Chemistry [CHEM]

Cycles included in this report:
Jun 1, 2023 to May 31, 2024

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Program Name: Chemistry [CHEM]

Reporting Cycle: Jun 1, 2023 to May 31, 2024

1 Is this program offered via Distance Learning?

2 Is this program offered at an off-site location?

No

2.1 If yes to previous, provide addresses for each location where 50% or more of program credits may be earned.

3 Example of Program Improvement

2019-2020:
Program improvement started with the arrival of the instruments listed in the 2018-2019 section. Along with this we also had multiple faculty working on these instruments to get them up and functioning. However, with the COVID-19 pandemic in the Spring 2020 semester they didn't get much use.

2020-2021:
This year the department faced many different issues from the continuation of the COVID-19 pandemic, as well as multiple hurricanes hitting the campus. This forced all instruction online and has possibly skewed the data for the 2020-2021 academic year, since the student's didn't get the hands-on experience with this equipment.

The ICP-MS, HPLC, and GC-MS were delivered and commissioned for use in 2020.

Unfortunately, Hurricane Laura severely damaged the building and the equipment was impacted. We anticipate a return to the building and access to test the equipment in the summer of 2021.

2021-2022:
The program will be getting a new general chemistry lab and organic chemistry lab.

2022-2023:

2023-2024:
Got new rotary evaporator for organic chemistry labs and new hood for inorganic lab.

4 Program Highlights from the Reporting Year

2019-2020:
The department received new equipment that could be very useful to helping with the forensic and analytical side of chemistry (this shows up in Chem 303 as well as Chem 442). However, this equipment didn't see much use due to the COVID-19 pandemic that hit in March of 2020.

2020-2021:
The highlights from the 2020-2021 academic year are difficult to identify because the department continued to go through the COVID-19 pandemic mixed with two hurricanes damaging Kirkman Hall, which has lead to all instruction being online or hybrid.

2021-2022:
Due to the low enrollment of the program, the highlights are rather small for chemistry education. For the department as a whole, a student did go present at the ACS national conference.

2022-2023:

2023-2024:
Department had graduate thesis defense after five years. Three students presented at ACS Spring conference at New Orleans. Three students presented at LAS meeting.

5 Program Mission

The mission of the Department of Chemistry & Physics includes the following components: (a) offering a quality educational program for all students enrolled in courses presented by the department, (b) providing an atmosphere conducive to (i) academic inquiry, (ii) the exchange of knowledge, and (iii) the advancement of knowledge through scientific research and/or other scholarly activities, and (c) providing service to the College of Science, the University, and the community. The department seeks to broaden and enhance the educational experiences for all students enrolled in chemistry courses, to optimize the productivity of the faculty and staff, and to provide service to the academic and industrial communities and to the citizens of Southwest Louisiana.

6 Institutional Mission Reference

The department’s mission mirrors that of the University in the provision of educational opportunities to students seeking a B.S. in Chemistry, and in providing support courses for students from other disciplines across the campus. In conjunction with the Department of Agricultural Sciences, we offer a M.S. in Environmental & Chemical Sciences. We conduct faculty-led research at both the undergraduate and graduate levels and interface many of our research efforts with local industries. The B.S program is approved by the American Chemical Society (ACS) and our program has received laudable reviews from them and from the Louisiana Board of Regents. Students are encouraged to present their research findings in oral or poster form in local, regional, and national meetings and student publication in scientific peer-reviewed journals is a departmental priority. Faculty serve as ad hoc consultants for a number of local industries, leveraging our technical expertise for the solution of industrial problems. In association with the Southwest Louisiana Crime Laboratory and SASOL North America we offer opportunities for students to intern in and conduct research in practical workplaces prior to graduation. Additionally, through collaboration with the Science Coordinator for Calcasieu Parish, we have a vibrant outreach program to local high schools and elementary schools aimed at sparking and sustaining student interest in science.

7 Assessment and Benchmark CHEM 301L Lab Report Grades

Assessment: Chemistry majors will demonstrate competence in the full range of classical experimental methodologies and techniques as demonstrated by lab report grades.

Student Learning Outcomes: At the completion of this course students should be able to:

- Predict and account for the physicochemical properties of organic compounds based upon their structures.
- Account for the behavior of organic compounds and the fates of organic reactions in terms of electronic, steric and orbital interactions.
- Describe preparative routes to the non-aromatic hydrocarbons, haloalkanes and alcohols /ethers.
- Discuss reaction pathways of the classes of organic compounds above.
- Draw reasonable curved arrow mechanisms for reactions profile and detail the SN and E reactions.

Benchmark: 70% of students will earn an average score of 80% on CHEM 301L lab reports.

7.1 Data

Academic Year	Students with 80%		Benchmark met?
	#	%	
2017-2018	69/96	71%	Yes
2018-2019	77/91	82%	Yes
2019-2020	55/90	61.1%	No
2020-2021	139/149	93.3%	Yes
2021-2022	81/90	90%	Yes
2022-2023	—	—	—
2023-2024	77/81	95%	Yes

7.1.1 Analysis of Data and Plan for Continuous Improvement [Not Approved]

2019-2020:
The students didn't meet the benchmark.
To improve it might be necessary for students to go to the write for excellence center to receive help with this.

2020-2021:
The students meant the benchmark. This could be due to the online teaching of the labs due to COVID-19 pandemic and the hurricanes that hit the area.

Plan for improvement, gather more data to see if this was a one time spike.

2021-2022:
The students met the benchmark. This shows that the 93.3% from last cycle wasn't necessarily a one time spike. However, the department wants one more year of data before making any major changes to the assessment. This is due to the fact that labs are being updated for Fall 2022 and might make more experiments possible.

2022-2023:

2023-2024:
The students met the benchmark.

8 Assessment and Benchmark CHEM 361 Lab Report Grades

Assessment: Chemistry majors will demonstrate competence in the full range of classical experimental methodologies and techniques as demonstrated by lab report grades.

Student Learning Outcomes have been measured as follows:
After completing this course, the student will:

1. Have the ability to use most laboratory techniques useful in the inorganic laboratory.
2. Have a working knowledge of synthesis separation, purification, and identification methods.
3. Demonstrate a working knowledge of Infrared Spectroscopy (IR).
4. Have the ability to interpret IR spectra.

Benchmark: Students will earn an average score of 80% on CHEM 361 lab reports.

8.1 Data

Academic Year	Students with 80%		Benchmark met?
	#	%	
2017-2018	9/9	100%	Yes
2018-2019	8/8	100%	Yes
2019-2020	9/9	100%	Yes
2020-2021	4/5	80%	Yes
2021-2022	9/11	82%	Yes
2022-2023	8/9	89%	Yes
2023-2024	7/7	100%	Yes

8.1.1 Analysis of Data and Plan for Continuous Improvement

2019-2020:
All students met the benchmark. This could have been due to the COVID-19 pandemic and all courses being moved online. Will need to have 361L in-person to see how the new instruments work.

2020-2021:
The students met the benchmark. This again was a completely online course, due to hurricanes Laura and Delta damaging Kirkman Hall. In Spring 2022 we will look at data to see how students do in a fully in-person lab.

2021-2022:
Most of the students met the benchmark. It was up just shy of 2% from the previous lab that was completely online. The department is going to see how next spring's section of CHEM 361L does and evaluate the benchmark to see if it needs to be updated.

2022-2023:

2023-2024:
The students met the benchmark of 80% or above.

9 Assessment and Benchmark CHEM 303 Final Examination

Assessment: Chemistry majors will demonstrate competence in sample preparation & analysis, data acquisition & analysis, chromatographic separations, optical atomic spectroscopy, and optical mass spectrometry as demonstrated by CHEM 303 Final Examination.

Student Learning Objectives for CHEM 303:

1. Understanding gravimetric and potentiometric analyses.
2. Understanding how chemical reactions are utilized for quantitative measurements of analytes
3. Using relevant chemical equilibria (solubility, acid-base, complexation, redox) for solving chemical problems.
4. Assessing the accuracy, precision, and uncertainty of experimental data.
5. Performing and properly interpreting basic statistical tests.
6. Understanding and applying calibration strategies and their limitations.
7. Understanding of Mass Spectra, Chromatography, and Separation Techniques.
8. Understanding- FTIR, NMR, UV-Visible Spectroscopy, and Thermogravimetric Analysis Techniques.

Benchmark: Students will earn an average score of 70% on the CHEM 303 final examination.

9.1 Data

Academic Year	Students with 70%		Benchmark met?
	#	%	
2017-2018	—	100%	Yes
2018-2019	0	0	No
2019-2020	11/17	65%	No
2020-2021	5/9	60%	No
2021-2022	10/12	83%	Yes
2022-2023	7/7	100%	Yes
2023-2024	5/8	63%	No

9.1.1 Analysis of Data and Plan for Continuous Improvement

2019-2020:
The students did not meet the benchmark this year. This could be do to multiple factors such as the course going completely online after March of 2020 due to the COVID-19 Pandemic.

2020-2021:
The students failed to meet the benchmark during the 2021 offering of the CHEM 303 course, due to Hurricanes Laura and delta doing damage to the buildings and forcing the course to be taught online completely. This course requires a lot of hands on learning to understand the instrumentation.

2021-2022:
As noted in last year's assessment analysis, CHEM 303 was taught completely online, which effected the students knowledge. This year, Dr. Vaughan had a small group of students that got hands on experience with most of the equipment in the department through this course and students benefited from this. To continue the success of this course benchmark, the department is looking into adding a certification along with a course that will either be hosted in this course or this course will be part of the sequence to obtain the certification.

2022-2023:

2023-2024:
Students did not meet the benchmark this year. Dr. Paudyal will introduce more qualitative and quantitative analytical techniques to enhance students understanding.The department did not meet the benchmark. The department is in the process of introducing lab section to aid students to understand analytical methods and techniques.

10 Assessment and Benchmark CHEM 441 Oral Presentation Score

Assessment: CHEM 441 oral presentation score from rubric.

Student Learning Objectives:
At the completion of this course, students should be able to:

1. Write an informative abstract describing and referencing their presentation topic.
2. Organize a coherent, audio-visual (PowerPoint) presentation based on laboratory and/or literature research.
3. Present a comprehensive, well-paced scientific seminar to an audience of their peers.
4. Answer questions from a scientific audience based upon the presentation.
5. Write concise critiques of a seminar topic.
6. Evaluate and critique speakers.

Benchmark: Students will earn a score of 80% or higher on the oral presentation in CHEM 441.

10.1 Data

Academic Year	Students with 80%		Benchmark met?
	#	%	
2017-2018	14/14	100%	Yes
2018-2019	15/15	100%	Yes
2019-2020	3/3	100%	Yes
2020-2021	6/8	75%	No
2021-2022	7/7	100%	Yes
2022-2023	11/11	100%	Yes
2023-2024	4/4	100%	Yes

10.1.1 Analysis of Data and Plan for Continuous Improvement [Not Approved]

2019-2020:
The primary plan is to offer this course more often to get a bigger pool for statistical data.

2020-2021:
To improve the course, we will need to let the students present in a face-to-face environment where the instructor can give better feedback.

2021-2022:
The seminar students did very well this year, especially being back in a face-to-face environment where they got to learn from several professionals about how to make their presentations better. It's important to note that many students in the spring session were set to take CHEM 442, however with the professor leaving suddenly they had to take seminar.

To improve the course, the department is thinking about getting freshman and sophomore students to attend the seminar so that the speakers can have a bigger audience with more questions.

2022-2023:

2023-2024:
The benchmark was met. To improve the quality, the departmental seminar had a few guest lectures this year. Additionally, all the students who registered for CHEM 451 research are required to attend.

11 Assessment and Benchmark CHEM 451 Research Paper

Assessment: Students will demonstrate ability to perform laboratory/computing research as well as literature research in their research project papers in CHEM 451.

Benchmark: 80% of program graduates will earn an average score of 80% or higher in CHEM 451. As well, 33.3% of program graduates will present their research findings at a state/regional/national scientific meeting and/or publish in a peer-reviewed journal.

11.1 Data

Academic Year	Students with 80%		Benchmark met?	Students that presented findings		Benchmark met?
	#	%		#	%	
2016-2017	—	100%	Yes	—	100%	Yes
2017-2018	27/27	100%	Yes	14/14	100%	Yes
2018-2019	29/29	100%	Yes	12/12	100%	Yes
2019-2020	—	—	—	—	—	—
2020-2021	13/13	100%	Yes	1/13	7.7%	No
2021-2022	21/21	100%	Yes	1/21	4.7%	No
2022-2023	20/20	100%	Yes	4/20	20%	No
2023-2024	10/10	100%	Yes	4/10	40%	Yes

11.1.1 Analysis of Data and Plan for Continuous Improvement [Not Approved]

2019-2020:

2020-2021:
The benchmark was met for all students in CHEM 451 on conducting research and one student did present results of there work. Presenting was very difficult with COVID-19 pandemic and multiple hurricanes in the local area.

2021-2022:
The benchmark was made for all students who conducted research with their advisors in CHEM 451. However, the benchmark wasn't made in presenting their results, however it is good to note that the one student who did present was at the ACS national conference in San Diego, California. To improve on the student presentation of their findings, the department is looking into making that part of their overall grade for the course.

2022-2023:

2023-2024:
The benchmark was made for all students in CHEM 451. But, the benchmark wasn't made in presenting their results. Therefore, the department is planning to have one day departmental oral presentation session to present research accomplishments for students who registered for CHEM 451.

12 Assessment and Benchmark Enrollment and Completers

Assessment: Enrollment numbers are based on the number of candidates that have declared Chemistry Education as their major and have turned in an EDUC 200 packet.

Benchmark: The EPP has set a goal to increase enrollment by 7% across programs each year from Fall 2017 to Fall 2021 to coincide with the University's Strategic Plan goal concerning enrollment and recruitment.

12.1 Data

Chemistry Education - Enrollment and Completer Data:

Academic Year	# officially enrolled with an EDUC 200 packet	# of completers in fall semester	# of completers in spring semester	Total # of completers
2017-2018	1	1	0	1
2018-2019	0	0	0	0
2019-2020	0	0	0	0
2020-2021	0	0	0	0
2021-2022	1	0	0	0
2022-2023	—	—	—	—
2023-2024	0			0

12.1.1 Analysis of Data and Plan for Continuous Improvement

2019-2020:
Data Analysis:
The benchmark was not met. There was no change in the number of students officially enrolled in the program from the previous year.

Plan for Continuous Improvement:
The goal for the 2019-2020 academic year will be to increase student enrollment to at least one student officially enrolled in the program.

Recommendation for Successful Implementation of Plan for Improvement:

- Secondary and Chemistry faculty will participate in the Education Professions Advising Session after the 14th day of each semester to make connections with candidates and provide guidance for official acceptance into the program.
- Faculty will attend recruitment events such as recruitment fairs, the Sulphur Career Fair, Geaux Teach- Unlock Education, and will visit at least two local high schools with the purpose of recruiting for education programs.
- Promote Ed Rising in the local school districts to recruit to the education profession. Complete process to give credit for two education courses within the program for participation and completion of assessments in the Ed Rising High School Program.

2021-2022:

2020-2021:
The benchmark was not met. The number of candidates enrolled in the program has remained at zero for the past three academic years. Currently, there are two candidates enrolling in preliminary coursework for the chemistry education curriculum. However, neither of these candidates has an approved EDUC 200 packet and therefore is not considered to be officially enrolled in the program.

EPP faculty are working on additional avenues to recruit students. Educators Rising was implemented in two local high schools to assist high school students in learning more about the education profession. Unlock Education has also expanded to include additional high schools in the area to recruit students to MSU and particularly into education programs. Dr. Ogea has visited local schools to recruit for our education programs. In the 2021-2022 academic year, both DEP and Content faculty will reach out to local high school students to promote Ed Rising and to recruit students into education programs.

2021-2022:
After four years with no candidates officially enrolled in the Chemistry Education concentration, 2021-2022 has one candidate enrolled. There were no completers in the program for the academic year.

The Burton College of Education and particularly the Department of Education Professions has made intentional efforts to recruit candidates into teacher-education programs and has focused particular attention on those from diverse backgrounds and within high needs areas. In addition to traditional attendance at parish career fairs and expos, the following are part of the Department of Education Professions (EDPR) Recruitment and Retention Plan: Unlock Education, Call Me MISTER, Educators Rising, and minors.

Although the efforts are strong and we are committed to recruiting candidates from diverse backgrounds, results of these efforts are not immediate as these students are juniors or seniors in high school and the data reported in the Performance Profile for education provider programs is on completers. We will track the data for program admission to monitor new students and make adjustments as needed to attract a diverse group of candidates interested in the field of education.

2022-2023:

2023-2024: There were no completers in Chemistry Education in the 2023-2024 academic year.

13 Assessment and Benchmark PRAXIS Content

Assessment 1: Praxis content exam is #5245 for Chemistry Education, Grades 7-12. This exam must be passed prior to student teaching. The passing score required by the state for 2017-2018 is 151.

Benchmark 1: 90% of Chemistry Education majors will achieve a passing score on the Praxis Chemistry Education Exam (#5245) on the first attempt. Passing score set by the state is 151.

13.1 Data

Term	Test #	Passing Score Required	n	EPP Range of Passing Scores Only	EPP Cycle Mean	2022-2023 National Median	EPP Mean National Median	EPP Pass First Attempt	
								#	%
Spring 2023	—								

2023-2024:

Term	Test #	Passing Score Required	n	EPP Range of Passing Scores Only	EPP Cycle Mean	2022-2023 National Median	EPP Mean National Median	EPP Pass First Attempt	
								#	%
Fall			—						
Spring			—						

13.1.1 Analysis of Data and Plan for Continuous Improvement

2023-2024:
There were no completers in Chemistry Education in the 2023-2024 academic year.

14 Assessment and Benchmark Praxis Principles of Learning and Teaching Exam

Assessment 2: Praxis Principles of Learning and Teaching Exam is #5624 for Grades 7-12. The passing score required by the state for 2017-2018 is 157.

Benchmark 2: 80% of candidates will pass the Principles of Learning and Teaching, Grades 7-12 Praxis exam on the first attempt.

14.1 Data

2019-2020:
There were no completers in the 2019-2020 academic year and, therefore, no new data to report.

2020-2021:
There were no completers in the 2020-2021 academic year and, therefore, no new data to report.

2021-2022:
There were no completers in the 2021-2022 academic year and, therefore, no new data to report.

2022-2023:
There were no completers in the 2022-2023 academic year and, therefore, no new data to report.

Chemistry Education - Praxis Content #5624:

		Fall 2023	Spring 2024
#5624 Overall	Number	—	—
	Mean		
	Range		
	% Passed on 1st Attempt		
#5624 Breakdown	Number		
Students as Learners	Mean		
	Range		
	Percentage Correct (21)		
Instructional Process	Mean		
	Range		
	Percentage Correct (21)		
Assessment	Mean		
	Range		
	Percentage Correct (14)		
Professional Development Leadership and Community	Mean		
	Range		
	Percentage Correct (13)		
Analysis of Instructional Scenarios	Mean		
	Range		
	Percentage Correct (16)		

14.1.1 Analysis of Data and Plan for Continuous Improvement

2019-2020:

2020-2021:
There were no completers during the 2020-2021 academic year. With the redesign of the program for teacher residency, particular coursework has been strategically determined to assist candidates on acquiring the knowledge needed for the exam. Candidates are advised to take the exam soon after completing PSYC 261 and EDUC 203 which according to sequence falls sophomore mid-year. Faculty will analyze secondary education program PLT data to determine trends and areas for improvement.

2021-2022:
There were no completers in the 2021-2022 academic year with a concentration in Chemistry Education therefore no new data was reported.

All course sequences are being re-evaluated for the 2023-2024 academic catalog to ensure proper alignment of content and that all required material is covered for candidates to perform well on the Principles of Learning and Teaching exam and in the P-12 classroom.

2023-2024:
There were no completers in Chemistry Education in the 2023-2024 academic year.

15 Assessment and Benchmark The Learner and Learning

Benchmark: A minimum of 80% of candidates will meet benchmark (3.00) when applying critical concepts and principles of learner development (InTASC 1), learning differences (InTASC 2), and creating safe and supportive learning environments (InTASC 3) in order to work effectively with diverse P-12 students and their families.

15.1 Data

	Semester/Year	n	Met
InTASC Standard 1	Fall 2023	—	
	Spring 2024	—	
InTASC Standard 2	Fall 2023	—	
	Spring 2024	—	
InTASC Standard 3	Fall 2023	—	
	Spring 2024	—	
The Learner and Learning	Fall 2023	—	
	Spring 2024	—	

15.1.1 Analysis of Data and Plan for Continuous Improvement

2023-2024:
There were no completers in Chemistry Education in the 2023-2024 academic year.

16 Assessment and Benchmark Content

Assessment: Content

Benchmark: A minimum of 80% of candidates will know central concepts of their content area (InTASC 4) and apply the content in developing equitable and inclusive learning experiences (InTASC 5) for diverse P-12 students.

16.1 Data

	Semester/Year	n	Met
InTASC Standard 4	Fall 2023	—	
	Spring 2024	—	
InTASC Standard 5	Fall 2023	—	
	Spring 2024	—	
Content	Fall 2023	—	
	Spring 2024	—	

16.1.1 Analysis of Data and Plan for Continuous Improvement

2023-2024:
There were no completers in Chemistry Education in the 2023-2024 academic year.

17 Assessment and Benchmark Instructional Practice

Benchmark: A minimum of 80% of candidates will assess (InTASC 6), plan for instruction (InTASC 7), and utilize a variety of instructional strategies (InTASC 8) to provide equitable and inclusive learning experiences for diverse P-12 students.

17.1 Data

	Semester/Year	n	Met
InTASC Standard 6	Fall 2023	—	
	Spring 2024	—	
InTASC Standard 7	Fall 2023	—	
	Spring 2024	—	
InTASC Standard 8	Fall 2023	—	
	Spring 2024	—	
Instructional Practice	Fall 2023	—	
	Spring 2024	—	

17.1.1 Analysis of Data and Plan for Continuous Improvement

2023-2024:
There were no completers in Chemistry Education in the 2023-2024 academic year.

18 Assessment and Benchmark Professional Responsibility

Benchmark: A minimum of 80% of candidates will engage in professional learning, act ethically (InTASC 9), take responsibility for student learning, and collaborate with others (InTASC 10) to work effectively with diverse P-12 students and their families.

18.1 Data

	Semester/Year	n	Met
InTASC Standard 9	Fall 2023	—	
	Spring 2024	—	
InTASC Standard 10	Fall 2023	—	
	Spring 2024	—	
Professional Responsibility	Fall 2023	—	
	Spring 2024	—	

18.1.1 Analysis of Data and Plan for Continuous Improvement

2023-2024:
There were no completers in Chemistry Education in the 2023-2024 academic year.