently unavailable instrumentation would be beneficial for our constituents and students entering the workforce. These might include a XRF spectrometer useful to Cardinal Glass and CMC Metals and electron microscope used daily by semiconductor chips manufacturers like Texas Instruments.

f. Ideally, there should be coordination of recruiting efforts with everyone contributing in various ways to advertise the chemistry program. In reality, there are obstacles, such as lack of support to create brochures or difficulty changing the website. There is a disconnect with faculty performance and any form of salary reward. The Chair should emphasize the contribution to recruiting for tenure and promotion, but the administration (Dean, Provost, President) needs to provide some direction. Students (4 interviewed) mentioned the importance of their high school teachers. I would recommend promoting the chemistry program with regional high school science teachers (invite teachers to SE, covering travel costs, to tour the science facilities and see student success stories).

CCPS needs to meet with SE's Recruitment Office and learn their needs as well as current strategies. CCPS would like to have the professionally edited program flyers (SE branded) that have been generated for most other SE programs for Chemistry, Computer Science, and Computer Information Systems. We have submitted the data for these flyers multiple times only to be lost with changes in staff. Currently the Recruitment Office does not frequently correspond with CCPS. We specifically would request the following:

1. **Have professional SE branded program flyers developed to be distributed.**
2. **Need a list of local high school contacts to reach HS teachers about CCPS recruitment visits.**

g. I agree with coordination there should be coordination of advising efforts. It could be as simple as assigning a faculty member to review enrolled students and offer advice (either to the student or the advising center). Students (all 4 interviewed) had no issues with advising.

Department needs to meet annually with the Advising Center to discuss the importance of getting Chemistry advisor assigned within the department and to clarify that Chemistry is a minimum 3-year program.

h. Encouraging research is a good recommendation. It has the same challenges as encouraging faculty to be involved in recruiting. There is lack of incentives. There are obstacles (lack of resources, difficulty in submitting grant applications). I think the incentive should come in the form of course release for the completion of some agree- upon, tangible output. Consider allowing the stockroom manager (if credentials are sufficient) to teach introductory chemistry labs. Use this to reward faculty who are working with students on research projects (course release).

Faculty are still required by the institution to carry a 12/12 teaching load. Potentially faculty could be assigned research credit (for load) in the future with the approval of the VPAA. Our emphasis remains on strong teaching that include faculty-student interactions in the classroom and we do not want to diminish this aspect. The chair will discuss with the VPAA the potential to consider previous year SCH load with research students towards some release time the following academic year.