Appendix I

Chemistry FTES, FTEF, and FTES:FTEF

Appendix *: Chemistry FTES, FTEF, and FTES:FTEF

Physical and Environmental Sciences Departmental Data, 2018

Ratio of full-time equivalent students (FTES) to full-time equivalent faculty (FTEF)

	2013-14			2014-15			2015-16			2016-17			2017-18		
	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF
CHEM	195.1	7.3	26.8	195.5	7.4	26.4	197.7	7.8	25.5	211.2	7.8	27.1	227.6	8.3	27.6

Appendix II

Course Evaluation Form

Colorado Mesa University Faculty Evaluation
Western Colorado Community College Faculty Evaluation

CRN

Instructor Name: ____________ Course: ________ (i.e. ENGL 111) Section ______ (i.e. 001)

NOTE TO STUDENTS: Your responses are anonymous. The results will not be returned to the professor until AFTER grades have been posted. IMPORTANT! This document will be scanned for data entry. Please completely fill in the circle of your selection with pencil or a black or blue pen.

OPTIONAL DATA SECTION: Your responses to the following items are optional.

1. Gender
- Male
- Female

2. Classification
- Freshman
- Sophomore
- Junior
- Senior
- Unclassified
- Graduate

3. Type of Course
- General Education
- Required for Major
- Elective in Major
- Elective Non Major

4. Degree
- Certificate
- AA
- AS
- AAS
- BA
- BAS
- BBA
- BFA
- BS
- BSN
- MA
- MBA
- MSN
- DNP
- Undeclared
- N/A

5. Department of Major
- Art
- Biological Sciences
- Business
- Computer Science, Math, & Statistics
- Health Sciences
- Kinesiology
- Languages, Literature, & Mass Comm
- Music
- Physical & Environmental Sciences
- Social & Behavioral Sciences
- Teacher Education
- Theatre Arts
- WCCC
- Undeclared

6. Expected grade for this course:
- A
- B
- C
- D
- F
- Don't Know

REQUIRED SECTION: Please answer each item as it applies to this class or to this professor, according to the following scale from strongly agree to strongly disagree, and not applicable.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Not Applicable
The course assignments are clear.						
The grading policies/procedures/criteria for this course are clear						
The teaching methods/techniques used by the professor are effective						
The exams and assignments of the course are consistent with the course content						
The course is appropriately challenging						
The course syllabus accurately reflects the learning outcomes.						
The instructor is well prepared for class.						
The instructor responds to student questions at an appropriate level.						
The instructor uses a variety of teaching methods						
The instructor explains how material in the course is useful or relevant.						
The instructor is accessible to students during office hours or by appointment.						
The instructor promotes respect and civility for all students						

Please make comments on the back of this sheet.

Written Comments

Please take the opportunity to make written comments about this class and the professor on this side of the evaluation sheet. Such comments can be useful in helping the professors evaluate their teaching styles and effectiveness.

A. What were the most effective aspects of this course?

B. What changes would you recommend for this course?

C. Are the classroom/laboratory facilities conducive to learning? If not, please explain.

D. Other Comments:

CRN: [redacted]
Time: 1400 - 1520

Course: [redacted]
Term: Spring 2012

Instructor: [redacted]

# Evaluations	16
Census Enroll	19
Response Rate	84.21%

Optional Data Section

1. Gender

Male	4	25.00%
Female	10	62.50%

2. Classification

Freshman	10	62.50%
Sophomore	3	18.75%
Junior	1	6.25%
Senior	0	0.00%
Unclassified	0	0.00%
Graduate	0	0.00%

3. Type of Course

General Education	4	25.00%
Required for Major	9	56.25%
Elective in Major	0	0.00%
Elective Non Major	1	6.25%

4. Degree

Certificate	0	0.00%
AA	0	0.00%
AS	0	0.00%
AAS	5	31.25%
BA	3	18.75%
BAS	0	0.00%
BBA	0	0.00%
BFA	0	0.00%
BS	2	12.50%
BSN	3	18.75%
MA	0	0.00%
MBA	0	0.00%
Undeclared	0	0.00%
NA	0	0.00%

5. Department of Major

Art	0	0.00%
Biological Sciences	0	0.00%
Business	0	0.00%
Computer Science, Math, and Statistics	0	0.00%
Health Sciences	10	62.50%
Kinesiology	3	18.75%
Languages, Literature, and Mass Comm.	0	0.00%
Music	0	0.00%
Physical and Environmental Sciences	1	6.25%
Social and Behavioral Sciences	0	0.00%
Teacher Education	0	0.00%
Theatre	0	0.00%
WCCC	0	0.00%
Undeclared	0	0.00%

6. Expected Grade for this course

A	1	6.25%
B	5	31.25%
C	4	25.00%
D	1	6.25%
F	0	0.00%
Don't Know	0	0.00%

Total Responses	192	
Median of Medians	5.00	
Total Average	4.66	
Strongly Agree	135	70.31%
Agree	50	26.04%
Neither Agree nor Disagree	3	1.56%
Disagree	3	1.56%
Strongly Disagree	0	0.00%
Not Observed	1	0.52%

CRN: [redacted]
Time: 1400 - 1520

Course: [redacted]
Term: Spring 2012

Instructor: [redacted]

# Evaluations	16
Census Enroll	19
Response Rate	84.21%

Required Section

1. The course assignments are clear.

	N	%
Strongly Agree	12	75.00%
Agree	4	25.00%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.75

2. The grading policies/procedures/criteria for this course are clear.

	N	%
Strongly Agree	12	75.00%
Agree	4	25.00%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.75

3. The teaching methods/techniques used by the professor are effective.

	N	%
Strongly Agree	10	62.50%
Agree	4	25.00%
Neither Agree nor Disagree	1	6.25%
Disagree	1	6.25%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.44

4. The exams and assignments of the course are consistent with the course content.

	N	%
Strongly Agree	12	75.00%
Agree	4	25.00%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.75

5. The course is appropriately challenging.

	N	%
Strongly Agree	12	75.00%
Agree	3	18.75%
Neither Agree nor Disagree	1	6.25%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.69

6. The course syllabus accurately reflects the learning outcomes.

	N	%
Strongly Agree	11	68.75%
Agree	5	31.25%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.69

7. The instructor is well prepared for class.

	N	%
Strongly Agree	11	68.75%
Agree	5	31.25%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.69

8. The instructor responds to student questions at an appropriate level.

	N	%
Strongly Agree	10	62.50%
Agree	6	37.50%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.63

9. The instructor uses a variety of teaching methods.

	N	%
Strongly Agree	10	62.50%
Agree	3	18.75%
Neither Agree nor Disagree	1	6.25%
Disagree	2	12.50%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.31

10. The instructor explains how material in the course is useful or relevant.

	N	%
Strongly Agree	12	75.00%
Agree	4	25.00%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.75

11. The instructor is accessible to students during office hours or by appointment.

	N	%
Strongly Agree	11	68.75%
Agree	4	25.00%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	1	6.25%
Median		5.00
Mean		4.73

12. The instructor promotes respect and civility for all students.

	N	%
Strongly Agree	12	75.00%
Agree	4	25.00%
Neither Agree nor Disagree	0	0.00%
Disagree	0	0.00%
Strongly Disagree	0	0.00%
Not Observed	0	0.00%
Median		5.00
Mean		4.75

Appendix III

Library Assessments and Periodical Lists

Library Program Assessment
John U. Tomlinson Library
Colorado Mesa University

Date of Assessment: August, 2018

Program under review: Chemistry

Description of Program: CMU chemistry students gain a unique perspective on the composition, properties and reactivity of the substances surrounding them. These students gain problem-solving skills that can be applied in chemistry labs, in other classes and in day-to-day life.

Program Level/s: Bachelors

Liaison: Jamie Walker

1. Collection Assessment

Collection development is the joint responsibility of the Chemistry faculty and the Physical and Environmental Sciences Librarian. Review slips and new title lists are sent to the faculty each month for their review. They may also recommend titles found in their journal reading or publishers' advertisements. Titles recommended are sent to the librarian, who reviews them and sends them on for purchase as funds allow. The budget line is also supplemented by the SpringerLink, ScienceDirect (Elsevier), and Oxford Reference e-book collections. 150 titles were purchased in the last 5 years distributed as follows:

FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
20	26	37	34	33

a. Reference Support

The print reference collection provides concise authoritative information with 24 titles.

General chemistry - 12 titles
Analytical chemistry - 1 title
Organic chemistry - 7 titles
Biochemistry - 1 title
Physical and theoretical chemistry - 3 titles.

Sample print and online Reference titles:

Comprehensive organic synthesis (print, 9 vols.)
CRC handbook of chemistry and physics (print)

Dictionary of chemical engineering (online)
Dictionary of chemistry (online)
Hawley's condensed chemical dictionary (print)
Lange's handbook of chemistry (print)
Macmillan encyclopedia of chemistry (print, 4 vols.)
Oxford dictionary of biochemistry and molecular biology (online)

b. Monographic Sources (both print/media and e-books)

Method of analysis: Within the Chemistry Department two concentrations are offered, one in chemistry and one in biochemistry. Each of these major terms was searched in the library catalog by date range using the Library of Congress Subject Headings "Chemistry" and "Biochemistry" respectively, with the addition of "Chemistry, Physical and theoretical" and "Chemistry, Inorganic". The collection was further examined by Library of Congress Classification Number ranges. Results are below.

Age Analysis: For the print portion of the collection analyzed by subject in the chart below, over 15% were published since 2010, with a third published since 2000. For e-books, 63% have been published since 2010, nearly all since 2000. For the collection analyzed by classification number, about 5% were published since 2010, since 2000 nearly 20%.

Chemistry	Print/Media	E-book
2010-	129	810
2000-2009	143	443
1990-2000	118	16
1980-1989	74	0
1970-1979	74	0
Pre 1970	241	0
TOTAL	779	1,269

Biochemistry	Print/Media	E-book
2010-	7	156
2000-2009	7	103
1990-2000	15	1
1980-1989	15	0
1970-1979	32	0
Pre 1970	46	0
TOTAL	122	260

Chemistry, Physical & theoretical	Print/Media	E-book
2010-	44	130
2000-2009	28	80
1990-2000	27	0
1980-1989	21	0
1970-1979	6	0
Pre 1970	35	0
TOTAL	161	210

Chemistry, Inorganic	Print/Media	E-book
2010-	0	65
2000-2009	7	31
1990-2000	5	0
1980-1989	3	0
1970-1979	7	0
Pre 1970	25	0
TOTAL	47	96

Another way of analyzing the collection is by LC Classification Number range which examines primarily print books. Highlighted here are sections of the chemistry portions of the LCCN schedule.

Call number ranges	QD 1-65 General Chemistry	QD 71-142 Analytical Chemistry	QD 146-197 Inorganic Chemistry	QD 241-441 Organic Chemistry	QD 415-436 Biochemistry	QD 450-801 Physical & Theoretical Chemistry
2010-	14	5	1	12	2	13
2000-2009	36	15	12	18	1	44
1990-1999	41	30	14	53	7	77
1980-1989	12	11	3	26	3	27
1970-1979	33	26	15	24	2	35
Pre 1970	42	51	33	101	3	134
TOTAL	178	138	78	234	18	330

Recent Monographic purchases of possible interest include:

Chemistry

- Ameta, R. & Ameta, S. C. (2017). ***Photocatalysis Principles and applications.*** Boca Raton, Fla.: CRC Press.
- Greer, S. C. (2017). ***Elements of ethics for physical scientists.*** Cambridge, Mass.: MIT Press.
- Lancaster, M. (2016). ***Green chemistry: An introductory text*** (3rd ed.). Cambridge, UK: Royal Society of Chemistry.
- Rayner-Canham, M. F., and Rayner-Canham, G. (2001). ***Women in chemistry: Their changing roles from alchemical times to the mid-twentieth century.*** Philadelphia, Penn.: Chemical Heritage Foundation.
- Zimmermann, K. (2003). ***An introduction to protein informatics.*** Boston: Kluwer Academic Publishers.
- Le Pinnet, P. (2017). ***Laboratory scientific glassblowing: A practical training method.*** New Jersey: World Scientific.

Biochemistry

- Meyers, R. A. (1995). Molecular biology and biotechnology: A comprehensive desk reference. New York: VCH.
- Glick, B. R., Pasternak, J. J., & Patten, C. L. (2010). Molecular biotechnology: Principles and applications of recombinant DNA (4th ed.). Washington, D.C.: ASM Press.
- Ream, W., & Field, K. G. (1999). Molecular biology Techniques: an intensive laboratory course. San Diego, Calif.: Academic Press.
- Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2017). Lehninger principles of biochemistry (7th ed.). New York: W.H. Freeman.
- Eliasson, A. (2017). ***Carbohydrates in food.*** (3rd ed.). Boca Raton, Fla.: CRC Press.

As a partial government depository, the Library also makes available a large number of federal documents. For chemistry, included are those published by a variety of governmental agencies such as the Environmental Protection

Agency, U.S. Geological Survey, National Aeronautics and Space Administration, the Food and Drug Administration, etc. These are available in a variety of formats with most recent documents online.

c. Electronic Resources

Indexes/Databases: Two databases were selected for analysis.

Academic Search Complete: A general subject academic journal database that contains nearly 600 full-text peer reviewed journals related to chemistry. Coverage goes back to the late 1960s.

American Chemical Society: A chemistry specific database containing 74 full-text ACS publications. Coverage goes back to 1996, with some back further.

Journal Articles:

Keyword and subject searches for some of the topics to be covered in the courses for this program were done in Academic Search Complete (ASC) and American Chemical Society (ACS) publications to illustrate available resources. The journal literature is rich in articles for this program. The chart below show a sampling of the resources available.

ASC (Subject)/ACS (Keyword, with phrases in quotes)

Topic	ASC Total Articles	ASC 2010- Articles	ASC 2010- Peer reviewed	ASC 2010- Peer reviewed, full-text	ACS Total Articles	ACS 2010- Articles
Chemistry	696,264	436,495	430,903	358,176	64,168	17,244
Biochemistry	126,206	61,108	60,761	52,571	11,415	2,983
Analytical Chemistry	28,745	11,642	10,926	9,188	4,960	451
Inorganic Chemistry	18,718	11,706	11,677	9,829	2,324	407
Organic Chemistry	64,584	36,998	36,815	31,849	5,231	1,034
Physical Chemistry	46,059	9,644	9,546	7,636	3,061	794

Other Databases:

SciFinder: A research discovery application that provides integrated access to the world's most comprehensive and authoritative source of references, substances and reactions in chemistry and related sciences.

d. Periodicals

Chemistry journal titles which formerly were held in print have moved to online access which is far more convenient, and are contained in science databases such as American Chemical Society, ScienceDirect (Elsevier), Wiley, or Academic Search Complete. The following titles highlight available journals and include CMU former print titles now online.

Analytical chemistry
Biochemistry
Bioorganic chemistry
European journal of biochemistry
Experimental & molecular pathology
Inorganic chemistry
Journal of biological chemistry (12 month embargo)
Journal of catalysis
Journal of chemical education
Journal of organic chemistry
Journal of chemical thermodynamics
Journal of colloid & interface science
Journal of molecular spectroscopy
Journal of solid state chemistry
Journal of the American Chemical Society
Langmuir
Organic letters
Solid state nuclear magnetic resonance
Superlattices & microstructures

A search of the subject "chemistry" in our Journal Finder retrieved over 600 full-text journal titles, and nearly 200 for the subject "biochemistry". Between the ACS journals and many available through other resources, CMU students and faculty have a large number of quality titles from which to choose.

e. Media

The Library holds physical DVDs, and also subscribes to Films on Demand (FoD), a streaming video service from Films Media Group. Films on Demand includes educational videos, documentaries, and PBS publications. A keyword search in FoD brings up over 200 chemistry titles. Some titles that might be appropriate for this program are:

Breaking the wall of sustainable chemistry (FoD)
Carbon chemistry (DVD)
Chem lab: Safety in every step (FoD
Chemical cycling and succession (DVD)
Chemistry (DVD)

Chemistry: Changing states of matter (FoD)
Chemistry of carbon: a very versatile atom (FoD)
Interpreting infrared and N.M.R. spectra (FoD)
Introduction to redox reactions (DVD)
Learning strategies for general chemistry (FoD)
Physics and chemistry of water (DVD)
Water: Iionic equilibrium, acid-base, and redox chemistry (FoD)

f. Additional Resources

Journal literature not available through Colorado Mesa University, including those titles not available because of publisher embargo, can be provided by the Interlibrary Loan Department. The average amount of time it takes to fill an article request is 12 hours. Physical items such as books and DVDs not owned by Colorado Mesa University can be borrowed from other libraries within the state or region through programs such as Prospector, and when necessary, throughout the world. Items from regional libraries typically arrive in 3-5 business days.

2. Evaluation of the total collection

a. Strengths

Journals are the primary resource for CMU chemistry faculty and majors. The indexing and full-text provided by CMU's database subscriptions provide access to much current scholarship in the field strengthening the Library's resources for Chemistry research. While not extensive, the Library's reference collection supports the need for authori-tative concise information. The Library's e-book collection is strong in the sciences and chemistry is well represented. E-books on both general and esoteric topics are readily available. The Library's DVD and Films on Demand collections provide many media resources. The circulating chemistry book collection receives regular use and sufficiently supports coursework for undergraduate Chemistry majors.

b. Weaknesses

As the circulating collection is further developed, consideration should be taken to order additional materials in areas that appear less well represented, such as biochemistry, which is one of the two concentrations offered by the program.

3. Recommendations

The purchase of newer titles in chemistry should continue, and the current scope of electronic resources should be maintained. Existing funds should be sufficient.

Library Director:

Sylvia L. Rael

Date: August 27, 2018

Journal List

ACS Journals

Title	Full-Text Start	Full-Text End
ACS Applied Materials and Interfaces	1/1/2009	current
ACS Biomaterials Science & Engineering	1/1/2015	current
ACS Catalysis	1/1/2011	current
ACS Chemical Biology	2/17/2006	current
ACS Chemical Neuroscience	1/1/2010	current
ACS Combinatorial Science	1/1/1999	current
ACS Infectious Diseases	1/1/2015	current
ACS Macro Letters	1/1/2012	current
ACS Medicinal Chemistry Letters	1/1/2010	current
ACS Nano	8/1/2007	current
ACS Photonics	1/15/2014	current
ACS Sustainable Chemistry & Engineering	1/1/2013	current
ACS Synthetic Biology	1/1/2012	current
Analytical Chemistry	1/1/1996	current
Biochemistry	1/1/1996	current
Bioconjugate Chemistry	1/1/1996	current
Biomacromolecules	1/1/2000	current
Chemical Research in Toxicology	1/1/1996	current
Chemical Reviews	1/1/1996	current
Chemistry of Materials	1/1/1996	current
Crystal Growth & Design	1/1/2001	current
Energy and Fuels	1/1/1996	current
Environmental Science & Technology Letters	1/14/2014	current
Environmental Science & Technology: ES&T	1/1/1996	current
Industrial & Engineering Chemistry Research	1/1/1996	current
Inorganic Chemistry	1/1/1996	current
Journal of Agricultural & Food Chemistry	1/1/1996	current
Journal of Chemical & Engineering Data	1/1/1996	current
Journal of Chemical Education	1/1/1996	current
Journal of Chemical Information and Modeling	3/1/2005	current
Journal of Chemical Theory and Computation	1/1/2005	current
Journal of Medicinal Chemistry	1/1/1996	current
Journal of Natural Products (Lloydia)	1/1/1996	current
Journal of Organic Chemistry	1/1/1996	current
Journal of Physical Chemistry C	1/1/2007	current
Journal of Physical Chemistry Letters	1/1/2010	current
Journal of Proteome Research	1/1/2002	current

Journal of the American Chemical Society	1/1/1996	current
Langmuir	1/1/1996	current
Macromolecules	1/1/1996	current
Molecular Pharmaceutics	1/1/2004	current
Nano Letters	1/1/2001	current
Organic Letters	1/1/1999	current
Organic Process Research & Development	1/1/1997	current
Organometallics	1/1/1996	current
The Journal of Physical Chemistry A	1/1/1997	current
The Journal of Physical Chemistry B, Condensed matter, materials, surfaces, interfaces & biophysical	1/2/1997	current

Elsevier Journals

Note: "Open Access" indicates we have full access to these journals. "Contains Open Access" makes no implications about how much access to the journal we have.

	Open Access	Some open access
Achievements in the Life Sciences	x	
Advances in Colloid and Interface Science		x
Analytica Chimica Acta		x
Analytical Biochemistry		x
Analytical Chemistry Research	x	
APCBEE Procedia	x	
Applications of Surface Science		x
Applied Surface Science		x
Arabian Journal of Chemistry	x	
Biochemical Systematics and Ecology	x	
Biochimica et Biophysica Acta (BBA) - Proteins and Proteomics		x
Bioelectrochemistry		x
Bioelectrochemistry and Bioenergetics	x	
Bioinorganic Chemistry	x	
Bioorganic Chemistry		x
Bioorganic & Medicinal Chemistry		x
Bioorganic & Medicinal Chemistry Letters		x
Biophysical Chemistry		x
Biosensors	x	
Biosensors and Bioelectronics		x
Carbohydrate Polymers		x
Carbohydrate Research		x
Cell Chemical Biology		x
Chem		x
Chemical Data Collections	x	

	Open Access	Some Open Access
Chemical Health & Safety	x	
Chemical Physics		x
Chemical Physics Letters		x
Chemistry & Biology		x
Chemistry and Physics of Lipids		x
Chemometrics and Intelligent Laboratory Systems		x
Chinese Chemical Letters	x	
Chinese Journal of Analytical Chemistry	x	
Clinical Mass Spectrometry		x
Colloid and Interface Science Communications		x
Colloids and Surfaces	x	
Colloids and Surfaces A: Physicochemical and Engineering Aspects		x
Colloids and Surfaces B: Biointerfaces		x
Combinatorial Chemistry - an Online Journal	x	
Comptes Rendus de l'Academie des Sciences - Series IIB - Mechanics-Physics-Chemistry-Astronomy	x	
Comptes Rendus de l'Academie des Sciences - Series IIC - Chemistry	x	
Comptes Rendus Chimie		x
Computational Biology and Chemistry		x
Computational and Theoretical Chemistry		x
Computational and Theoretical Polymer Science	x	
Computer Physics Communications		x
Computers & Chemistry	x	
Coordination Chemistry Reviews		x
Crystal Engineering	x	
Current Opinion in Chemical Biology		x
Current Opinion in Colloid & Interface Science		x
Current Opinion in Electrochemistry		x
Current Opinion in Green and Sustainable Chemistry		x
Educacion Quimica	x	
Electrochemistry Communications		x
Electrochimica Acta		x
EuPA Open Proteomics	x	
European Journal of Medicinal Chemistry		x
European Polymer Journal		x
FlatChem		x
Fluid Phase Equilibria		x
Focus on Polyvinyl Chloride	x	
Focus on Powder Coatings	x	
Food Chemistry		x
Forensic Chemistry		x
Forensic Science	x	

	Open Access	Some open access
Forensic Science International		x
Forensic Science International Supplement Series	x	
Fuel		x
Fuel Processing Technology		x
HardwareX	x	
Heliyon	x	
Inorganic Chemistry Communications		x
Inorganica Chimica Acta		x
International Journal of Chemical and Analytical Science	x	
International Journal of Hydrogen Energy		x
International Journal of Mass Spectrometry		x
International Journal of Mass Spectrometry and Ion Processes	x	
iScience	x	
Journal of Advanced Research	x	
Journal of the American Society for Mass Spectrometry		x
Journal of Analytical and Applied Pyrolysis		x
Journal of the Association of Arab Universities for Basic and Applied Sciences	x	
Journal of Chemical Health and Safety		x
The Journal of Chemical Thermodynamics		x
Journal of Chromatography A		x
Journal of Chromatography B		x
Journal of Chromatography B: Biomedical Sciences and Applications	x	
Journal of Colloid and Interface Science		x
Journal of Colloid Science	x	
Journal of Cultural Heritage		x
Journal of Electroanalytical Chemistry		x
Journal of Electron Spectroscopy and Related Phenomena		x
Journal of Fluorine Chemistry		x
Journal of Food Composition and Analysis		x
Journal of Functional Foods		x
Journal of Inorganic Biochemistry		x
Journal of King Saud University - Science	x	
Journal of Luminescence		x
Journal of Magnetic Resonance		x
Journal of Magnetic Resonance, Series A	x	
Journal of Magnetic Resonance, Series B	x	
Journal of Magnetic Resonance (1969)		
Journal of Microscopy and Ultrastructure	x	
Journal of Molecular Catalysis A: Chemical		x

	Open Access	Some open access
Journal of Molecular Graphics		
Journal of Molecular Graphics and Modelling		x
Journal of Molecular Liquids		x
Journal of Molecular Spectroscopy		x
Journal of Molecular Structure		x
Journal of Molecular Structure: THEOCHEM	x	
Journal of Organometallic Chemistry		x
Journal of Pharmaceutical and Biomedical Analysis		x
Journal of Photochemistry	x	
Journal of Photochemistry and Photobiology A: Chemistry		x
Journal of Photochemistry and Photobiology B: Biology Journal		x
Journal of Photochemistry and Photobiology C: Photochemistry Reviews		x
Journal of Power Sources		x
Journal of Proteomics		x
Journal of Quantitative Spectroscopy and Radiative Transfer		x
Journal of Rare Earths	x	
Journal of Solid State Chemistry		x
The Journal of Supercritical Fluids		x
Journal of Supramolecular Chemistry	x	
Journal of Taibah University for Science	x	
Journal of Trace Elements in Medicine and Biology		x
Karbala International Journal of Modern Science	x	
Laboratory Automation & Information Management	x	
Legal Medicine		x
Marine Chemistry		x
Materials Science for Energy Technologies	x	
Materials Today		x
Mendeleev Communications	x	
Microchemical Journal		x
Molecular Astrophysics		x
Molecular Catalysis		x
Nano-Structures & Nano-Objects	x	
Nano Today		x
Organic Electronics		x
Organic Geochemistry		x
Pacific Science Review A: Natural Science and Engineering	x	
Photoacoustics	x	
Phytochemistry		x
Phytochemistry Letters		x

	Open Access	Some open access
Plasmas and Ions	x	
Polyhedron		x
Polymer		x
Polymer Contents	x	
Polymer Degradation and Stability		x
Polymer Testing		x
Procedia Chemistry	x	
Procedia Food Science	x	
Progress in Nuclear Magnetic Resonance Spectroscopy		x
Progress in Polymer Science		x
Progress in Surface Science		x
Reactive and Functional Polymers		x
Reactive Polymers	x	
Reactive Polymers, Ion Exchangers, Sorbents	x	
Revue Francaise des Laboratoires	x	
Revue Francophone des Laboratoires	x	
Science Bulletin		x
Science & Justice		x
Sensing and Bio-Sensing Research	x	
Sensors and Actuators	x	
Sensors and Actuators A: Physical		x
Sensors and Actuators B: Chemical		x
Solar Energy Materials and Solar Cells		x
Solid State Ionics		x
Solid State Nuclear Magnetic Resonance		x
Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy		x
Spectrochimica Acta Part B: Atomic Spectroscopy		x
Surface Science		x
Surface Science Letters	x	
Surface Science Reports		x
Talanta		x
Tetrahedron		x
Tetrahedron: Asymmetry		x
Tetrahedron Letters		x
Thermochimica Acta		x
TIP	x	
TrAC Trends in Analytical Chemistry		x
Trends in Environmental Analytical Chemistry		x
Ultrasonics Sonochemistry		x
Vibrational Spectroscopy		x

Wiley Chemistry Journals

Acta Crystallographica Section A
Acta Crystallographica Section B
Acta Crystallographica Section C
Acta Crystallographica Section D
Acta Crystallographica Section F
Advanced Energy Materials
Advanced Functional Materials
Advanced Healthcare Materials
Advanced Materials
Advanced Materials Interfaces
Advances in Polymer Technology
AIChE Journal
American Journal of Industrial Medicine
Angewandte Chemie
Angewandte Chemie International Edition
Animal Science Journal
Annals of the New York Academy of Sciences
Applied Organometallic Chemistry
Aquaculture Nutrition
Archives of Insect Biochemistry and Physiology
Asia?Pacific Journal of Chemical Engineering
Asian Journal of Organic Chemistry
Atmospheric Science Letters
Australian Journal of Grape and Wine Research
Autonomic and Autacoid Pharmacology
Berichte zur Wissenschaftsgeschichte
BioFactors
Biofuels, Bioproducts and Biorefining
Biology of the Cell
Biomedical Chromatography
Biopharmaceutics & Drug Disposition
Biotechnology and Bioengineering
Biotechnology Progress
Brewer and Distiller International
British Journal of Pharmacology
Cell Biochemistry and Function
Cell Biology International
Cellular Microbiology
ChemBioEng Reviews
ChemCatChem
ChemElectroChem
Chemical Biology & Drug Design
Chemie in unserer Zeit
Chemie Ingenieur Technik

Chemistry & Industry
ChemistryOpen
CHEMKON
ChemNanoMat
ChemPlusChem
Chirality
CITplus
Clinical Pharmacology & Therapeutics
Clinical Pharmacology in Drug Development
CNS Neuroscience & Therapeutics
Color Research & Application
Coloration Technology
Comprehensive Reviews in Food Science and Food Safety
Concepts in Magnetic Resonance Part A
Cornerstone
CPT: Pharmacometrics & Systems Pharmacology
Culture, Agriculture, Food and Environment
Drug Testing and Analysis
ELECTROPHORESIS
Energy Technology
Environmental and Molecular Mutagenesis
Environmental Progress & Sustainable Energy
Environmental Toxicology
Environmental Toxicology and Chemistry
Epilepsia
European Journal of Lipid Science and Technology
Family and Consumer Sciences Research Journal
FEBS Letters
FEBS Open Bio
Fire and Materials
Flavour and Fragrance Journal
Food and Energy Security
Food Quality
Food Science & Nutrition
Geoarchaeology
Geophysical Prospecting
Geostandards and Geoanalytical Research
Greenhouse Gases: Science and Technology
Heteroatom Chemistry
Infocus Magazine
Integrated Environmental Assessment and Management
International Journal of Applied Ceramic Technology
International Journal of Applied Glass Science International Journal of Chemical Kinetics
International Journal of Cosmetic Science
International Journal of Dairy Technology
International Journal of Food Science & Technology

International Journal of Quantum Chemistry
Israel Journal of Chemistry
Journal of Animal Physiology and Animal Nutrition
Journal of Applied Crystallography
Journal of Applied Microbiology
Journal of Applied Polymer Science
Journal of Applied Toxicology
Journal of Biochemical and Molecular Toxicology
Journal of Biomedical Materials Research Part A
Journal of Biomedical Materials Research Part B: Applied Biomaterials
Journal of Chemical Technology and Biotechnology
Journal of Chemometrics
Journal of Computational Chemistry
Journal of Eukaryotic Microbiology
Journal of Food Biochemistry
Journal of Food Process Engineering
Journal of Food Processing and Preservation
Journal of Food Safety
Journal of Food Science
Journal of Food Science Education
Journal of Forensic Sciences
Journal of Heterocyclic Chemistry
Journal of Industrial Ecology
Journal of Labelled Compounds and Radiopharmaceuticals
Journal of Mass Spectrometry
Journal of Microscopy
Journal of Molecular Recognition
Journal of Peptide Science
Journal of Petroleum Geology
Journal of Pharmacy and Pharmacology
Journal of Physical Organic Chemistry
Journal of Plant Nutrition and Soil Science
Journal of Polymer Science Part B: Polymer Physics
Journal of Raman Spectroscopy
Journal of Sensory Studies
Journal of Synchrotron Radiation
Journal of Texture Studies
Journal of the American Ceramic Society
Journal of the Chinese Chemical Society
Journal of the Institute of Brewing
Journal of the Science of Food and Agriculture
Journal of Veterinary Pharmacology and Therapeutics
Journal of Vinyl and Additive Technology
Lebensmittel-Industrie
Lebensmittelchemie
Letters in Applied Microbiology

Lipid Technology
Luminescence
Macromolecular Chemistry and Physics
Macromolecular Materials and Engineering
Macromolecular Rapid Communications
Magnetic Resonance in Chemistry
Mass Spectrometry Reviews
Materials and Corrosion
Materialwissenschaft und Werkstofftechnik
Medicinal Research Reviews
Microbial Biotechnology
Microscopy and Analysis
Microscopy Research and Technique
Molecular Ecology
Molecular Ecology Resources
Molecular Nutrition & Food Research
NMR in Biomedicine
Nutrition & Dietetics
Oil and Energy Trends
Oil and Energy Trends: Annual Statistical Review
Packaging Technology and Science
Pest Management Science
Pharmacology Research & Perspectives
Photochemistry and Photobiology
Phytochemical Analysis
Phytotherapy Research
Pigment Cell & Melanoma Research
Plastics Engineering
Polymer Composites
Polymer Engineering & Science
Polymer International
Polymers for Advanced Technologies
Process Safety Progress
Propellants, Explosives, Pyrotechnics
Protein Science
Proteins: Structure, Function, and Bioinformatics
PROTEOMICS
Quarterly Journal of the Royal Meteorological Society
Rapid Communications in Mass Spectrometry
Remediation Journal
Small
Spectroscopy Asia
Spectroscopy Europe
Starch? Starke
Surface and Interface Analysis
Terrestrial Magnetism

Terrestrial Magnetism and Atmospheric Electricity
The Canadian Journal of Chemical Engineering
The Chemical Record
The FEBS Journal
The Journal of Clinical Pharmacology
The Sciences
Transactions of the New York Academy of Sciences
Vakuum in Forschung und Praxis
Wiley Interdisciplinary Reviews: Computational Molecular Science
Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology
Wiley Interdisciplinary Reviews: RNA
Wiley Interdisciplinary Reviews: Water
World Oil Trade
X-Ray Spectrometry Yeast
Zoonoses and Public Health

Appendix IV

Curriculum Map

Appendix IV: Chemistry Curriculum Map, AY19

Course	SLO 1 Spec. Knwl.	SLO 2 Quant./C	SLO 3 Applied Knwl.	SLO 4 Info. Lit.	SLO 5 Comm.
100	X				
121	X	X			
121L	X	X	X		
122	not offered				
122L	not offered				
123	X	X			
131	X	X			
131L	X	X	X		
132	X	X			
132L	X	X	X		
151	X	X			
151L	X	X	X		
196	not offered				
296	not offered				
300	X	X			
301	X	X			
301L	X	X	X		X
311	X				
311L	X	X	X		X
312	X				
312L	X	X	X	X	X
315	X				
315L	X	X	X	X	X
316	X	X		X	X
321	X	X			
322	X	X			
341	X	X	X	X	X
351	X				X
352	X				
395	NA				
396	NA				
397	X		X	X	X
421	X			X	X
422	X			X	X
431	X	X			
431L	X	X	X		X
442	X			X	X
487	X		X	X	X
494	not offered				
495	NA				
496	NA				
497	X		X	X	X
596	NA				

Appendix V

Program Outcome and Assessment Report

Appendix V. Program Outcome and Assessment Report

COLORADO MESA UNIVERSITY
Program Name: BS, Chemistry

Date of Submission: 10/15/18

Program Reviews of the Assessment Plan and Report

In this box and in reverse chronological order, please provide a timeline of when your program faculty reviewed your assessment plan and/or report. Please focus on dates when the following were performed:

- **A) The learning outcomes were reviewed by the program faculty for possible revision.**
- **B) All program faculty received the assessment results.**
- **C) Faculty input regarding the results was sought.**
- **D) The majority of program faculty met face-to-face to discuss the assessment results in depth.**

September, 2018: A) The learning outcomes were reviewed by the program faculty for possible revision.
B) All program faculty received the assessment results.
C) Faculty input regarding the results was sought.
D) The majority of program faculty met face-to-face to discuss the assessment results in depth. The assessment plan and report were revised based on input from faculty.

January, 2018: B) All program faculty received the assessment results.
C) Faculty input regarding the results was sought.
D) The majority of program faculty met face-to-face to discuss the assessment results in depth. The assessment plan and report were revised based on input from faculty.

November, 2016: B) All program faculty received the assessment results.
C) Faculty input regarding the results was sought.

August, 2016: B) All program faculty received the assessment results.
C) Faculty input regarding the results was sought.
D) The majority of program faculty met face-to-face to discuss the assessment results in depth. The assessment plan and report were revised based on input from faculty.

January, 2016: B) All program faculty received the assessment results.
C) Faculty input regarding the results was sought.
D) The majority of program faculty met face-to-face to discuss the assessment results in depth. The assessment plan and report were revised based on input from faculty.

Assessment Report

Program Outcomes	Courses/Educational Strategies (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection/ Person Responsible
Outcome #1 Demonstrate fluency in the concepts from the major fields of chemistry (inorganic, organic, physical, and analytical...) (Specialized Knowledge)	CHEM 132: General Chemistry II (B);	**What:** ACS General Chemistry Exam **How:** Delivered as the final exam in CHEM 132	**Who:** All professors teaching CHEM 132 **When:** As the final exam for every CHEM 132 section in all semesters.
	CHEM 312: Organic Chemistry II (D);	**What:** CHEM 312 final exam standardized across CHEM 312 sections **How:** Delivered as the final exam in CHEM 312	**Who:** All professors teaching CHEM 312 **When:** As the final exam for every CHEM 312 section; these all occur in spring semesters
	CHEM 315: Biochemistry I (D);	**What:** CHEM 315 final exam standardized across CHEM 315 sections **How:** Delivered as the final exam in CHEM 315	**Who:** All professors teaching CHEM 315 **When:** As the final exam for every CHEM 315 section; these all occur in fall semesters
	CHEM 442: Communicating in the World of Chemistry (A)	**What:** The ETS Major Field Test (MFT), a standardized chemistry test for senior students that is administered at 100 – 250 schools across the country. It assesses students' overall scores and their scores across physical, organic, inorganic, and analytical chemistry. **How:** Seniors are required to take this test before they graduate.	**Who:** The CMU testing center will administer the test, and a spring semester CHEM 442 instructor will collect and analyze the results. **When:** Seniors will take this exam during the semester before they graduate, and the results will be collected at the end of every spring semester.

Results of Assessment (include numbers of students involved in the assessment and the percentage)

Results:

CHEM 132 ACS General Chemistry Exam (percentile in parenthesis, when appropriate)

Semester/Year	Spring 2018	Fall/Spring 2017	Spring 2016	2015 (Fall and Spring)	2014 (Spring)
$N_{sections}$	4	4	3	4	3
$N_{students}$	198 (148 pass)	242 (184 pass)	159	198	153
Average	56.3% (54th)	53.6% (48th)	52.9% (46th)	56.5% (54th)	57.7%(56th)
Median	54.3%(49th)	51.4% (44th)	51.4% (44th)	55.7% (53rd)	57.0% (55th)
Average of top 5%	91.6% (97th)	85.1% (94th)	84.7% (93rd)	85.5% (94th)	85.9% (94th)
Average of bottom 5% of passing	35.1% (14th)	33.6%(12th)	31.2% (10th)	39.9% (23rd)	39.0% (21st)

2018, Spring (198 students who took the exam, 4 sections):
Average: 56.3% (54th percentile); Median: 54.3% (49th percentile); average of top 5%: 91.6% (97th percentile); average of bottom 5% passing: 35.1%(14th percentile)

2017, Spring and Fall (242 students who took the exam, 4 sections):
Average: 53.6% (48th percentile); Median: 51.4% (44th percentile); average of top 5%: 85.1% (94th percentile); average of bottom 5% passing: 33.6%(12th percentile)

2016, Spring (159 students who took the exam, 4 sections):
National average: 55.5%; National median 53.9%; Average: 52.9% (46th percentile); Median: 51.4% (44th percentile); average of top 5%: 84.7% (93rd percentile); average of bottom 5% passing: 31.2% (10th percentile)

Note: Beginning in 2016, the top/bottom 5% were calculated as follows: Take all of the exam scores of students who passed CHEM 132. Place these scores in a list. Take 5% of the count of scores in the passing list, and round that number to the nearest integer; call that number $N_{.05}$. Find the mean of the average $N_{.05}$ scores on that list and the mean of the lowest $N_{.05}$ scores on that list, and report these as "average of top 5%" and "average of bottom 5% passing." Previous results for the top/bottom 5% passing may have been calculated is slightly different ways.

2015, Fall and Spring (198 students, 4 sections): National Average: 55.5%; National median: 53.9%; Avg: 56.5% (54th percentile); Median: 55.7% (53rd percentile);
Mean of top 5%: 85.5 (94th percentile); Mean of bottom 5% passing: 39.9% (23rd percentile)
Note: National average and median is different from the last year because of newly-published, more complete norming data.

2014, Spring (153 students): National Avg: 52.5 %; National Med: 51 %; Avg.: 57.7 %; Avg. of Med.: 57.0 %; Mean of Top 5 %: 85.9 %; Mean Bot. 5% Pass: 39 %

CHEM 312 Organic Chemistry Final Exam:

2018 (65 students): Final Exam Mean: 74.42%; Final Exam Median: 75.25%; Top 5% Mean: 97.00%; Bottom 5% Passing Mean: 48.67%

2017 (58 students): Final Exam Mean: 70.36%; Final Exam Median: 71.50%; Top 5% Mean: 94.17%; Bottom 5% Passing Mean: 45.17%

2016 (60 students): Final Exam Mean: 77.52%; Final Exam Median: 81.25%; Top 5% Mean: 96.83%; Bottom 5% Passing Mean: 56.17%

2015 (67 students): Final Exam Mean: 79.29%; Final Exam Median: 81.00%; Top 5% Mean: 98.33%; Bottom 5% Passing Mean: 61.00%

2014 (64 students): Final Exam Mean: 74.33%; Final Exam Median: 76.00%; Top 5% Mean: 95.33%; Bottom 5% Passing Mean: 48.67%

CHEM 315 Biochemistry I Final Exam:

2017 (42 students): Final Exam Mean: 79.5%; Final Exam Median: 80.0%; Standard Deviation: 7.8%; Top 5% Mean: 94.0%; Bottom 5% Passing Mean: 64.0%

2015 (41 students): Final Exam Mean: 77.%; Final Exam Median: 78.0%; Standard Deviation: 10.2%; Top 5% Mean: 98.0%; Bottom 5% Passing Mean: 68.0%

2014 (44 students): Final Exam Mean: 66.8%; Final Exam Median: 66.0%; Standard Deviation: 11.7%; Top 5% Mean: 95.0%; Bottom 5% Passing Mean: 48.0%

CHEM 442: Communicating in the World of Chemistry, ETS Major Field Test (MFT):

MFT for All CMU Chemistry Graduates

Academic Year	# students	National Percentiles for Institutional Averages				
		Overall	Physical	Organic	Inorganic	Analytical
12 to 13	6	68	70	65	56	73
13 to 14	12	60	68	55	40	69
14 to 15	11	85.5	91	82	80	84
15 to 16	14	69	87	45	52	80
16 to 17	6	17	29	21	18	10
17 to 18	15	45	59	49.5	42	45

MFT for All CMU Chemistry Graduates

Academic Year	# students	National Percentiles for Median Students				
		Overall	Physical	Organic	Inorganic	Analytical
12 to 13	6	68	70	48	52	70
13 to 14	12	56	67	60	52	56
14 to 15	11	72	70	66	66	70
15 to 16	14	66	76	33	52	64
16 to 17	6	28	41	30	23	26
17 to 18	15	39	52	44	30	49

MFT for CMU Chemistry Graduates Who Have Taken at Least
1 Year Each of Physical and Organic Chem. and
1 Semester Each of Inorganic and Analytical Chem.

Academic Year	# students	National Percentiles for Institutional Averages				
		Overall	Physical	Organic	Inorganic	Analytical
12 to 13	3	86	89	83	88	88
13 to 14	5	85	91	76	81	87
14 to 15	9	91	95.5	90	88	88
15 to 16	9	69	92	33	53	87
16 to 17	3	30	50	23	36	26
17 to 18	9	54	81	55	66	40

MFT for CMU Chemistry Graduates Who Have Taken at Least
1 Year Each of Physical and Organic Chem. and
1 Semester Each of Inorganic and Analytical Chem.

Academic Year	# students	National Percentiles for Median Students				
		Overall	Physical	Organic	Inorganic	Analytical
12 to 13	3	70	76	66	78	70
13 to 14	5	80	85	66	60	64
14 to 15	9	77	81	76	78	70
15 to 16	9	63	81	40	52	76
16 to 17	3	34	52	34	23	33
17 to 18	9	39	59	34	40	41

Key Findings:

CHEM 132 ACS General Chemistry Exam:

Scores in Fall 2018 were higher than scores in 2017 and Spring 2016. They are most similar to Fall/Spring 2015.

Spring and Fall 2017 scores were similar to Spring 2016 scores, and these scores were lower than in other years.

The average of the bottom 5% of students passing class has been quite a bit lower than in the first two years (2014 and 2015), but that is probably due to a standardization of the way in which this statistic was calculated among sections and instructors.

Norming data has been published for this exam. Both the average and median of our students' scores are generally close to the national averages

CHEM 312 Organic Chemistry Final Exam:

The scores have remained relatively similar from 2014 – 2018. The mean and median scores are generally around the middle to high "C" range for the exam. In most years, there are more "A" and "B" scores than "D" and "F" scores on the exam, and in the course as a whole. Considering that this course requires students to successfully pass three previous semesters of chemistry instruction, this is not surprising. Final Exam scores also appear to be a strong indicator of student success in the course. Most students end up with a course grade that matches the grade earned on the Final Exam.

CHEM 315 Final Exam:

In 2014, only 7 of 44 students earned "A" and "B" scores as compared to 26 out of 41 students in 2015. The mean on the final exam was 67% in 2014, and it improved to 77% in 2015.

In 2017, 22 of 42 students earned "A" and "B" scores. The 2017 mean is only slightly higher than the that of 2015.

No data from 2016, since the instructor left.

CHEM 442: Communicating in the World of Chemistry, ETS Major Field Test (MFT):

From 2012 to 2016, the median scores of our students and our institutional averages were generally above, and commonly well above, the 50th percentile of schools participating in the exam. Our percentiles dropped dramatically in academic year 2016 – 2017 and stayed lower than previously in 2017 – 2018. Our program did not undergo any major changes between the spring and fall of 2016, but the ETS Major Field Test was changed at that time along with the number of schools and students used for coming up with the percentiles. In coming up with the percentiles for 2016 – 2017 and for 2017 – 2018, there was a dramatic decrease in the number of students that participated from 8,836 students to 2,694 students, and there was also a decrease in the number of institutions from 220 to 143. This makes it likely that the change in our percentiles for academic years 2016 – 2018 as compared to 2012 – 2016 is likely due to a change in the schools and students participating in the exam as opposed to a change in our program. It should also be noted that the schools participating in the MFT are in charge of what students take the exam, and they are also in charge of whether or not there is any reward for performing well on the exam. This could be detrimental to how well our school performs relative to other schools because we have all of our students take the exam, and we do not offer any incentives for our students to perform well.

Regardless of the issues associated with comparing our scores to the scores of other schools, we can use the scores to get insight into the relative performances of our students with respect to physical, organic, inorganic, and analytical chemistry. Our students consistently performed better in physical chemistry than in the other fields of chemistry. This was observed both for our students overall and when only looking at students who had at least taken 1 year each of physical chemistry and organic chemistry and at least 1 semester each of inorganic chemistry and analytical chemistry. It should be noted that students majoring in chemistry with a concentration in biochemistry (first offered in 2015) are only required to take the first semester of physical chemistry, and they are also not required to take inorganic chemistry. The chemistry major with a chemistry concentration requires the second semester of physical chemistry and inorganic chemistry, but inorganic chemistry was not required until the 2013 – 2014 academic year. In comparing the scores of CMU chemistry majors as a whole with the scores of chemistry majors who have taken at least taken 1 year each of physical chemistry and organic chemistry and at least 1 semester each of inorganic chemistry and analytical chemistry, the students' scores overall and in all fields of chemistry generally increased for students who have at least taken 1 year each of physical chemistry and organic chemistry and at least 1 semester each of inorganic chemistry and analytical chemistry. While increases in students' scores with respect to inorganic chemistry and physical chemistry are likely in part due to students getting additional course material in these areas, the fact that their scores increase overall is likely in part because better performing students are more likely to choose this path. Taking all of this into consideration, it seems that our students are generally performing reasonably well across all fields of chemistry, regardless of the pathway that they choose.

Actions Taken (steps taken to enhance student learning)

Action:

CHEM 132:

No actions needed at this time. A decrease was observed between 2015 and 2016, but the scores have returned to near 2015 values. If any further decrease is observed, we will try to determine if specific topics are causing any issues (for example, scores for certain questions decreasing over time).

CHEM 312:

No actions needed at this time.

CHEM 315:

No actions needed at this time.

CHEM 442, ETS Major Field Test (MFT):

National participation in the ETS MFT has decreased dramatically. Beyond that, the students taking the exam are not necessarily representative of their individual institutions, and the institutions using the exam are self-selecting and not necessarily representative of the range of undergraduate institutions in the United States. We should therefore explore alternatives to the ETS MFT in order to determine how our senior students are performing relative to the other undergraduate students in this nation.

Re-evaluation Date:

January, 2019

Program Outcomes	Courses/Educational Strategies (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection/ Person Responsible
Outcome #2 Utilize mathematics to solve chemical problems. (Quantitative Fluency)	CHEM 131: General Chemistry I (B);	**What:** A stoichiometry problem on the CHEM 131 final exam that includes percent yield and multiple unit conversions. **How:** Delivered as a problem on the CHEM 131 final exam.	**Who:** All professors teaching CHEM 131 **When:** On the final exam for every CHEM 131 section in all semesters.
	CHEM 341: Advanced Laboratory I (A)	**What:** Journal-style laboratory write-up on a CHEM 341 rate analysis project **How:** Students are required to compose journal-style laboratory reports on every CHEM 341 project. Their report on this project will be assessed for their application of mathematics to determine a rate law and for their application of the results to proposing a reaction mechanism. These will be assessed using rubrics that rate them on scales of 1 – 5.	**Who:** The physical chemistry professor teaching CHEM 341 **When:** During every section of CHEM 341. There is typically only one section of CHEM 341 offered every year, and it is offered during the spring semester.

Results of Assessment (include numbers of students involved in the assessment and the percentage)

Results:

CHEM 131 Stoichiometry Problem:

2017 (276 students): 166 students (60%) answered correctly
2016 (267 students): 185 students (69%) answered correctly
2015 (206 students): 122 students (59%) answered correctly
2014 (265 students): 154 students (58%) answered correctly

CHEM 341 Rate Analysis Project:

2018 (15 students): 8 students scored a 4/5 on the rubric, 5 students scored 3/5, two students scored a 2/5
2017 (8 students): 4 students scored a 4/5 on the rubric, 2 students scored a 3/5, two students scored a 2/5

2016 (11 students): 7 students scored a 4/5 on the rubric, 4 scored a 3/5 on the rubric. 2015 (14 students): All 14 students scored a 4/5 on the rubric.
2014 (11 students): 5 scored 4 or above on the rubric; 6 scored a 3 on the rubric.

Key Findings:

CHEM 131 Stoichiometry problem:

The majority of the students were successfully able to perform the necessary unit conversions and calculate the theoretical yield of the reaction. An analysis of all the answers chosen in two sections of CHEM 131 showed that (by section), the percent of students responding correctly ranged from 53% *(35/66)* to 69% *(49/71)*. For students answering the question incorrectly, a common mistake was basing their answer on the theoretical yield of the reagent in excess (based on a survey of responses in one source section, n= 66 total responses) [Data from Fall 2015]. Data analysis from Fall 2017 indicated a similar range of correct responses amongst sections: 53% (31/59) was the lowest % percent of students responding correctly within a single section, and 66% (50/79) was the highest percent of correct student responses in a section. Again, based on a survey of the responses a single section this term (n = 59), the most common incorrect response was to base the theoretical yield on the reagent in excess. The Fall 2016 term represented an outlying term; a significantly higher number of students answered the question correctly in this term. More data gathering is needed to determine whether this is truly an anomalous result, or may ultimately indicate improved student performance on this question in the future.

CHEM 341 Rate Analysis Project:

Based on the results from 2014, the instructor spent more time reviewing the relevant theory with students before the data collection, starting in 2015. This resulted in the majority of students both being able to identify the equations that needed to be used for the analysis and being able to carry out the analysis. The majority of students scored a 4 on the rubric, indicating achievement of the learning outcome at a capstone level. The past two years (2017/2018), about half of the students scored 4/5 on the rubric, while two students each year scored a 2/5. No students scored a 5 on the rubric, which would represent complete mastery of the topic, indicating a Masters-level understanding of the material.

Analysis:

CHEM 131 Stoichiometry Problem:

Most students completing the final exam in CHEM 131 successfully achieved the learning objective. Incorrect responders preferentially took a generally correct approach to solving the problem, but either failed to identify the limiting reagent or failed to perform the final unit conversion necessary to solve the problem. The average percent of students responding correctly has been very consistent over the first four years of assessment.

CHEM 341 Rate Analysis Project:

Based on the results from the spring of 2014, a review of the relevant theory was implemented prior to data collection, starting in the spring of 2015, and this has led to an increase in students achieving the learning outcome at a satisfactory level. However, it is evident that during past two years, a lower percentage of students received a 4/5. In addition, two students each year graded as a 2/5 on the rubric.

Actions Taken (steps taken to enhance student learning)

Action:

CHEM 131 Stoichiometry Problem: No action is necessary at this time.

CHEM 341 Rate Analysis Project:

Based on the results from the spring of 2014, a review of the relevant theory was implemented prior to data collection, starting in the spring of 2015, and this has led to an increase in students achieving the learning outcome at a satisfactory level. Perhaps a more thorough review of relevant theory should be performed due to the slight dip in performance in 2017 and 2018. Strategies for improving students' achievement of this learning outcome at the advanced level are being explored and will be implemented unless there is a significant increase with respect to students' achievements of this SLO in 2019.

Re-evaluation Date:

January, 2019

Program Outcomes	Courses/Educational Strategies (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection/ Person Responsible
Outcome #3 Employ proper experimental techniques. (Applied Learning)	CHEM 132L: General Chemistry II Laboratory (B)	**What:** Students will synthesize a compound and analyze its kinetics **How:** Faculty teaching labs will report the number of successful and unsuccessful lab groups in each lab section for the synthesis during week one of the lab. They will then report the rate law constants and the relative standard deviations for all groups.	**Who:** All professors teaching CHEM 132L **When:** Every spring semester.
	CHEM 341: Advanced Laboratory I (A)	**What:** A lab involving the determination of a rate law **How:** Students will extract a rate law constant from data obtained in lab. The constant will be compared to either a literature value or the instructor's value for the rate law constant. The percent deviation from one of these known values will be reported in the student's lab report.	**Who:** The physical chemistry professor teaching CHEM 341 **When:** During every section of CHEM 341. There is typically only one section of CHEM 341 offered every year, and it is offered during the spring semester.

Results of Assessment (include numbers of students involved in the assessment and the percentage)

Results:

CHEM 132L Synthesis and Kinetics

Academic Year	# of Groups	Successful Syntheses	Avg. Rate Constants ($k_{50°C}$, $k_{60°C}$)	Rel. Std. Dev. ($k_{50°C}$, $k_{60°C}$)
2017-2018	50	47	0.0803 min^{-1}, 0.114 min^{-1}	19%, 56%
2016-2017	22	21	0.0700 min^{-1}, 0.184 min^{-1}	42%, 70%
2015 - 2016	19	19	0.0934 min^{-1}, 0.153 min^{-1}	98%, 47%
2014 - 2015	15	15	0.0940 min^{-1}, 0.156 min^{-1}	15%, 16%

CHEM 341 Rate Law Determination

2018: Overall, the accuracy of the measured rate constants was very good at all pH ranges. In fact, 27 out of 29 rate constants were within 20% of the literature values. Just over half of the students did this comparison themselves.

2017: The accuracy of the determined rate constant varied with pH. At low pH (pH~2), the log k value was within 20% of the measured literature value. This was also true at pH~10. At intermediate pH values, substantial errors in the rate constant value were observed. 5 of the 8 students compared their data to the relevant literature values in their report.

2016: All the students were able to measure the natural logarithm of k versus pH within 20% of literature data. About half of 11 students did this comparison themselves; the instructor compared the rest of the data.

2015. All the students were able to measure the natural logarithm of k versus pH within 20% of literature data. Only seven out of 14 students did this comparison themselves; the instructor compared the rest of the data.

2014: All the students were able to measure the natural logarithm of k versus pH within 20% of literature data. Several of the 11 students did not do this comparison themselves, and the instructor had to do the comparison for their data.

Key Findings:

CHEM 132L Synthesis and Kinetics

Almost all of the lab groups synthesized the compound of interest successfully. There was good agreement between the average rate constants from the three years assessed; however, one of the relative standard deviations (RSDs) for the 2014 - 2015 data was excessively high (98%). The RSD for the 2014 - 2015 data were exceptionally good (15 – 16%), and the other RSD for 2015 – 2016 was good (47%). Relative standard deviations from the 2016-2017 academic year were good (42% and 70%), but not exceptional. In 2018, the RSD of rate constants improved to 19% and 56%. 19% RSD is excellent, while 56% RSD is good.

CHEM 341 Rate Law Determination

The students were able to obtain data resulting in *k* values that closely match literature values. However, only about half of the students put their results into context by comparing the results with known literature values.

Analysis:

CHEM 132L Synthesis and Kinetics

While only a basic chemical synthesis was evaluated, all but a few of the groups did execute the techniques at a high enough level to achieve the compound of interest. This indicates that nearly all of the students are competent in employing synthetic experimental techniques at a lower division chemistry major's level.

The utilization of scientific instrumentation for the determination of a rate constant is a challenging task. It is expected that the precision of such measurements be relatively large, while the overall accuracy be consistent from year to year. The 2014 – 2015 data were excellent. In both the 2015-2016 and 2016-2017 academic years, one rate constant had a good RSD (47% and 42%, respectively), while the other rate constants were not nearly as precise (98% and 70% RSD). It is unclear at this time why these two particular RSD's were high. This may be an aberration, but additional data will need to be collected in order to make that determination. It does seem that we had more experimental issues with this lab experiment during the 2015-2017 academic years than in years past. These issues included instrumental problems, as well as the synthesized complex not being stable over the two-week period. These issues certainly could contribute to high RSD's. We have, as a result, repaired/replaced several of our Spec20 instruments and taken more care in storage of the synthesized complexes. Improvement in precision was achieved in 2018. It should also be noted that the average values between the three academic years are remarkably close. There is not a good literature value to compare the average values to; however, it appears that the students are exhibiting proper lab technique and obtaining accurate values. The above data is surprisingly good for this type of exercise. As a result, it seems the students have successfully gained fundamental experimental skills in this type of Analytical Chemistry. These are very positive results and no action has been taken to improve upon these exercises.

CHEM 341 Rate Law Determination

The students have excellent lab technique. However, only about half of the students put their results into context by comparing the results with known literature values. Students at this level may be expected to compare values they obtain with values that are known without being prompted

Actions Taken (steps taken to enhance student learning)

Action:

CHEM 132L Synthesis and Kinetics

No action is needed at this time, but additional data must be collected in order evaluate possible issues with the relative standard deviations.

CHEM 341 Rate Law Determination

At the beginning of this course, the instructor will stress the importance of comparing collected data to known values. Furthermore, the instructors of lower level courses will be encouraged to stress this concept in their courses.

Re-evaluation Date:

January, 2019

Program Outcomes	Courses/Educational Strategies (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection/ Person Responsible
Outcome #4 Interpret chemical information from peer-reviewed publications. (Critical Thinking)	CHEM 341: Advanced Laboratory I (A)	**What:** Development of a procedure for the synthesis of a compound via combining and adapting at least two peer-reviewed publications. **How:** Students are required to develop a procedure for the synthesis of a particular transition metal complex by combining and adapting the information in at least two peer-reviewed publications. Their proposed procedures will be rated on a scale of 1 – 5.	**Who:** The synthetic chemistry professor teaching CHEM 341 **When:** During every section of CHEM 341. There is typically only one section of CHEM 341 offered every year, and it is offered during the spring semester.
	Chem 316: Biochemistry II (D)	**How:** Students are required to write a review paper based on a biochemical topic of their choice and citing literature research. Student mini reviews will be rated using a rubric in which they are assessed on a number of criteria on a scale from 1 to 5.	**Who:** The chemistry professor teaching CHEM 316 **When:** During every section of CHEM 16. There is typically only one section of CHEM 316 offered every year, and it is offered during the spring

Results of Assessment (include numbers of students involved in the assessment and the percentage)

Results:

CHEM 341 Procedure Development:

- 2018 (6 groups): Avg. 5.0/5
- 2017 (3 groups): Avg. 4.3/5
- 2016 (11 students): Avg. 4.5/5
- 2015: Data was not collected
- 2014 (11 students): Avg. 4.2/5

CHEM 316: Biochemistry II Mini-Review Article:
2018: (6 students): Mean 93.3%, Median 96.0%
2017: No data because the instructor left CMU before providing this data
2016 (5 students): Mean 94.4%, Median 94.0%
2015 (9 students): Mean 89.6%, Median 90.0%
2014 (5 students): Mean 95.2 %, Median 96.0%

Key Findings:

CHEM 341 Procedure Development:

Most students are developing the complete procedure without any significant errors and without any significant amount of assistance from the instructor; however, almost every year, there is one group of students that needs a significant amount of assistance. This is probably to be expected, as the students who struggle are generally performing at a "C" level in the course. In order for these students to be successful in bachelor's level jobs, they should be able to put together the majority of the procedure independently. Since almost all the students are able to do this, it seems that the students are performing at an adequate level with respect to this learning outcome. In 2014, a few students sought out too much help from the instructor without putting in enough effort on their own. Starting in 2015, the students were encouraged to spend more time and effort thinking about the labs for this class on their own. Since then, all groups of students have been able to at least formulate the majority of the procedure independently.

CHEM 316: Biochemistry II Mini-Review Article:

The students are generally doing an excellent job of collecting and synthesizing information from the chemical literature. While the scores in 2015 were slightly lower, they were still quite good. Furthermore, the lower scores were more reflective of general student performances than of student performances specific to this student learning outcome.

Analysis:

CHEM 341 Procedure Development:

The students generally do well at interpreting chemical information from the chemical literature. Prior to 2015, the students sometimes sought out too much help from the instructor. In order to help our students in general become less reliant on instructors and better able to solve problems on their own, the chemistry faculty have discussed this issue and are now encouraging students to spend more time and effort thinking about experiments on their own. Based on the results from 2016 through 2018, this approach was helpful.

CHEM 316: Biochemistry II Mini-Review Article:

The current process for completing the review article is working well and successfully prepares students to utilize and write journal articles. The process is as follows:

a) instructor review of title and abstract
b) Instructor review of primary literature references
c) Detailed student outline review by the professor
d) Instructor reviews of draft articles (several).
e) Peer review primarily occurred during weekly informal board presentations by eachstudent.
f) Submission of final draft

New in 2016 was the peer and instructor review of review of the title/ abstract and draft article. In 2018, Peer and instructor review was predominantly achieved via feedback from weekly informal board presentations by each student. These informal sessions were practice talks for the final; formal presentations were given during the last week of class. The instructor also provided written feedback for several written drafts.

ActionsTaken (steps taken to enhance student learning)

Action:

CHEM 341 Procedure Development

In January of 2015, the chemistry faculty were asked to spend more time in lab asking students to explain why they are carrying out particular steps in experimental procedures. It was thought that this would encourage students to spend more time and effort thinking about experiments on their own. Based on the results from 2016 through 2018, this approach was helpful. No additional actions are needed at this time.

CHEM 316: Biochemistry II

Mini-Review Article: No actions needed at this time

Re-evaluation Date:

January, 2019

Program Outcomes	Courses/Educational Strategies (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection/ Person Responsible
Outcome #5 Communicate chemical topics effectively, both verbally and in writing. (Communication Fluency)	CHEM 431: Instrumental Analysis (D)	**What:** Oral PowerPoint presentation at the end of the course. **How:** This presentation will last approximately 15 minutes and will cover an instrumental technique of the student's choice that was not covered in CHEM 431. A PowerPoint presentation will be created by the students in order to aid in the oral presentation. In addition, 5-10 minutes of questions by peers and instructor will follow the presentation. This project will be assessed using a rubric that rates them on a scale of 1 – 5 for the following categories: organization; accuracy/depth of content; use/presentation of power point slides; use of language, grammar, and voice; ability to answer questions.	**Who:** The CHEM 431 instructor. **When:** During every section of CHEM 431, which is delivered every fall semester. Students will take 431 in either the fall of their junior or senior year.
	CHEM 442: Communicating in the World of Chemistry (A)	**What:** Oral Power Point presentation at the end of the course. **How:** This presentation will last approximately 15 minutes and will cover a project from CHEM 341 (corequisite) or a topic from a recent publication in the chemical literature. A Power Point presentation will be created by the students in order to aid in the oral presentation. In addition, 5-10 minutes of questions by peers and instructor will follow the presentation. This project will be assessed using a	**Who:** All professors teaching CHEM 442 **When:** During every section of CHEM 442 There is typically only one section of CHEM 442 offered every year, and it is offered during the spring semester.

		rubric that rates them on a scale of 1 – 5 for the following categories: organization; accuracy/depth of content; use/presentation of power point slides; use of language, grammar, and voice; ability to answer questions.	
	CHEM 341: Advanced Laboratory I (A)	What: Journal-style laboratory write-up on the final CHEM 341 project How: Students are required to compose journal-style laboratory reports on every CHEM 341 project. Their reports for the final lab will be assessed using a rubric that rates them on a scale of 1 – 5 for the following categories: organization; accuracy/depth of content; use of proper spelling, grammar, and punctuation.	Who: All professors teaching CHEM 341 When: During every section of CHEM 341. There is typically only one section of CHEM 341 offered every year, and it is offered during the spring semester.
	Chem 316: Biochemistry II (D)	What: An about 10 minute presentation of literature research. How: Students are required to give an about 10 minute presentation on a topic of their choice that cites peer- reviewed literature. Student presentations are rated on a number of criteria using a rubric that scores those criteria on a scale from 1 to 5.	Who: The chemistry professor teaching CHEM 316 When: During every section of CHEM 316. There is typically only one section of CHEM 316 offered every year, and it is offered during the spring semester.

Results of Assessment (include numbers of students involved in the assessment and the percentage)

Results:

CHEM 431 Presentation:

2017 (11 students in groups of ~3); Avg: 89%, Median: 91%

Average category scores: Organization: 4.2; Content: 4.3; Slides: 4.7; Oral Pres: 4.3; Q+A: 4.0

2016 (5 students, individual presentations);

Average category scores: Organization: 4; Content: 4.8; Slides: 4.4; Oral Pres: 4.2; Q+A: 4.6

2015 (9 students in groups of 3): Avg. 86%, Median 85%

2014 (12 students): Avg. 83.3%, Median 84%

2013 (8 students): Avg. 83.5%, Median 86%

CHEM 442 Presentation:

2018 (15 students): Organization Avg: 4.4, Accuracy/Depth Avg: 4.0, Use/Present. Slides: 4.0, Lang., gram., voice: 4.1, Answering questions: 4.1

2017 (8 students): Organization Avg: 4.3, Accuracy/Depth Avg: 4.6, Use/Present. Slides: 4.5, Lang., gram., voice: 4.5, Answering questions: 4.3

2016 (10 students): Organization Avg: 4.6, Accuracy/Depth Avg: 4.1, Use/Present. Slides: 4.7, Lang., gram., voice: 4.3, Answering questions: 4.5

2015 (14 students): Organization Avg: 4.8, Accuracy/Depth Avg: 4.0, Use/Present. Slides: 4.6, Lang., gram., voice: 4.7, Answering questions: 4.3

2014 (10 students): Organization Avg: 4.6, Accuracy/Depth Avg: 3.9, Use/Present. Slides: 4.45, Lang., gram., voice: 4.3, Answering questions: 4.6

CHEM 341 Final Report:

2018 (14 students): Organization Avg.: 4.4; Accuracy/Depth Avg.: 4.1; Spelling, Grammar, and Punctuation Avg.: 3.9

2017 (8 students): Organization Avg.: 4.6; Accuracy/Depth Avg.: 4.1; Spelling, Grammar, and Punctuation Avg.: 4.0

2016 (11 students): Organization Avg.: 4.5; Accuracy/Depth Avg.: 3.9; Spelling, Grammar, and Punctuation Avg.: 4.1

2015 (14 students): Organization Avg.: 4.4; Accuracy/Depth Avg.: 3.4; Spelling, Grammar, and Punctuation Avg.: 3.9

2014 (10 students): Organization Avg.: 4.6; Accuracy/Depth Avg.: 4.0; Spelling, Grammar, and Punctuation Avg.: 4.3

2013 (6 students): Organization Avg.: 4.7; Accuracy/Depth Avg.: 3.8; Spelling, Grammar, and Punctuation Avg.: 4.0

CHEM 316 Literature Presentation:

2018: (6 students): Avg. 92.0%; Median 95.0%

2017: No data because the instructor left CMU before providing this data

2016 (5 students): Avg. 91.2%; Median 94.0%

2015 (9 students): Avg. 89.5%; Median 90.0%

2014 (5 students): Avg. 93.6%; Median 92.0%

Key Findings:

CHEM 431: Presentation:

Average and median scores were consistently in the low to mid 80s. When broken down by category, student presentations are consistently averaging "4s," which the instructors classify as appropriate for junior level presentations. More data needs to be collected to determine whether student presentations are consistently weaker or stronger in specific areas.

CHEM 442: Presentation:

The students have generally done well in all the categories; however in 2018, the students did not perform as well except with respect to organization. This year was likely an exception as these students performed at a lower level in almost all aspects of their capstone chemistry courses. Over the years, students have struggled the most with accuracy/depth of content. It should be noted, though, that accuracy/depth of content is probably the most challenging category to do well in.

CHEM 341: Final Report:

The students are performing well with respect to the organization of their reports; however, there is a significant amount of room for improvement with respect to Accuracy/Depth of Content and with respect to Spelling, Grammar, and Punctuation. While there have regularly been efforts to improve the students' performances with respect to Accuracy/Depth of Content, the students' performances seem to have plateaued.

CHEM 316: Literature Presentation:

From 2014 -2018, students enrolled in Biochemistry II have done a fine job of presenting their topic to the class in an organized and visually appealing way while speaking clearly and at an appropriate speed. While the scores in 2015 were slightly lower, they were still quite good. Furthermore, the lower scores were more reflective of general student performances than of student performances specific to this student learning outcome. In 2018, it was observed that the students did excellent jobs in providing clear and concise summaries of their topics.

Analysis:

CHEM 431: Presentation:

For the most part, our students gave clear and thoughtful presentations. The students were able to design clear and informative PowerPoint slides, although they generally need to improve formatting and visual design (with respect to use of images). Each presenting group had various strengths and weaknesses. Therefore, each group met individually with the instructor the week after the presentations to get personalized feedback.

CHEM 442: Presentation:

In order to improve students' scores with respect to accuracy/depth of content, more work needs to be done to improve the students' understanding of what they are doing and to help them practice explaining the experiments in depth.

CHEM 341: Final Report:

Efforts should be made to improve students' performances with respect to Accuracy/Depth of Content and with respect to Spelling, Grammar, and Punctuation. To improve the Accuracy/Depth scores, chemistry lab instructors were asked in January of 2015 to spend more time in lab helping students understand the experiments and asking the students to explain the experiments in depth. From 2016 - 2018, the Accuracy/Depth scores did improve relative to the students' scores in other areas; however, there is still room for improvement. The students' Spelling, Grammar, and Punctuation scores are now lower than their Accuracy/Depth scores, and actions should be taken to improve students' performances with respect to Spelling, Grammar, and Punctuation.

CHEM 316: Literature Presentation:

All students demonstrated competency with respect to SLO #5 by giving oral presentations in an organized and visually appealing way while speaking clearly and at an appropriate speed. In 2014, the students' oral presentation scores lagged behind their scores on the written article. In 2015, measures were adopted to improve the oral presentation scores (draft slide review and additional instruction on presentation skills). While the oral presentation scores dropped slightly in 2015, they actually improved relative to the students' other work in the course. These measures had similar impacts in 2016 and 2018, and the overall scores improved. A better understanding of the students' scores could be achieved by scoring the students in similar categories to those used for assessing this SLO in CHEM 431 and 442. In future years, this type of system will be implemented.

Actions Taken (steps taken to enhance student learning)

Action:

CHEM 431:

No actions needed at this time

CHEM 341 and 442:

To improve the Accuracy/Depth scores, chemistry lab instructors were asked in January of 2015 to spend more time in lab helping students understand the experiments and asking the students to explain the experiments in depth. In 2016 and 2017, the Accuracy/Depth scores did improve relative to the students' scores in other areas, and a positive impact was seen on students' abilities to independently interpret information from the chemical literature (see Outcome #4). Lab instructors will continue pushing the students to spend more time thinking in depth about the experiments. In order to address students' struggles with respect to Spelling, Grammar, and Punctuation, all of the chemistry faculty are being encouraged to include more writing assignments that require the students to use proper spelling, grammar, and punctuation and that involve the students getting faculty feedback with respect to issues in these areas. The chemistry faculty are also pushing for a campus-wide reevaluation of the Essential Learning writing curriculum.

CHEM 316:

Starting in 2015, measures were adopted to improve the oral presentation scores (draft slide review and additional instruction on presentation skills). While the oral presentation scores dropped slightly in 2015, they actually improved relative to the students' other work in the course. These measures had a similar impact in 2016 and 2018, and the overall scores improved. For 2019, the scores will be broken down into similar categories as those used for CHEM 431 and 442 (Organization; Accuracy/Depth of Content; Use/Presentation of Slides; Language, Grammar, and Voice; and Answering Questions).

Re-evaluation Date:

January, 2019