Instructional Program Review 2018/19 (Comprehensive)

Chemistry

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Table of Contents

General Information (Instructional Program Review 2018/19 (Comprehensive))

2018/19 Instructional Program Review

Program Review Data and Resources

Submission Information (REQUIRED)

- Name of Lead Writer: Donna Budzynski
- Name of Liaison: Robert Wong
- Department Chair: Paula Hjorth-Gustin
- Name of Manager/Service Area Supervisor: Susan Topham
- Is this a CTE program? (State **Yes** or **No**): No

Faculty/staff (REQUIRED)

- Number of T/TT Faculty: 9 (soon to be 11)
- Number of Adjunct Faculty: 25
- Number of sections taught by T/TT Faculty: 42
- Percent of FTEF taught by T/TT Faculty: 45
- Number of Pro-Rata Faculty: 0

Program Mission (REQUIRED)

Mission Statement:

The San Diego Mesa College Chemistry Department offers several levels of chemistry courses ranging from introductory level courses for nonscience majors to majors level chemistry. The student population in the courses is very diverse as well. For this reason, the mission of the San Diego Mesa College Chemistry Department is three-fold and as follows:

- To prepare transfer students for upper division science courses.
- To prepare students for jobs or careers in the sciences and health industries.
- To provide a basic understanding of scientific principles to prepare students to make informed decisions about issues they will face as responsible citizens.

Program Overview (REQUIRED)

Form: 2018/19 Comprehensive Program Review Instructional Program Overview Section (See appendix)

Form: "2018/19 Comprehensive Program Review Instructional Program Overview Section"

Created with : Taskstream
Participating Area: Chemistry

(REQUIRED) Program name

Chemistry

(REQUIRED) Program strengths

Discuss strengths of the program.

Students take chemistry to fulfill requirements for several STEM majors and several allied health fields, as well as to fulfill general education requirements. The department keeps all these needs in mind when developing and updating curriculum, scheduling classes and hiring faculty and staff. Our program takes a diverse student population and gives them the required knowledge to help build a foundation that not only can be applied in the chemistry but also in the biological, medical, and engineering fields. These foundation courses are transferable and are required in many college science programs. Also, the courses we teach play a role in everyone's lives since knowledge in this area is essential for meeting our basic needs as a society in general, i.e. our need for food, clothing, shelter, health, energy, and clean air, water, and soil. Thus, studying chemistry is useful in preparing our students for the real world where they will need to make tough decisions based on their understanding of current local and global conditions. Lastly, the study of chemistry helps our students choose from a wide variety of useful, interesting and rewarding careers. A Mesa College student that transfers and obtains a bachelor's level education in chemistry is well prepared to assume professional positions in industry, education, or public service. A chemistry degree also serves as an excellent foundation for advanced study in a number of related and non-related areas. The list of career possibilities for people with training in chemistry is long and varied. Even in times when unemployment rates are high, the chemist remains one of the most highly sought after and employed scientists.

Our current department chair Paula Gustin was previously Curriculum Chair and brings a wealth of knowledge to our department from that area. Since Fall 2017, we have been able to split the department chair duties across three faculty. Besides our chair, we have an assistant chair for scheduling (Donna Budzynkis) and an assistant chair for SLOs (Saloua Saidane). We have become very proactive and flexible in our scheduling. We are constantly looking at student course needs and enrollment trends, as well as student success and equity. Our constant goal is to develop a class schedule that will meet these changing needs. For example, we recently added another Organic Chem I Lab on Fridays to help more students complete their transfer requirements at Mesa. We have increased our offerings in Introduction to General Chemistry since it is a prerequisite to General Chemistry and Biology courses. We have experienced an overall 8% growth in the last 4 years, much of it in the General Chemistry sequence. We continue to add sections. For Spring 2019 we

are at 97 sections, up from 87 in Spring 2018 and 94 in Fall 2018, while maintaining greater than 95% fill rate.

We have an amazing Math and Science building that boasts state of the art laboratory facilities as well as being very student oriented. For example, there are numerous study/meeting spaces that lend to learning opportunities. Not only do students have easy access to faculty but they can easily meet with their colleagues to discuss, study, and learn. This adds an informal flavor to the learning process that already exists in the nearby classrooms and encourages serendipitous learning. The state of the art equipment in our labs gives students exposure to scientific study that many community college students do not receive.

The chemistry department at Mesa college enjoys an excellent faculty, both adjunct and contract. Several of the faculty members have had various academic and industrial experiences here in the US and abroad. Our faculty offers the students excellent educational opportunities that are well sought after as evidenced by our astronomical Fill rate and continued increase in student numbers even while the college as a whole has seen a decline (see data analysis section). Our faculty are consistently involved in college and district leadership positions in areas such as Faculty Senate, Curriculum, tutoring and grant writing. One faculty member conducts research as well as heads the Bridges to Baccalaureate program. This allows us as a program to stay in the know when it comes to, for example, resource allocations since some of us have helped developed these processes. Another benefit is that our faculty serve as excellent examples or role models for student behavior. Though it is not formally taught, our students indirectly learn by example about personal responsibility, environmental awareness and interpersonal skills.

As of January 2018, when we hired Binh Vong, we are up to four full time Instructional Lab Techs who keep the lab courses running smoothly. They are highly educated in the sciences, some holding graduate degrees. Because of this high level of chemistry knowledge they work with the faculty in developing lab experiments that meet curriculum goals while also maintaining staff and student safety.

(REQUIRED) Program challenges

Discuss challenges to the program.

Staffing continues to be a challenge for the department. We have 9 full time faculty and 25 adjuncts. Because we have increased our student numbers by 8% over the past two years, finding and keeping good adjuncts is a constant battle. With the economy on an upswing, many scientists are finding work in local biotech firms. So, not as many new graduates are available to teach, and adjuncts leave to do other things. Since our full time faculty participates in many leadership roles that provide reassigned time, we continually need to search for new adjuncts. We hired several new adjunct faculty in the past year alone, while 5-6 of those left after a short time due to finding full time

employment. The hiring process itself is extremely time consuming, and then once hired there is additional time needed to mentor and evaluate new faculty. We were able to hire a new contract faculty who started Fall 2017, and are thrilled to be welcoming two additional new contract faculty for Spring 2019. This should alleviate some of the challenges, but with our student numbers continuing to grow this will continue to be an issue. And, with so many new faculty, both contract and adjunct, mentoring them will be a priority.

We also face a challenge with updating our lab manuals. This is a very time consuming process that includes writing new experiments and updating old ones, working with our instructional lab techs to order supplies and get updated procedures working well for students, communicating updates to all faculty teaching the course, and they revising again after students have attempted the experiments. Currently, three of our lab courses (130L, 231L, 233L) are in the middle of this update process while two others (100L and 201L) need to be updated.

Although our new building opening in 2014 made it easier to expand class offerings, we are now in a position where our space is actually maxing out, especially in labs and popular lecture times. For example, if we need to open another section of Chem 201L, there are no daytime blocks open in that lab room (and two evenings are currently filled as well as all day Friday). We are also running into similar issues in the labs used to teach Organic Chem I and II and Chem 152L. We will need to come up with some creative plans in the future if these and other classes continue to expand. This may include such things as retrofitting labs to accommodate different classes. For next semester (Spring 2019) we are switching lab rooms between our Chem 100L and 152L courses, since the current 100L lab has more space which will help with the increasing number of 152L sections. This will require moving equipment and setting up rooms during intersession. We are seeing the same issue at popular lecture times, making it difficult to open a new section of a course as others fill.

Students in the sciences can come in underprepared for the work required to complete the courses. We continue to try and boast our students' study skills and knowledge. Along these lines, we see equity gaps in success rates for our courses between underrepresnted groups, especially Latinx students, and white and Asian students. We are trying to close these gaps by instituting new Chem 015 and 020 courses as well as taking advantage of the Classroom Tutoring and Peer Mentoring program. One of our facutly, Amanda Fusco-Hernandez serves as the liason between our department and the Mesa Tutoring program.

(REQUIRED) External influences

Discuss external influences (Collegewide and beyond).

Although the current economic upturn has generally reduced community college enrollment, overall chemistry department enrollment continues to increase. This is most likely due to the demand for STEM majors and for Allied Health as well. Our greatest increase has been in our General Chemistry sequence (STEM majors). Mesa continues to be known as a great place to take STEM courses for transfer, with many of our students transfering to UCSD and SDSU. The San Diego region is known for its

research, biotech and other STEM influenced industies. Our region's military influence also feeds the STEM pathway as many student veterans go into fields such as engineering once they leave the military.

The change in the statewide funding formula will have an effect on the department as well as the college as a whole. Because our courses are in great demand, we do not anticipate too much change in the number of offerings in the near future. It is much more difficult to predict what the next few years holds due to this change in funding.

(REQUIRED) Areas of Focus

Describe one or more areas that your department is focusing on. You will refer to this response in the Program Analysis Section.

We will continue to be focused on hiring, mentoring and evaluating new faculty, both contract and adjunct. As described in the Challenge section, our department is currently updating some lab classes, with more in need of overview.

In order to better meet student needs, we will offer a new course, Chem 103, starting in Fall 2019. This course is Intro to General, Organic and Biochemisty. It is geared towards Allied Health students, especially pre-nursing. Students take this one semester lecture/lab course instead of the two semester sequence Chem 100/100L and 130/130L, allowing them to finish their requirments more quickly. We will start with one section and monitor.

To facilitate student success, we will be offering two courses that will help students in Chem 152 and Chem 200. Our new Chem 015 is an optional course taken with Chem 152. This course will institutionalize our very successful workshop series that was previously grant funded. Students will meet weekly to work on lecture topics in Chem 152 that students find challenging. Chem 020 will be an optional review course to help students taking Chem 200 who have taken the prerequisite Chem 152 many semesters previously, or who need some additional review on essential topics. This will be an online course using ALEK software offered in the summer and intersession. We anticipate starting these courses in the 2019-2020 school year.

In the past year we have increased our number of sections of Chem 152/152L (Intro to Gen Chem and lab), Chem 200/200L (Gen Chem I and lab), Chem 201L (Gen Chem II lab), and Chem 231/231L (Organic Chem I and lab). We will need to monitor these and all our courses closely to see if enrollment trends continue and where adjustments need to be made.

With the hiring of two new contract faculty, to start in Spring 2019, one main focus will be mentoring them. Professors Jessica Sardo and Danica Moore are both experienced adjuncts in our district. We are looking to one of them, Prof Moore, to take on the Chem 100L lab course updating while Prof Sardo will join our newer hire from 2017, Professor Kalagara, in working to launch Chem 103 in Fall 2019.

Additionally, we will continue to work on clarifying our Chem Pathways to students through work in the STEM Pathways workgroup. We look forward to seeing their results.

The Following Questions are for CTE Programs ONLY.

Enter "not applicable" if your program is not CTE.

_____

(REQUIRED) Describe how the program's industry partners (including advisory committee) assist with program improvement including curriculum advice, obtaining equipment, providing internships and finding or providing other funding (limit 500 characters) (P.N. 1.b.). Please upload Advisory Committee minutes from the last year here.

Enter "not applicable" if your program is not CTE.

No answer specified

(REQUIRED) Describe how your program connects to High Schools, Universities and Continuing Education, creating career pathways in your field. Include articulation, specific projects, collaboration with teachers/professors, etc. (limit 500 characters) (P.N. 3)

Enter "not applicable" if your program is not CTE.

No answer specified

Form: "2018/19 Comprehensive Program Review Instructional Curriculum Section"

Created with : Taskstream
Participating Area: Chemistry

(REQUIRED) Program Name

Chemistry

(REQUIRED) What degrees and certificates are offered?

The chemistry department has several degrees:

AS Chemistry, Liberal Arts & Sciences Physical Chemistry-Chemistry, Liberal Arts and Sciences -Science Studies-Chem, Certificate of Achievement-Chemistry, Certificate of Achievement-Chemistry Technician, Associated Degree-Chemistry Technician

(REQUIRED) How many of each degree and certificate have been earned in the past 4 years?

Over the past 4 years, students have earned the following numbers of degrees:

Associate Degree (AS)- Chemistry: 23

Liberal Arts & Sciences-Physical Sciences-Chemistry: 35

Liberal Arts & Sciences-Science Studies-Chemistry: 9

Certificate of Achievement-Chemistry: 0

Certificate of Achievement-Chemistry Technician: 0

Associate Degree-Chemistry Technician: 0

(REQUIRED) If you have no (or very few) degrees/certificates, what other paths do you offer? (for example, GE, transfer)

Transfer is an important goal of the chemistry department. Looking at UC transfer information for the last four years, we have had a total of 60 students enroll in the University of California system declaring chemistry as their major.

The chemistry department is an integral part of the curriculum in biology, allied health fields, physics and engineering. It is a central science that all science majors have to take.

(REQUIRED) Have you developed any new courses in the past 4 years? Please give details.

Our department has activated the General, Organic, and Biochemistry-Chemistry 103 to help improve our nursing majors pathways. We are planning on offering in Fall 2019. This is

a much needed course that allows nursing majors to complete their chemistry requirement in one course.

Student success and retention is an important part of our departmental mission. Mesa faculty have developed two support courses to help with this goal. One course is Chemistry 20 which is a chemistry refresher course for students who have completed Chemistry 152 (General Chemistry Preparation), but who need to review the material. It is our hope that this will help retention rates in Chemistry 200. The second course is Chemistry 15 which is a support course for Chemistry 152. This will allow students to have workshop style discussions to improve their understanding. Departmental data shows that this can close the equity gap in the chemistry prep courses and help improve student retention and success.

(REQUIRED) Have you made other curricular changes? (for example, renumbering, sequence change, co-reqs or pre-reqs)

With legislative changes in prerequisites, the chemistry department will be assessing the math pre-requisites for Chemistry 100 and Chemistry 152. This will include removing non-transfer level math prerequisites and/or advisories to the courses.

The Following Questions are for CTE Programs ONLY.

Enter "not applicable" if your program is not CTE.

_____

(REQUIRED) List any licensure and/or accreditation associated with your program.

Enter "not applicable" if your program is not CTE.

No answer specified

(REQUIRED) Indicate the program TOP codes for your AA, AS, COA and COPs.

Please find TOP Code Link in the Directions.

Enter "not applicable" if your program is not CTE.

No answer specified

(REQUIRED) Indicate the SOC codes and title associated with your program's AA, AS, COA and COPs.

Please find SOC Code Link in the Directions.

Enter "not applicable" if your program is not CTE

No answer specified

(REQUIRED) Select the sector associated with your program.

Link to sectors list: In process of being developed

- *No answer specified*

Form: "2018/19 Comprehensive Program Review Instructional Outcomes and Assessment Section"

Created with : Taskstream
Participating Area: Chemistry

(REQUIRED) Program name

Chemistry

(REQUIRED) We are halfway through our 6-year cycle. Is your department/program on target to complete CLO assessment by Spring 2022? Please attach your schedule for CLO assessment, with explanations as needed.

Refer back to Direction #3 on how to attach documents.

Yes, we are on target. Please see slides two and three of the attched powerpoint for the schedule.

(REQUIRED) Please list your PLOs.

PLO #1: Communication
Students will be able to demonstrate ability to report scientific information appropriately.

PLO #2: Critical Thinking
Students will be able to utilize the scientific method to analyze and interpret data.

PLO #3: Technology awareness
Students will be able to investigate questions utilizing modern and appropriate tools.

PLO #4: Personal responsibility
Students will come prepared for class and complete assigned work thoughtfully.

PLO #5: Environmental Responsibility
Students will be able to explain or describe the impact of chemistry on environment.

(REQUIRED) What progress have you made in your PLO assessment? Please attach your schedule, with explanations as needed.

Refer back to Direction #3 on how to attach documents.

Please see attached PowerPoint.

(REQUIRED) What have your completed assessments revealed about your courses or program?

Please see attached PowerPoint.

(REQUIRED) If issues or problems were identified, what is your plan for implementing change?

Please see attached PowerPoint.

(REQUIRED) Based on your assessments, have you identified resource needs?

- Faculty

Please provide any other comments.

No answer specified

Form: "2018/19 Comprehensive Program Review Instructional Program Analysis Section"

Created with : Taskstream
Participating Area: Chemistry

(REQUIRED) Program name

Chemistry

(REQUIRED) Using the data dashboards, discuss how students are doing in your program. Please refer to indicators of success, retention, persistence, etc.

The overall success rate for Chemistry courses since 2014 is 77% with a retention rate of 88%. This is higher than the college's rates of 72% and 87%. The overall GPA for Chemistry courses since 2014 is 2.78, which is almost identical to the college's overall GPA of 2.74. In general, our lab courses tend to have higher success and retention rates as well as GPAs than lecture courses. This is to be expected, as grades in lab courses are mostly based on completing experiments and graded lab reports, while lecture grades have a higher percentage of students' grades based on exams.

Even though the indicators overall show good success for Chemistry courses, improvements can be made for certain courses. For example, Chem 100 and Chem 231 both have overall success rates less than 70%. These courses are on complete opposite ends of the spectrum, so addressing their issues will be very different. Chem 100 students are a mix of pre-allied health and general education students. This course is for students with no chemistry background. Increasing success in Chem 100 should include measures such as tutoring, outreach to students new to college, and workshops. Chem 231 is the first course in organic chemistry for STEM majors. These students have already passed Chem 152, 200 and 201. The lower success rate there is probably mostly due to the shift to a sophomore level STEM major schedule, with a huge increase in workload in all their courses. Addressing this success rate could include counseling and mentoring before registering for classes. There is also a consistent need for tutors at this level.

(REQUIRED) How does your program help to prepare students for success beyond your classrooms?

We have three areas of preparation. For STEM majors, various courses in the Chem 152, 200, 201, 231, 233, 251 sequence are required courses, so the focus there is transfer. For example, Chemistry, Biology, and Biochemistry majors are required to take 152 - 233. Engineering majors take 152-200 or 201, depending on transfer institution. Chem 251 is required for Chemistry majors at SDSU as well as for students whose goal is Clinical Laboratory Science. Besides being actual prerequisite and transfer degree requirements, our courses prepare students for higher level science courses by helping to learn critical thinking skills, problem solving skills, as well as practical laboratory and data analysis skills. By the time they are done with this sequence they are well prepared to walk into a university as an upper division STEM student.

Another area we prepare students for is Allied Health careers. This sequence of courses includes 100, 130 and 160. In 2019, Chem 103 will be added to this list. The 100, 130

sequence prepares students for many allied health fields, especially nursing. Nutrition majors take these courses too, as well as Chem 160.

Finally, we offer Chem 111/111L which is for non-science majors fulfilling a general education requirement. We also have a significant number of these students taking our 100/100L. By taking these courses, students become better informed in science and can discuss and understand current events better. For example, they might better understand the issues caused by climate change. Critical thinking in these areas is crucial.

(REQUIRED) Given your stated area(s) of focus in your program overview section, has your program introduced new or different actions that may have affected changes in these indicators? Please describe.

As stated in the program overview section, In the past year we have increased our number of sections of Chem 152/152L (Intro to Gen Chem and lab), Chem 200/200L (Gen Chem I and lab), Chem 201L (Gen Chem II lab), and Chem 231/231L (Organic Chem I and lab). Increasing these sections will allow more students to complete their course of student and transfer. We will begin offering Chem 103 in Fall 2018. This course is for pre-nursing students. They could choose to take this 5 unit course instead of the Chem100/100L followed by Chem 130/130L sequence, allowing them to complete their requirements in a shorter time period.

We have continued to work on improving and updating our lab manuals and lab courses. This not only helps students in their understanding of topics in the lab courses, but also helps them to be successful in lecture courses. Labs are essentially hands on learning exercises. Although this work continues, in the past year Saloua Saidane did an enormous amount of work updating the Chem 231L and 233L courses. This semester (fall 2018) we added an additional section of 231L on Fridays. This increased enrollment in that course by 43% over the previous semester. Our newest contract faculty, Sudhakar Kalagara, hired in Fall 2017 has started teaching courses in this sequence as well.

Our workshop series first started in Spring 2016 with an equity mini grant. That allowed us to offer faculty lead workshops on topics students typically struggle with in Chem 152 and 200. In the Fall 2016 these workshops continued and expanded with a $31,348 Blasker Science and Technology Grant obtained by Amanda Fusco-Hernandez. In total 178 STEM workshops were offered in that academic year. There were 25 Biology, 19 Physics, 16 Math and 118 Chemistry workshops provided. Attendance was on average 16 students per workshop. The success rate of under-represented students and non-under-represented students was analyzed for two Chem 152 sections per year taught by the same instructor over a three year period. Success rates were calculated by comparing the number of students enrolled in the course at census to the number of students who passed the course with a C or better. These courses were selected because they had a large percentage of students attend workshops; out of approximately 105 students enrolled per semester, 49% attended workshops in the Fall semester and 62% attended workshops in the Spring semester. Approximately 54% of these students were from under-represented groups. The average success rate for the previous two academic years (No STEM Workshops) for under-represented students was 67% as compared to 82% for non-under-represented students with a gap of

15%. The average success rate of under-represented students for the academic year that conducted STEM workshops showed a significant increase from 67% to 78% and for non-under-represented it increased from 82% to 87.5% with a decrease in the gap from 15% to 9.5%. This demonstrates an increase in student success rates for both under-represented and non-under-represented students with a decrease in the gap by 37%. It should be noted again that this analysis was only conducted for one instructor's sections, since these students had high attendance rates at workshops.

(REQUIRED) Has your program introduced any new actions specifically focused on issues of equity? Please describe.

In looking at the equity data for our program, overall it is very similar to the college as a whole. For example, the two largest groups by ethnicity taking chemistry course are Whites and Latinx. Since 2014, student of these ethnicities in chem courses numbered 9304 and 9218 respectively. The equity gap between success rates of these two groups in chemistry courses is 10% (so on average, Latinx students have 10% lower success rates than White students). This is very similar to the college as a whole which shows a 9% gap for these same groups. The high enrollment course with the largest success rate gap between these students is Chem 200 lecture, with a 15% gap.

To address these gaps and to increase the success rate of chemistry students as a whole, the department has introduced the following actions:

As described above, starting in Spring 2016, workshops for Chem 152 and Chem 200 were started. As the data above indicated, these workshops can be very successful in closing the equity gap, especially for Chem 152. Since the grants were not indefinite, and since the workshops are so successful, the Chem department will begin offering the Chem 015 and 020 courses as a way to effectively institutionalize these workshops in the 2019/2020 school year. Please see the Curriculum and Goals sections for a full description of these new courses.

Chemistry instructors have participated in the Classroom Tutoring program for Chem 152. Additionally, in Fall 2018 through the HSI STEM Title V grant, the department started participating in the Peer Mentoring program. Since this was the initial start up semester for the program, one instructor with two sections of Chem 200 was chosen to participate. In this program, a student who has recently passed Chem 200 runs structured study groups for current Chem 200. There are currently two sessions per week. Although it is too soon for any success data from this program, students have indicated they think it is very helpful. This program will be continued and possibly expanded in Spring 2019.

(REQUIRED) Describe the trends in enrollment for your program. What changes might you foresee in the next 2-3 years?

Overall, Chemistry has seen an 8% increase in yearly (spring plus summer plus fall) enrollment over the past 3 years. The majority of this increase has come from the general chemistry sequence: Chem 152, 200 and 201 and their labs which together has seen an

11% increase over that 3 year period. This has been facilitated by increasing sections in many courses: the fall 2018 chemistry course offering totaled 93 sections which was an increase from the previous fall's 84 sections. The fill rate in chemistry continues to stay above 95%. The only course that seems to be leveling or slightly decreasing in enrollment is Chem 130/130L. For spring 2019 we have added one Chem 152 lecture section and two Chem 152L lab sections, while we decreased our Chem 130L offerings by one section.

We anticipate the trend of increasing enrollment will continue for the next 2-3 years, but probably at a lower percentage. Chem 152 is a prerequisite for Chem 200 (as well as Bio 210A) so increasing enrollment there has the potential effect of increasing enrollment in subsequent semesters. Additionally, we are hoping to increase our organic Chemistry 231/233 sequence enrollment by increasing sections. The challenge we face here is space to add more lab sections, especially in the daytime. We may try to add more 152/152L in Fall 2019 as already the new sections we have added for spring 2019 seem to be filling. As mentioned in other comments, we are running out of lab space and this may eventually limit what we can offer.

(REQUIRED) Are there any data sets that are not already provided in the dashboards that you could use to inform your program?

Yes, it would be very helpful to see previous semesters' enrollment trends by week during the registration period. Currently, we cannot go back and look to see how a particular course was doing at the same point in registration last year. Some courses have a tendency to fill more after open registration starts than others, and knowing that trend can helping when watching registration numbers. It would also be interesting to see persistence data for course sequences such as Chem 152, 200, 201, 231, 233. It would be necessary there to see data from the entire district since many students take courses as more than one college.

(REQUIRED) In what ways can the college support your program in our effort to encourage major and career exploration early on in a student’s college experience?

We are currently working on Pathways to help students understand the best way to reach their goals in the sciences and allied health fields. Chemistry is required for almost all of the STEM majors, so we are in a unique position to help these students understand the best path to take. The college can support this by hiring more full time counselors with expertise in STEM areas, starting a STEM Summer Cruise to help students who already identify as STEM majors understand what the STEM paths are like, hiring more peer mentors, and finding a way to reinstitute the faculty mentoring program that was started as part of the HSI STEM grant but dropped after one or two semesters. It would also be helpful to expand the STEM Center which is currently filled to capacity much of the week.

One of the issues we see with students in chemistry, is that they overload with classes. Most of our students already know what they want to major in. That is why they are taking chemistry! But, many of them want to get out quickly so they take too many units or too many difficult classes at once. More STEM specific counselors would be very beneficial. We are finding the current STEM counselor to be extremely helpful in working with us, but more are needed. We also see many students who already struggle with issues such as anxiety and depression taking on heavy loads of very difficult courses. More full time DSPS counselors who understand the intense nature of STEM courses would be helpful in guiding these students.

The Following Questions are for CTE Programs/Services ONLY.

Enter "not applicable" if your program/service is not CTE.

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(REQUIRED) For CTE programs ONLY: Provide specific labor market information showing: 1) Number of jobs available or projected in San Diego County 2) Number of other institutions offering the program 3) How many Mesa students completed the program in the last three years 4) The pay rates for those in the industry (limit 500 characters) (P.N.2.A)

Enter "not applicable" if your program is not CTE.

No answer specified

(REQUIRED) For CTE Services ONLY: How are CTE students identified and tracked for service? (limit 500 characters) (P.N.2.B)

Enter "not applicable" if your service is not CTE.

No answer specified

(REQUIRED) For CTE programs/services ONLY: Upload the report from Launchboard that includes at least three (3) of the following Strong Workforce metrics for your BASELINE year.

Please use the Cal-PASS Plus Launchboard Link available in the Directions.

Refer back to Direction #3 to #6 on how to attach documents.

Strong Workforce Program Metrics
a. Number of Enrollments
b. Number of students Who Got a Degree or Certificate
c. Number of Students Who Transferred
d. Percentage of Students Employed in Two Quarters After Exit
e. Percentage of Students Employed in Four Quarters After Exit
f. Median Earnings in Dollars Two Quarters After Exit
g. Percentage of Students Who Achieved a Job Closely Related to Field of Study
h. Percentage Change in Earrings
i. Percentage Who Attended a Living Wage.

Enter "not applicable" if your program/services is not CTE.

No answer specified

(REQUIRED) For CTE programs/services ONLY Upload the report from the CCCO Perkins site for the College Aggregate Core Indicator Information by 6 digit TOP Code.

Please use the Core Indicator Reports Link available in the Directions.

Refer back to Direction #3 to #6 on how to attach documents.

Enter "not applicable" if your program/service is not CTE.

No answer specified

Curriculum (REQUIRED)

Form: 2018/19 Comprehensive Program Review Instructional Curriculum Section (See appendix)

Outcomes and Assessment (REQUIRED)

Form: 2018/19 Comprehensive Program Review Instructional Outcomes and Assessment Section (See appendix)

File Attachments:

1. **ChemAssessPlanF17S18.pptx** (See appendix)

Program Analysis (REQUIRED)

Form: 2018/19 Comprehensive Program Review Instructional Program Analysis Section (See appendix)

Program Goals (REQUIRED)

2018/2019

Goal

Goal	Mapping
Goal 1: Clarify Chemistry Student Pathways This is a short term goal. We are working on clarifying to students the various student pathways and sub-pathways for chemistry. These include Allied Health pathways, STEM pathways and General Education Pathways.	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.4, Strategic Goal 1.5, Strategic Goal 2.2, Strategic Goal 2.4
Goal 2: Update Lab Manuals	**CA- Mesa College Strategic Directions**

and/or Experiments This is a short term goal. Several of our lab classes need updating of either their lab manuals or experiments, or both. For some of these courses this is already in progress. For others it will begin in the next year. The courses are: Chem 100L, 111L, 130L, 201L, 231L, 233L, 251. These updates will include such things as clarifying some instructions and introductory material for better student understanding, revising/replacing some experiments to better coordinate with lecture material, revising/replacing some experiments to make them more interesting and relevant for students, revising/replacing some experiments to make them safer for students and/or the environment, revising/replacing some experiments to make them less costly.	**and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.4, Strategic Goal 1.6, Strategic Goal 4.1, Strategic Goal 4.2, Strategic Goal 6.1, Strategic Goal 6.2, **Institutional Learning Outcomes 2016/17:** Critical Thinking, Global Consciousness, Information Literacy, **Program Learning Outcomes for Chemistry:** PLO #1: Communication, PLO #2: Critical Thinking, PLO #3: Technology awareness, PLO #4: Personal responsibility, PLO #5: Environmental Responsibility
Goal 3: Update the Chemisty component of the pre-Allied Health Pathway This is a short term goal. Currently at Mesa, pre-Allied Health students in many fields take the Chem 100/100L Chem 130/130L sequence. However, many programs, especially in Nursing, accept the single semester, 5 unit, GOB (General, Organic, and Biochemistry) Chem 103 course currently offered at Miramar and other local colleges. This course includes both a lecture and lab component. We have activated that course and will be offering it in Fall 2019. So, this goal will involve the scheduling, start up and initial evaluation of the success of this course at Mesa.	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.4, Strategic Goal 1.5, Strategic Goal 1.6, Strategic Goal 3.1, Strategic Goal 4.1, Strategic Goal 4.2, Strategic Goal 6.1, Strategic Goal 6.2, **Institutional Learning Outcomes 2016/17:** Communication, Critical Thinking, Information Literacy, Professional & Ethical Behavior, **Program Learning Outcomes for Chemistry:** PLO #1: Communication, PLO #2: Critical Thinking, PLO #3: Technology awareness, PLO #4: Personal responsibility, PLO #5: Environmental Responsibility

Goal 4: Improving Student Success in the General Chemistry Sequence This is a short term goal. The general chemistry courses we will be focusing on are Chem 152 and Chem 200. Both of these courses are required for a large number of STEM majors including Biology, Chemistry, Biochemistry, several Engineering fields, and others. These are two of our highest enrollment courses. Our goal for these courses is to improve the overall success rate and close the equity gap between underrepresented groups, especially LatinX students, and white and Asian students. This will be accomplished in part by introducing two new "helper" courses, Chem 015 (to be taken by students in need of extra help in conjunction with Chem 152) and 020 (to be taken by at risk students before starting Chem 200). Both of these courses will be introduced in the 19/20 school year. A large part of this goal involves the scheduling, planning, implementation and evaluation of the initial success of these courses. Other actions for this goal will be describe further in the Action section.	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.4, Strategic Goal 1.5, Strategic Goal 1.6, Strategic Goal 4.1, Strategic Goal 4.2, **Institutional Learning Outcomes 2016/17:** Critical Thinking, Information Literacy, **Program Learning Outcomes for Chemistry:** PLO #1: Communication, PLO #2: Critical Thinking, PLO #3: Technology awareness
Goal 5: Maintain Excellence in Instruction by Mentoring New Faculty This is a long term goal, with some short term components. We have one recent contract hire (Fall 2017) and two brand new contract hires (starting in Spring 2019). Although all three of these hires are amazing, excellent faculty, they will require continued mentoring over the next few years. Additionally, 15 % of our sections in Spring of 2019 are being taught by adjunct faculty	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.4, Strategic Goal 1.6, Strategic Goal 2.3, Strategic Goal 4.1, Strategic Goal 5.1, Strategic Goal 5.2

that have been hired since Fall 2017. These newer adjuncts also require continued mentoring. All this hiring was due to retirement of faculty and expansion of class offerings. The majority of the full time professors in the department will retire in 5 - 10 years. And we anticipate to continue to expand the offerings in some courses.	
Goal 6: Expansion of Organic Chemistry Offerings This is a long term goal, with some short term components. This goal involves our sophomore level organic chemistry courses, Chem 231/231L and 233/233L. These courses are required for many STEM transfer students including those majoring in Chemistry, Biochemistry and Biology. They are required by professional programs such as Medical, Pharmacy and Dental schools. We would like to expand our offering by increasing the number of sections in both of these courses. We recently added an additional lab section to Chem 231L and it filled easily. Considering the large number of students who complete the pre-requisite General Chemistry sequence (Chem 200/200L and 201/201L) at Mesa, we should be able to fill more sections of these courses. Our current limiting factor is lab and lecture space. In order to accomplish this goal completely, in the long term we will need to retrofit another lab room and purchase equipment to be able to utilize it for these sophomore level courses.	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.4, Strategic Goal 1.5, Strategic Goal 1.6, **Institutional Learning Outcomes 2016/17:** Communication, Critical Thinking, Information Literacy, Professional & Ethical Behavior, **Program Learning Outcomes for Chemistry:** PLO #1: Communication, PLO #2: Critical Thinking, PLO #3: Technology awareness, PLO #4: Personal responsibility, PLO #5: Environmental Responsibility
Goal 7: Finish Development and Implementation of Associate Degree in Biochemistry This is short term goal. This work	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.4, Strategic Goal 1.6

is already in progress. We currently offer various associate degrees in Chemistry and Biology, but none in Biochemistry. Since this is a very common STEM major and many of our students actually major in this upon transfer, it makes sense that we would offer an associate degree in this interdisciplinary field.	
Goal 8: Enrollment Management This is a short term goal. With the new funding formula in place, it is imperative we continue to follow, analyze, right size and otherwise manage the enrollment in Chemistry. We will be continuing to look at ways to increase offerings in courses with high fill rates, such as Chem 152/152L and the organic chemistry sequence. Although most courses in Chemistry are seeing stable or increasing enrollment, in a few instances we may need to adjust our offerings.	**CA- Mesa College Strategic Directions and Goals:** Strategic Goal 1.1, Strategic Goal 1.2, Strategic Goal 1.3, Strategic Goal 1.5, Strategic Goal 1.6, Strategic Goal 6.1

Action Plans for Non CTE Programs (REQUIRED)

Actions

2018/2019

Goal

Goal: Goal 1: Clarify Chemistry Student Pathways

This is a short term goal. We are working on clarifying to students the various student pathways and sub-pathways for chemistry. These include Allied Health pathways, STEM pathways and General Education Pathways.

Action: Work in MS STEM Pathways Workgroup

Describe the actions needed to achieve this objective:	-Collaborate with MS STEM Pathways work group members from Physics, Math, Bio, and STEM counselor. -Develop documents for students to understand Chem pathways. -Develop website with Chem pathways information.
Who will be responsible for overseeing the completion of this objective:	Paula Hjorth-Gustin
Provide a timeline for the actions:	-Ongoing. -Work to be completed in Spring 2019.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-The documents for students will be available for the dean to review. -The information will be available on the website.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty, including counseling. -Classified staff (help with website).

Goal: Goal 2: Update Lab Manuals and/or Experiments

This is a short term goal. Several of our lab classes need updating of either their lab manuals or experiments, or both. For some of these courses this is already in progress. For others it will begin in the next year. The courses are: Chem 100L, 111L, 130L, 201L, 231L, 233L, 251. These updates will include such things as clarifying some instructions and introductory material for better student understanding, revising/replacing some

experiments to better coordinate with lecture material, revising/replacing some experiments to make them more interesting and relevant for students, revising/replacing some experiments to make them safer for students and/or the environment, revising/replacing some experiments to make them less costly.

Action: Update Chem 100L Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed. - Coordination and communication of changes with all instructors teaching the course. - Ongoing communication of progress with department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Danica Moore
Provide a timeline for the actions:	Work will begin in Spring 2019. Partial implementation by Fall 2019. Full implementation by Fall 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	- Any new experiments will be performed by students and results will be shared between faculty teaching the course. - A new lab manual will be available for student use.
List resources needed achieve this objective and associated costs (Supplies, Equipment,	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test procedures.

Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Supplies as needed for new experiments.

Action: Update Chem 111L Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed. - Coordination and communication of changes with all instructors teaching the course. - Ongoing communication of progress with department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Rob Fremland
Provide a timeline for the actions:	Currently ongoing. To be completed by Spring 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	A new lab manual will be available for student use.
List resources needed achieve this objective and associated costs	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test

(Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	procedures. - Supplies as needed for new experiments.

Action: Update Chem 130L Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed. - Coordination and communication of changes with all instructors teaching the course. - Ongoing communication of progress with department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Ed Alexander
Provide a timeline for the actions:	Work currently in progress Partial implementation by Spring 2019. Full implementation by Fall 2019.
Describe the assessment plan you will use to know if the objective was achieved and effective:	- Any new experiments will be performed by students and results will be shared between faculty teaching the course. - A new lab manual will be available for student use.

List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test procedures. - Supplies as needed for new experiments.

Action: Update Chem 201L Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed. - Coordination and communication of changes with all instructors teaching the course. - Ongoing communication of progress with department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Joe Toto
Provide a timeline for the actions:	Work will begin in Spring 2019. Partial implementation by Fall 2019. Full implementation by Fall 2020.
Describe the assessment plan you will use to know if the	- Any new experiments will be performed by students and results will be shared between faculty teaching the course.

objective was achieved and effective:	- A new lab manual will be available for student use.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test procedures. - Supplies as needed for new experiments.

Action: Update Chem 231L Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed. - Coordination and communication of changes with all instructors teaching the course. - Ongoing communication of progress with department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Saloua Saidane, with input from Sudhakar Kalagara and Dwayne Gergens
Provide a timeline for the actions:	Work in progress. To be completed by Fall 2019
Describe the assessment plan you	- Any new experiments will be performed by students and results will be shared between

will use to know if the objective was achieved and effective:	faculty teaching the course. - A new lab manual will be available for student use.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test procedures. - Supplies as needed for new experiments.

▾ **Action:** Update Chem 233L Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed. - Coordination and communication of changes with all instructors teaching the course. - Ongoing communication of progress with department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Saloua Saidane, with input from Sudhakar Kalagara.
Provide a timeline for the actions:	Work in progress. To be completed by Fall 2019
Describe the	- Any new experiments will be performed by

assessment plan you will use to know if the objective was achieved and effective:	students and results will be shared between faculty teaching the course. - A new lab manual will be available for student use.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test procedures. - Supplies as needed for new experiments.

Action: Update Chem 251 Lab Manual

Describe the actions needed to achieve this objective:	-Existing manual will be evaluated and updated for clarity of instructions, end of lab questions, figures and equations, and introductory material. Changes to experiments that need to be updated or replaced to improve student success, safety, environmental impact or relevance will be implemented. - Coordination with ILTs to insure implementation of any experimental changes. - Testing of new procedures if needed.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski
Provide a timeline for the actions:	Work in progress. To be completed by end of Spring 2019
Describe the assessment plan you will use to know if the	- A new lab manual will be available for student use.

objective was achieved and effective:	
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time to review and update manual, and communicate with department. - Potential faculty and ILT time to test procedures. - Supplies as needed for new experiments.

Goal: Goal 3: Update the Chemisty component of the pre-Allied Health Pathway

This is a short term goal. Currently at Mesa, pre-Allied Health students in many fields take the Chem 100/100L Chem 130/130L sequence. However, many programs, especially in Nursing, accept the single semester, 5 unit, GOB (General, Organic, and Biochemistry) Chem 103 course currently offered at Miramar and other local colleges. This course includes both a lecture and lab component. We have activated that course and will be offering it in Fall 2019. So, this goal will involve the scheduling, start up and initial evaluation of the success of this course at Mesa.

▾ **Action:** Initial Offerings of Lab portion of Chem 103

Describe the actions needed to achieve this objective:	- Development/Selection of Lab Manual - Selection of Experiments - Coordination with lecture topics - Coordination with ILTs for ordering of supplies/testing of experiments -Setup of Chem 130L laboratory for Chem 103 -Development of experiment schedule -Communication of progress with department chair and assistant chair
Who will be responsible for overseeing the	Sudhakar Kalagara and Jessica Sardo

completion of this objective:	
Provide a timeline for the actions:	Begin Spring 2019 and continue through Fall 2019 and Spring 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	- Student success in Chem 103 will be monitored in Fall 2019 and Spring 2020. - Lab manual will be available for student use. -Results of student experiments will be monitored and evaluated.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time - Classified (ILT) time: ordering any new supplies, setup of 130L room to accommodate Chem 103 -Supplies and equipment as needed for experiments

Action: Initial Offerings of Lecture portion of Chem 103

Describe the actions needed to achieve this objective:	- Textbook selection - Lecture material development
Who will be responsible for overseeing the completion of this objective:	Sudhakar Kalagara and Jessica Sardo
Provide a timeline for the actions:	Begin Spring 2019 and continue through Fall 2019.
Describe the assessment plan you will use to know if the objective was achieved and effective:	- Student success in Chem 103 will be monitored in Fall 2019 and Spring 2020.

List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time - Possible software and supplies (to be determined).

Action: Scheduling of Chem 103 sections

Describe the actions needed to achieve this objective:	- Determination of best times for lecture and lab components - Finding a lecture room (this lecture meets for 4 hours per week so scheduling across blocks will be tricky). - Working with chair and dean to determine best instructor for initial offering for Fall 2019. - Determination of number of sections for future semesters.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski
Provide a timeline for the actions:	- Initial offering (Fall 2019) will be scheduled in February - March 2019. -Second offering (Spring 2020) will be scheduled in Summer 2019.
Describe the assessment plan you will use to know if the objective was achieved and effective:	The enrollment of the course in Fall 2019 and Spring 2020 will be watched carefully. Fill rate will determine if any changes need to be made.
List resources needed achieve this objective and associated costs	- Faculty time (scheduler and dept chair) - Manager time (dean)

(Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):

Goal: Goal 4: Improving Student Success in the General Chemistry Sequence

This is a short term goal. The general chemistry courses we will be focusing on are Chem 152 and Chem 200. Both of these courses are required for a large number of STEM majors including Biology, Chemistry, Biochemistry, several Engineering fields, and others. These are two of our highest enrollment courses. Our goal for these courses is to improve the overall success rate and close the equity gap between underrepresented groups, especially LatinX students, and white and Asian students. This will be accomplished in part by introducing two new "helper" courses, Chem 015 (to be taken by students in need of extra help in conjunction with Chem 152) and 020 (to be taken by at risk students before starting Chem 200). Both of these courses will be introduced in the 19/20 school year. A large part of this goal involves the scheduling, planning, implementation and evaluation of the initial success of these courses. Other actions for this goal will be describe further in the Action section.

Action: Establishment of General Chemistry Success Workgroup

Describe the actions needed to achieve this objective:	In order to facilitate new ideas for general chemistry student success, monitor and coordinate startup and existing programs (tutoring, peer mentoring, classroom tutors, Chem 015 and Chem 020), and monitor/ evaluate student success and equity gaps, a work group of interested faculty will be established.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski

Provide a timeline for the actions:	Spring 2019
Describe the assessment plan you will use to know if the objective was achieved and effective:	-The work group will share minutes with the chemistry department and the dean. -Student success in general chemistry courses before and after the work group was established will be monitored and compared.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty

Action: Expansion and Coordination of Peer Mentoring

Describe the actions needed to achieve this objective:	In Fall 2018, with funding from the HSI STEM Title V, Peer Mentors were utilized for one instructor's sections of Chem 200. The project was very well liked by these Chem 200 students. In future semesters, this will be expanded, pending funding. We will need to: -Coordinate the Peer Mentors with the Chem 200 instructors. -Work with Peer Mentors on the topics they will cover. -Coordinate people working with the HSI STEM grant. -Identify other potential sources of funding for expansion.
Who will be responsible for overseeing the completion of this	-In Spring 2019 (and possibly subsequent semesters), Amanda Fusco-Hernandez will be responsible for the first three items.

objective:	-Identifying other potential sources of funding will be coordinated by Donna Budzynski and Paula Hjorth-Gustin.
Provide a timeline for the actions:	This action started in Fall 2018 and will continue as long as we can keep it funded.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-Success of students in Chem 200 using Peer Mentoring versus those who do not will be evaluated. -Overall student success rate in Chem 200 before and after Peer Mentoring was offered will be compared. -Equity gaps in Chem 200 will be compared from before and after Peer Mentoring was offered. -Note: much of this assessment will be done by people in the HSI STEM program, not the Chemistry Department.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty time. -Student Mentor compensation (especially once the grant runs out in a few years). -Classrooms or other rooms to meet in.

▾ **Action:** Initial Offering of Chem 015

Describe the actions needed to achieve this objective:	This is a supplemental course for Chem 152 (see section on Curriculum). to start offering this course, we will need to: - identify students who would benefit and encourage them to register. - develop a schedule of topics to be covered. -develop material to be used.

	-facilitate ongoing communication with Chem 152 instructors. -communicate progress to department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Amanda Fusco-Hernandez
Provide a timeline for the actions:	Startup work will start in Spring 2019 and continue through Spring 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-Enrollment in Chem 015 will be monitored. -Success of students in Chem 152 taking 015 versus those who do not will be evaluated. -Overall student success rate in Chem 152 before and after 015 was offered will be compared. -Equity gaps in Chem 152 will be compared from before and after 015 was offered.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time. -Supplies such as copy paper and toner.

▼ **Action:** Initial Offering of Chem 020

Describe the actions needed to achieve this objective:	This is a supplemental course for Chem 200 (see section on Curriculum). to start offering this course, we will need to: - identify students who would benefit and encourage them to register. - develop a schedule of topics to be covered.

	-learn how to use the ALEK software. -setup the ALEK software for use in Chem 020. -facilitate ongoing communication with Chem 200 instructors. -communicate progress to department chair and assistant chair.
Who will be responsible for overseeing the completion of this objective:	Amanda Fusco-Hernandez
Provide a timeline for the actions:	Startup work will start in Spring 2019 and continue through Fall 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-Enrollment in Chem 020 will be monitored. -Success of students in Chem 200 taking 020 versus those who do not will be evaluated. -Overall student success rate in Chem 200 before and after 020 was offered will be compared. -Equity gaps in Chem 200 will be compared from before and after 020 was offered.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time -ALEK software (already used in Math department).

▾ **Action:** Scheduling of Chem 015 sections

Describe the actions needed to achieve this objective:	-Determination of best times - Finding lecture rooms - Working with chair and dean to determine

	number of sections and instructors for initial offering in Fall 2019. - Determination of number of sections for future semesters.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski
Provide a timeline for the actions:	- Initial offering (Fall 2019) will be scheduled in February - March 2019. -Second offering (Spring 2020) will be scheduled in Summer 2019.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-The enrollment of the course in Fall 2019 and Spring 2020 will be watched carefully. Fill rate will determine if any changes need to be made.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time (scheduler and dept chair) - Manager time (dean)

▼ **Action:** Scheduling of Chem 020 sections

Describe the actions needed to achieve this objective:	- Working with chair and dean to determine number of sections and instructors for initial offering in Intersession 2020. - Determination of number of sections for future semesters.
Who will be responsible for overseeing the	Donna Budzynski

completion of this objective:	
Provide a timeline for the actions:	- Initial offering (Intersession 2020) will be scheduled in Fall 2019. -Second offering (Summer 2020) will be scheduled in Spring 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-The enrollment of the course in Intersession 2020 and Summer 2020 will be watched carefully. Fill rate will determine if any changes need to be made.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	- Faculty time (scheduler and dept chair) - Manager time (dean) -Software (this course will be offered using ALEK software. This is already used in other departments, such as Math).

Goal: Goal 5: Maintain Excellence in Instruction by Mentoring New Faculty

This is a long term goal, with some short term components. We have one recent contract hire (Fall 2017) and two brand new contract hires (starting in Spring 2019). Although all three of these hires are amazing, excellent faculty, they will require continued mentoring over the next few years. Additionally, 15 % of our sections in Spring of 2019 are being taught by adjunct faculty that have been hired since Fall 2017. These newer adjuncts also require continued mentoring. All this hiring was due to retirement of faculty and expansion of class offerings. The majority of the full time professors in the department will retire in 5 - 10 years. And we anticipate to continue to expand the offerings in some courses.

▾ **Action:** Mentoring of New Adjunct Faculty

Describe the actions needed to achieve this objective:	-Most newer adjunct faculty have already been assigned a mentor. These should be reevaluated depending on the adjuncts current schedule, and the contract faculties' availability. -We have one brand new adjunct starting in Spring 2019. She needs to be assigned a mentor. -Mentors and their adjunct faculty mentee should meet as needed, and communicate regularly. -An updated chemistry department checklist/guide for new adjunct faculty should be developed.
Who will be responsible for overseeing the completion of this objective:	Paula Hjorth-Gustin and Donna Budzynski
Provide a timeline for the actions:	-Ongoing for current "newer" adjuncts. -Spring 2019 for new hire. -This process will continue as long as we continue to hire adjuncts. -Fall 2019 for checklist/guide.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-Adjuncts will overall have favorable student evaluations. -Success rates for Chemistry courses will stay the same or increase.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty

Action: Mentoring of New Contract Faculty

Describe the actions needed to achieve this objective:	-Mentors for two new faculty starting in Spring 2019 to be selected. -Mentoring for Sudhakar Kalagara (hired for Fall 2017) will continue -Mentors will meet regularly with new faculty.
Who will be responsible for overseeing the completion of this objective:	Paula Hjorth-Gustin
Provide a timeline for the actions:	2017 hire: Ongoing New hires: Begins Spring 2019. Continues until all faculty have been tenured.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-New faculty will successfully complete the tenure process.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty

Goal: Goal 6: Expansion of Organic Chemistry Offerings

This is a long term goal, with some short term components. This goal involves our sophomore level organic chemistry courses, Chem 231/231L and 233/233L. These

courses are required for many STEM transfer students including those majoring in Chemistry, Biochemistry and Biology. They are required by professional programs such as Medical, Pharmacy and Dental schools. We would like to expand our offering by increasing the number of sections in both of these courses. We recently added an additional lab section to Chem 231L and it filled easily. Considering the large number of students who complete the pre-requisite General Chemistry sequence (Chem 200/200L and 201/201L) at Mesa, we should be able to fill more sections of these courses. Our current limiting factor is lab and lecture space. In order to accomplish this goal completely, in the long term we will need to retrofit another lab room and purchase equipment to be able to utilize it for these sophomore level courses.

Action: Evaluate increasing current offering of 231/231L and 233/233L

Describe the actions needed to achieve this objective:	-Look carefully at usage in current lab room (MS 407) to see how to effectively maximize space usage. -Work with ILTs to develop an expanded schedule that still allows for safe and effective lab usage . -Work with chair and dean to decide if more sections can be added. -Work with chair and dean to identify instructors.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski
Provide a timeline for the actions:	-Analysis to start in Spring 2019. -Possible section increase in Fall 2019.
Describe the assessment plan you will use to know if the objective was achieved and effective:	If new sections are added, enrollment and fill rate will be assessed.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment,	-Faculty (time for assessment and instructor FTEF). -Supplies: chemicals and additional lab supplies. -Classified: ILT time for prepping more

Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	sections.

Action: Evaluate larger increase in offering of 231/231L and 233/233L

Describe the actions needed to achieve this objective:	Because the current room (MS407) for these courses, we will only be able to offer a very limited number of new sections there. To increase the offering further, we will need to add additional lab space, possibly by retrofitting a current chemistry lab (MS414). This lab is used for Chem 130L which has a limited number of sections. It will also be used for the new Chem 103. In order to further expand 231L/233L we need to: -evaluate the feasibility of retrofitting MS414 to be used for these classes (which need a larger amount of fume hood space than is currently available in that room). -get a rough estimate for the cost this would incur. -decide if this is necessary and cost effective. -look for funding/shared funding.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski
Provide a timeline for the actions:	This is a long term goal. First we will see how many sections we can safely and effectively fit into MS407. Once we increase those offerings (possibly in the 2019/2020 school year), we will watch enrollment to see if more sections are necessary. In the meantime, we can look into the possibility of the room retrofit. Overall

	timeline: 5 years.
Describe the assessment plan you will use to know if the objective was achieved and effective:	If the project was deemed necessary and completed we would see a large increase in the enrollments of Chem 231/231L and 233/233L.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty time to evaluate. If sections are eventually added, FTEF for instruction. -Classified (ILTs). More sections mean more time to prep. -Supplies and equipment: more sections = more chemicals and equipment. -Renovation cost. This would be an expensive project. Fume hoods alone cost several thousand dollar each, and this lab would require 9 large ones. In order to fit them, the front of the lab would need to rotate 90 degrees to a smaller wall, similar to the configuration of MS 407. Add to that construction and other furniture/equipment and this room reno would run hundreds of thousands of dollars.

Goal: Goal 7: Finish Development and Implementation of Associate Degree in Biochemistry

This is short term goal. This work is already in progress. We currently offer various associate degrees in Chemistry and Biology, but none in Biochemistry. Since this is a very common STEM major and many of our students actually major in this upon transfer, it makes sense that we would offer an associate degree in this interdisciplinary field.

▾ **Action:** Completion and Establishment of Biochemistry Associates Degree

Describe the actions	This work has already started. The program has

needed to achieve this objective:	been designed and entered into Curricunet. To complete the goal the following needs to be done: -Collaborate with the articulation officer -Complete and submit the state chancellor's narrative paperwork. -Complete the curriculum review process.
Who will be responsible for overseeing the completion of this objective:	Paula Hjorth-Gustin
Provide a timeline for the actions:	Ongoing. To be completed Spring 2020.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-the degree will be offered by Mesa college. -eventually we will see students selecting and completing the degree.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment, Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	-Faculty time. -Articulation officer time.

Goal: Goal 8: Enrollment Management

This is a short term goal. With the new funding formula in place, it is imperative we continue to follow, analyze, right size and otherwise manage the enrollment in Chemistry. We will be continuing to look at ways to increase offerings in courses with high fill rates, such as Chem 152/152L and the organic chemistry sequence. Although most courses in Chemistry are seeing stable or increasing enrollment, in a few

instances we may need to adjust our offerings.

Action: Monitor and Evaluate enrollment in Chemistry

Describe the actions needed to achieve this objective:	-The chemistry scheduler will work with the department chair and dean to monitor fill rates in chemistry courses and specific sections. -Classes with very high fill rates will be evaluated for section increases. -Classes with low fill rates will be evaluated for section decreases. -New classes (Chem 103, 015 and 020) will be monitored and adjusted as needed. -Efforts will be made to offer sections at popular, convenient times for students. -Efforts will be made to offer sections that do not conflict with courses in other STEM departments that students typically take concurrently.
Who will be responsible for overseeing the completion of this objective:	Donna Budzynski
Provide a timeline for the actions:	-Ongoing and continuous. However, with the new funding formula in place, special care will be taken between now and 2021. -For new offerings: Fall 2019 - Spring 2021.
Describe the assessment plan you will use to know if the objective was achieved and effective:	-Chemistry department enrollments will remain constant or increase overall. -Chemistry department fill rates will remain constant or increase overall.
List resources needed achieve this objective and associated costs (Supplies, Equipment, Computer Equipment,	-Faculty time. -Facilities: to offer more sections of lecture we will need more available lecture rooms. -Facilities: we are at or near capacity for some of our lab courses. To increase sections in some

Travel & Conference, Software, Facilities, Classified Staff, Faculty, Other):	of these courses, we would need more lab space.

Project Plan for CTE Programs Only (REQUIRED)

Closing the Loop (REQUIRED)

Form: 2018/19 Comprehensive Program Review Instructional Closing the Loop (See appendix)

Form: "2018/19 Comprehensive Program Review Instructional Closing the Loop"

Created with : Taskstream
Participating Area: Chemistry

(REQUIRED) Program name

Chemistry

(REQUIRED) Which one(s) of the following were received in past year?

- BARC
- Faculty
- Other: HSI STEM

(REQUIRED) How have these resources benefited your program and your students?

The BARC equipment purchased helped us to continue to offer excellent lab classes and continue to expand our offerings. In our general chemistry series, the equipment (reaction surfaces, ie hot plates) was used to conduct experiments across several classes. Having enough of these allows student to work more independently, gather data, and complete experiments on time. The refractometer purchased helped to modernize the organic chemistry sequence by replacing older, broken equipment with one with better precision.

The HSI STEM grant money was used to purchase a second UV/VIS spectrophotometer. This allows students in Analytical and Organic Chemistry to complete experiments in a timely manner and work more independently. Perviously, with only one instrument for a group of 18 students, it was difficult for students to take their time and learn how to use the instrument.

In Fall 2018 we hired two new contract faculty who will begin with us in Spring 2019. We are beyond thrilled about this. The benefit to students will last for years to come as these two dynamic new faculty work not only in teaching their courses but in improving our program. They will help with tackling some of the tasks we have needed help with for a while, such as updating lab manuals.

Request Forms

- **BARC & Facilities Requests**
- **Classified Position Request**
- **Faculty Position Request**

Reviewers

Liaison's Review

Form: Instructional Program Liaison's Review 2018/19 (Comprehensive)

Manager's Review

Form: Instructional Program Manager's Review 2018/19 (Comprehensive)

Appendix

A. **2018/19 Comprehensive Program Review Instructional Program Overview Section** (Form)
B. **2018/19 Comprehensive Program Review Instructional Curriculum Section** (Form)
C. **2018/19 Comprehensive Program Review Instructional Outcomes and Assessment Section** (Form)
D. **ChemAssessPlanF17S18.pptx** (PowerPoint Presentation (Open XML))
E. **2018/19 Comprehensive Program Review Instructional Program Analysis Section** (Form)
F. **2018/19 Comprehensive Program Review Instructional Closing the Loop** (Form)

Chemistry Department Outcome Assessment Results

(2017-2018)

PREPARED BY: DR. SALOUA SAIDANE

Course Learning Outcomes
(Lecture Courses)

1. Measurements and Calculations
2. Atoms/Compounds
3. Structure/Properties
4. Nomenclature
5. Chemical Reactions

Note: *Some courses don't have all the outcomes as listed above.*
Most courses have a total of five outcomes as shown in tables related to courses.

Course Learning Outcomes
(Lab Courses)

1. Purpose and Background
2. Material, Safety and Experimental Procedure
3. Observation and Data
4. Calculations
5. Discussion and Conclusion

Note: *Some courses don't have all the outcomes as listed above.*
Most courses have a total of five outcomes as shown in tables related to courses.

Tentative Assessment Plan: Lecture courses
(Six-year cycle)

- Year One (16-17): Measurements and Calculations
- Year Two (17-18): Atoms and Compounds
- ***Year Three (18-19):*** ***Structure and Properties***
- Year Four (19-20): Nomenclature
- Year Five (20-21): Chemical Reactions
- Year Six (21-22): Review and reassess as needed.

Tentative Assessment Plan: Lab courses
(Six-year cycle)

- Year One (16-17): Purpose and Background
- Year Two (17-18): Material, Safety and Procedure
- ***Year Three (18-19):*** ***Observations and Data***
- Year Four (19-20): Calculations
- Year Five (20-21): Discussion and Conclusion
- Year Six (21-22): Review and reassess as needed

Lecture Courses

Chem 100 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 74

Number of sections: 2

Target: 70% of correct answers

Chem 100 Assessment Fall 2017

Assessment : *Two multiple choice questions given on the final exam*

1) An incorrect statement is that an atom with 28 protons and 30 neutrons :

   a) Must be the element Ni

   b) Could be the element Fe

   c) Must have 28 electrons

   d) None of these

2) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ represents what element?

   a) Ar b) I c) Mg d) K

Chem 100 Assessment Fall 2017

Question 1	Section 1:	70%
	Section 2:	68%
Question 2	Section 1:	89%
	Section 2:	79%

Chem 100 Assessment Fall 2017

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Chem 111 Assessment Spring 2018

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 22

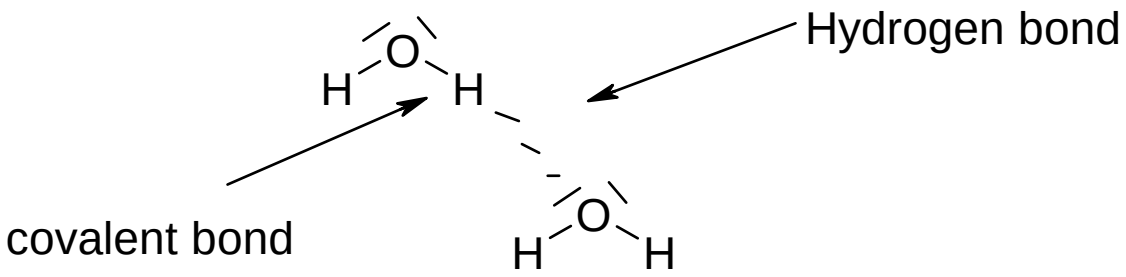
Number of sections: 1

Target: 70% of correct answers

Chem 111 Assessment Spring 2018

Assessment :

Draw two water molecules hydrogen bonded to each other.
Indicate the hydrogen bond and the covalent bond.



Grading: If students drew the molecules attached to each other correctly, they got 3 out of five. If they labeled the bonds they got the other 2.

Chem 111 Assessment Spring 2018

Results:

The average score was 4.45/5. (89% correct)

All students could draw the water molecules. (100%)

16 of 22 answered completely correctly.

6 did not label the bonds.

Chem 111 Assessment Spring 2018

Discussion

Target met

What needs to be done?

Move to the next assessment cycle

Chem 130 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 45

Number of sections: 2

Target: 70% of correct answers

Chem 130 Assessment Fall 2017

Assessment : Question on the Final Exam

Which of the following can have two isomers?

(a) CH_4 (b) C_2H_6 (c) C_3H_8 (d) C_4H_{10} (e) C_5H_{12}

Chem 130 Assessment Fall 2017

Section 1: 12/25 = 48%

Section 2: 9/20 = 45%

Chem 130 Assessment Fall 2017

Discussion

Target was not met.

What needs to be done?

Discuss possible ways to improve student understanding and reassess.

Chem 160 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of sections: 1

Target: 70% of correct answers

Chem 160 Assessment Fall 2017

Assessment : One question on an exam

Beta pleated sheets are examples of protein's

- primary structure
- secondary structure – correct answer
- tertiary structure
- quaternary structure

Chem 160 Assessment Fall 2017

a = 0.5%

b = 97%

c = 2%

d =0.5%

97% got the correct answer

Chem 160 Assessment Fall 2017

Discussion

Exceeded target

What needs to be done?

Move to the next assessment cycle

Chem 152 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 294

Number of sections: 6

Target: 70% of correct answers

Chem 152 Assessment Fall 2017

Assessment :

A multiple choice question given on an exam

Which of the following is the correct electron configuration for Ni^{2+}?

a. $[Ar]4s^2 3d^8$

b. $[Ar]4s^2 3d^6$

c. $[Ar]3d^8$

d. $[Ar]4s^2 3d^{10}$

Chem 152 Assessment Fall 2017

	% Correct Answers
a. $[Ar]4s^2 3d^8$	14.6%
b. $[Ar]4s^2 3d^6$	34.7%
c. $[Ar]3d^8$	46.3%
d.$[Ar]4s^2 3d^{10}$	4.4%

Correct answer is c

Expected answers are b and c

Overall 81 % gave the expected answers

Chem 152 Assessment Fall 2017

Discussion

It was expected that many students would choose “b” as the answer, which they did. Though “b” is incorrect, at this level of chemistry it’s not a critical fix. Adding results from “b” and “c” gives an overall 80%, which is not bad.

What needs to be done?

This is probably the wrong thing to access at this level. We need to access concepts that are more appropriate to the level.

Chem 200 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 260

Number of sections: 6

Target: 70% of correct answers

Chem 200 Assessment Fall 2017

Assessment : Two exam questions were given.

1. Identify the orbital hybridization of the central atom in NH_3

2. Identify the orbital hybridization of the central atom in SF_4

Chem 200 Assessment Fall 2017

Question 1: 76% correct answers

Question 2: 70% correct answers

Benchmark met for both questions

Chem 200 Assessment Fall 2017

Discussion

Benchmark met and exceeded.

What needs to be done?

Move to the next assessment cycle.

Chem 201 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of Students: 126

Number of sections: 4

Target: 70% of correct answers

Chem 201 Assessment Fall 2017

Assessment : Four multiple choice questions concerned with crystal field theory as applied to coordination compounds.

1. According to CFT, which one of the following ligands might you expect to form more bluish metal complexes than the others?

a. Ethylenediamine (en) b. CN^- c. NO_2^- d. CO e. Cl^-

2. In the presence of a strong octahedral ligand field, CFT predicts that the number of unpaired electrons in Co(III) will be

a. 0 b. 2 c. 4 d. 6 e. None of the above

3. Which of the following octahedral complexes should have the largest crystal field splitting energy, Δ?

a. $[Cr(H_2O)_6]^{3+}$ b. $[Cr(SCN)_6]^{3-}$ c. $[Cr(NH_3)_6]^{3+}$ d. $[Cr(CN)_6]^{3-}$ e. $[Cr(en)_3]^{3+}$

4. How many unpaired electrons will there be in a high-spin octahedral complex of Fe(II)?

a. 0 b. 2 c. 4 d. 6 e. None of the above

Chem 201 Assessment Fall 2017

Results

Start of Sentence	Question	Percent Correct
According to	1	61%
In the presence of ...	2	57%
Which of the following ...	3	72%
How many unpaired	4	56%

Only one of four met the arbitrary benchmark

Chem 201 Assessment Fall 2017

Discussion

There was some spread in the results from one section to the next. This is mostly attributed to the way in which different instructors emphasize different material. Another factor seems to be the way in which various instructors frame questions and assign student HW and practice problems as well as their usual mode of testing which could vary greatly.

What needs to be done?

We decided to explore the difference in our teaching techniques next round by asking each instructor to contribute a piece of the next assessment.

Chem 231 Assessment Fall 2017

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 54

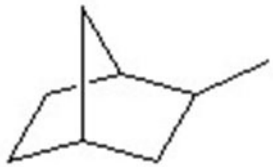
Number of sections: 2

Target: 70% of correct answers

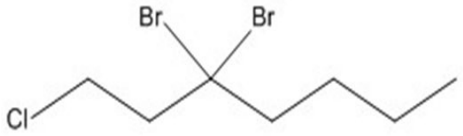
Chem 231 Assessment Fall 2017

Assessment : The four following questions were given on the final exam.

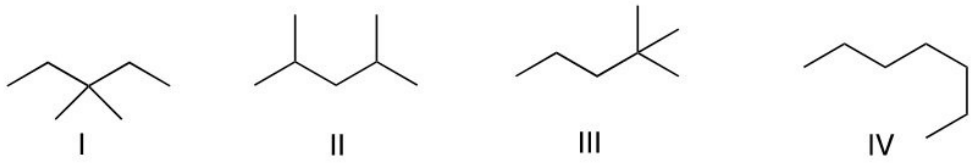
1. Identify and ***circle the tertiary carbons*** in the following structure.



2. Draw the structure for *sec*-butylcyclopentane.
3. Provide the IUPAC name for the following compound.



4. Which of the following represent constitutional isomers?



Chem 231 Assessment Fall 2017

Question	Average Score (Section 1)	Average Score (Section 2)	Average
1	94.1 %	100.0 %	97.1 %
2	91.0 %	94.4 %	92.7 %
3	90.0 %	77.8 %	83.9 %
4	75.0 %	66.7 %	70.9 %

Chem 231 Assessment Fall 2017

Discussion

Benchmark met and exceeded.

What needs to be done?

Move to the next assessment cycle

Chem 233 Assessment Spring 2018

Outcome Assessed:

Atoms, Molecules and compounds/atomic structure

Number of students: 32

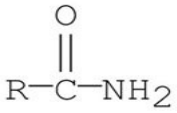
Number of sections: 1

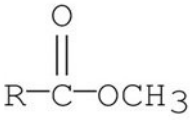
Target: 70% of correct answers

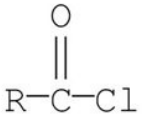
Chem 233 Assessment Spring 2018

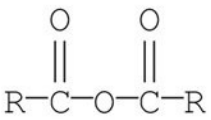
Assessment : *Four multiple choice question given on the final exam*

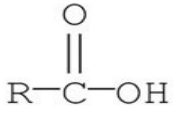
1. Which of the following compounds is hydrolyzed most rapidly in aqueous NaOH? (See Attachment)

A) 

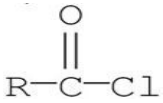
B) 

C) 

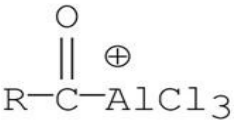
D) 

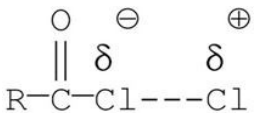
E) 

2. Which of the following is the electrophile that attacks the aromatic ring during Friedel-Crafts acylation?

A) 

B) 

C) 

D) 

E) AlCl3

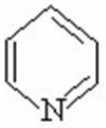
Chem 233 Assessment Spring 2018

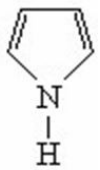
Assessment : *Four multiple choice question given on the final exam*

3. Which of the following is the most basic amine. ***Circle the correct answer. Explain!***

I. $CH_3CH_2NH_2$

II. $(CH_3)_3N$

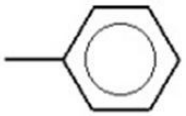
III. 

IV. 

4. Which of the following substrates is an electron withdrawing group overall? ***Circle the correct answer.***

I. $-CH_3$

II. $-OH$

III. 

IV. $-OCH_3$

V. $-SO_3H$

Chem 233 Assessment Spring 2018

Question	Number of correct answers	Number of incorrect answers	% of correct answers
1	30	2	93.8 %
2	20	12	62.5 %
3	15	17	46.9 %
4	23	9	71.9 %

Chem 233 Assessment Spring 2018

Discussion

Total average in percentage is 68.8 % (very close to the benchmark.)

Benchmark was exceeded for question 1, met for question 4 but is low for question 2 and very low for question 3.

What needs to be done?

Reteach concepts in question 3 and 4 and reassess.

Lab Courses

Chem 100L Assessment Fall 2017

Outcome Assessed:

Purpose and Theory

Number of students: 40
Number of sections: 2
Target: An average of 3 on the lab rubric

Chem 100L Assessment Fall 2017

Assessment : *Write the purpose and theory for experiment 12. Graded based on the following rubric:*

	Purpose and Theory Can someone else understand why the experiment was done and what theory is behind it?
5	The experiment has (a) clearly stated purpose(s). A detailed explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
4	The experiment has (a) clearly stated purpose (s). A sufficient summary and explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
3	The experiment has (a) stated purpose (s) and a tentative explanation of the theory behind the experiment.
2	Purpose (s) and theory are insufficiently stated.
1	Purpose (s) and theory are unclear or irrelevant.

Chem 100L Assessment Fall 2017

Average scores:

Section 1: 3.10

Section 2: 2.95

Total average: 3.03

Benchmark met

Chem 100L Assessment Fall 2017

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Chem 111L Assessment Fall 2017

Outcome Assessed:

Measurements and Data Analysis

Number of students: 40
Number of sections: 2
Target: No Benchmark. It is a new experiment.

Chem 111L Assessment Spring 2018

Assessment : Calculating Calories from Cheese Puffs

This is a brand new experiment.

We wanted to see how students recorded data.

They don't do much of it in this class so we weren't expecting much.

Chem 111L Assessment Spring 2018

Results:

We found that only 10% could record data appropriately.

Most left off units or had ridiculous amounts of digits.

Chem 111L Assessment Spring 2018

Discussion

This is not a quantitative class so we aren't terribly concerned. However, the results were so egregious that we are planning something.

What needs to be done?

Do a worksheet that helps students determine how to record data. The plan is to have them keep this handy.

Chem 130L Assessment Fall 2017

Outcome Assessed:

Purpose and Background: Understand why the experiment is done and what theory is behind it.

Number of students: 40

Number of sections: 2

Target: An average of 3 on the lab rubric

Chem 130L Assessment Fall 2017

Assessment : *Write the purpose and theory for experiment 12. Graded based on the following rubric:*

	Purpose and Theory Can someone else understand why the experiment was done and what theory is behind it?
5	The experiment has (a) clearly stated purpose(s). A detailed explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
4	The experiment has (a) clearly stated purpose (s). A sufficient summary and explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
3	The experiment has (a) stated purpose (s) and a tentative explanation of the theory behind the experiment.
2	Purpose (s) and theory are insufficiently stated.
1	Purpose (s) and theory are unclear or irrelevant.

Chem 130L Assessment Fall 2017

92% scored 5/5
8% scored 4/5

Benchmark met

Chem 130L Assessment Fall 2017

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Chem 152L Assessment Fall 2017

Outcome Assessed:

Purpose and Theory

Number of students: 208
Number of sections: 12
Target: An average of 3 on the lab rubric

Chem 152L Assessment Fall 2017

Assessment : *Write the purpose and theory for experiment 12. Graded based on the following rubric:*

	Purpose and Theory Can someone else understand why the experiment was done and what theory is behind it?
5	The experiment has (a) clearly stated purpose(s). A detailed explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
4	The experiment has (a) clearly stated purpose (s). A sufficient summary and explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
3	The experiment has (a) stated purpose (s) and a tentative explanation of the theory behind the experiment.
2	Purpose (s) and theory are insufficiently stated.
1	Purpose (s) and theory are unclear or irrelevant.

Chem 152L Assessment Fall 2017

Score	Total Number of Students	Total %
5	78	37.5%
4	71	34.1%
3	40	19.2%
2	13	6.3%
1	6	2.9%

Over 90% of the students had a score of 3 or higher.
Benchmark met and exceeded!

Chem 152L Assessment Fall 2017

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Chem 200L Assessment Fall 2017

Outcome Assessed:

Purpose and Theory

Number of students: 205
Number of sections: 10
Target: An average of 3 on the lab rubric

Chem 200L Assessment Fall 2017

Assessment : *Write the purpose and theory for experiment 11. Graded based on the following rubric:*

	Purpose and Theory Can someone else understand why the experiment was done and what theory is behind it?
5	The experiment has (a) clearly stated purpose(s). A detailed explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
4	The experiment has (a) clearly stated purpose (s). A sufficient summary and explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
3	The experiment has (a) stated purpose (s) and a tentative explanation of the theory behind the experiment.
2	Purpose (s) and theory are insufficiently stated.
1	Purpose (s) and theory are unclear or irrelevant.

Chem 200L Assessment Fall 2017

Score (out of 5)	Percent of Students with Score
5	23.5%
4	41.2%
3	26.5%
2	5.9%
1	2.9%

Students scoring 3, 4 or 5: 91.2%.
Benchmark met and exceeded!

Chem 200L Assessment Fall 2017

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Chem 201L Assessment Fall 2017

Outcome Assessed:

Purpose and Theory

Number of students: 125
Number of sections: 6
Target: 70% of correct answers

Chem 201L Assessment Fall 2017

Assessment

Multiple choice questions involving the purpose and background of the equilibrium experiment where students prepare five initially different concentrations and analyze.

Consider the reaction Acetic acid + Ethanol => Ethylacetate + water

1. Equilibrium occurs when

a. Concentrations are at a minimum but not equal

b. There is an equivalent amount of products to reactants

c. the reaction stops and K(forward) equals 1/K(reverse)

d. the rate forward equals the inverse of the reverse rate

e. There is no net change in concentrations

Chem 201L Assessment Fall 2017

Assessment

2. Which of the following statements is false and not a part of the purpose of the equilibrium experiment?

a. The equilibrium constant is independent of starting ratios of reactants and products.

b. The equilibrium constant is independent of the direction that the reaction needs to shift.

c. The equilibrium constant is independent on the temperature at which the reaction takes place.

d. The equilibrium constant is independent of the initial reactant concentrations.

e. The equilibrium constant is independent of the initial product concentrations.

Chem 201L Assessment Fall 2017

Assessment

3. Which of the following statements is not true nor a part of the background of the equilibrium experiment?

a. The equilibrium constant is calculated using the law of mass action.

b. The size of the equilibrium constant indicates the relative amounts of reactant and products at equilibrium.

c. The equilibrium constant is dependent on the temperature at which the reaction takes place.

d. The equilibrium takes place relatively quickly (in a few minutes) without a catalyst.

e. The equilibrium constant is independent of the initial product concentrations.

Chem 201L Assessment Fall 2017

The scores were the following:

	Percent Correct
Ques on Equil occurs.....	37
Ques on purpose	70
Ques on background	79

Only one question resulted in low student performance.

Chem 201L Assessment Fall 2017

Discussion

We have discussed how students may have misinterpreted the intent of the first question.

What needs to be done?

We will try to avoid ambiguities in problems that could lead to lower student success

Chem 231L Assessment Fall 2017

Outcome Assessed:

Purpose and Theory

Number of students: 31

Number of sections: 2

Target: 80% of students have a score of 4 or 5 on the lab rubric

Chem 200L Assessment Fall 2017

Assessment : *Write the purpose and theory for the Aspirin lab. Graded based on the following rubric:*

	Purpose and Theory Can someone else understand why the experiment was done and what theory is behind it?
5	The experiment has (a) clearly stated purpose(s). A detailed explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
4	The experiment has (a) clearly stated purpose (s). A sufficient summary and explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
3	The experiment has (a) stated purpose (s) and a tentative explanation of the theory behind the experiment.
2	Purpose (s) and theory are insufficiently stated.
1	Purpose (s) and theory are unclear or irrelevant.

Chem 200L Assessment Fall 2017

Score	Number of students (Section 1)	Number of students (Section 2)	Number of students	%
5	9	7	16	51.61%
4	7	3	10	32.25 %
3	2	3	5	16.13%

83.86 % of students had a 4 or 5 score.
Benchmark met and exceeded!

Chem 231L Assessment Fall 2017

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Chem 233L Assessment Spring 2018

Outcome Assessed:

Purpose and Theory

Number of students: 17

Number of sections: 1

Target: 85% of students have a score of 4 or 5 on the lab rubric

Chem 233L Assessment Spring 2018

Assessment : *Write the purpose and theory for the Suzuki lab. Graded based on the following rubric:*

	Purpose and Theory Can someone else understand why the experiment was done and what theory is behind it?
5	The experiment has (a) clearly stated purpose(s). A detailed explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
4	The experiment has (a) clearly stated purpose (s). A sufficient summary and explanation of the theory behind the experiment is described, including chemical reactions, formulas that will be used in the calculations.
3	The experiment has (a) stated purpose (s) and a tentative explanation of the theory behind the experiment.
2	Purpose (s) and theory are insufficiently stated.
1	Purpose (s) and theory are unclear or irrelevant.

Chem 233L Assessment Spring 2018

15 out of 17 students had a score of 5.
One student had a score of 4.
One student didn't submit the report.

94% of the student had a score of 4 or 5.

Benchmark met and exceeded!

Chem 233L Assessment Spring 2013

Discussion

Target met

What needs to be done?

Go to the next assessment cycle

Program Outcomes

What is the Chemistry Department Program?

It is a sequence of courses that most students take.

These are the courses with the highest number of sections.

They are: Chem 152, Chem 200 and Chem 201 lecture and lab.

Program Learning Outcome(s) assessed

- For the lecture courses: Atoms and Compounds
- For the lab courses: Purpose and background

The assessments targeted the following program learning outcomes:

- ✓ Communication
- ✓ Critical thinking
- ✓ Personal responsibility.

Assessment Design

- For the lecture courses:
  - ✓ Questions were given to students as part of an exam.
  - ✓ Results were collected, evaluated to see if the benchmark was met.

- For the lab courses
  - ✓ Grade the section purpose and background of one experiment for each course based on the chemistry department lab rubric.
  - ✓ Results were collected, evaluated to see if the benchmark was met.

Assessment target/benchmark

For the lecture courses

70% of correct answers

For the lab courses

- A score of 3 or higher for chem 152 and 200.
- 70% of correct answers for Chem 201

Summary of Findings

For the lecture courses

Benchmark met for chem 152, 200 but not met for Chem 201.

For the lab courses

- Benchmark met for chem 152L and 200L.
- Benchmark partially met for Chem 201L.

Department Discussion

Discussion

- For Chem 201: There was some spread in the results from one section to the next. Various instructors frame questions and assign student HW and practice problems as well as their usual mode of testing which could vary greatly.
- For Chem 201 L: We have discussed how students may have misinterpreted the intent of the first question.

What needs to be done?

Form Chem 201: We decided to explore the difference in our teaching techniques next round by asking each instructor to contribute a piece of the next assessment.

For Chem 201 L. We will try to avoid ambiguities in problems that could lead to lower student success

Next Assessment Cycle (2018-2019)

- For the lecture courses:

  Assess: Structure/Properties

- For the Lab Courses:

  Assess: Observation and Data

Timeline

- Fall 2018: Assess and Collect data. (*Deadline December 15th*)
- Spring 2019: Discuss data. *(Flex week Spring semester)*
- Department discussion. *(Third week Spring semester)*
- Report data. *(June 30th)*

Who is in Charge?

	Lecture	Lab
Chem 100	Joe Toto	Joe Toto
Chem 130	Ed Alexander	Dwayne Gergens
Chem 111	Rob Fremland	Rob Fremland
Chem 160	Paula Gustin	
Chem 152	Amanda Fusco	Amanda Fusco
Chem 200	Donna Budzynski	Donna Budzynski
Chem 201	Paula Gustin	Paula Gustin/ Joe Toto
Chem 231	Saloua Saidane	Saloua Saidane
Chem 233	Saloua Saidane	Sudhakar