DALTON STATE COLLEGE
COMPREHENSIVE PROGRAM REVIEW

Program/Subject Area: BS in Chemistry
Review Period: 2009-2014

1. PROGRAM GOAL AND STUDENT LEARNING OUTCOMES

Program goal statement: To produce B.S. Chemistry graduates qualified for a wide variety of relevant post-graduation pursuits and to provide fundamental course work aimed at building foundational knowledge in chemistry and related fields.

Program outcomes:
1. High job placement of B.S. Chemistry graduates in their related fields or in post-graduate programs.
2. High employer satisfaction with B.S. Chemistry graduates.
3. High graduate satisfaction with the B.S. Chemistry program.

Student learning outcomes:
1. Students will acquire detailed, in-depth knowledge of chemistry and be able to integrate and apply these principles to solve complex scientific problems.
2. Students will acquire laboratory skills necessary to answer questions of chemical relevance.
3. Students will effectively use primary literature and communicate scientific information in written and oral forms.
4. Students will perform foundational mathematical operations and express data graphically or mathematically.

2. MEASURES OF EFFECTIVENESS

(a) Five-year enrollment summary by headcount, FTE, & full-time/part-time status

	2009-10	2010-11	2011-12	2012-13	2013-14	% Change
Headcount	7	35	44	66	81	1057.14%
FTE	7.8	36.7	45.3	70.8	85.1	991.03%
Full-time	5	26	33	49	63	1160%
Part-time	2	9	11	17	18	800%

Analysis and comments:
The B.S. Chemistry program has seen significant increases in headcount, FTE, and number of full-time and part-time students over the last five years. If this trend continues we will need additional faculty to expand the number of upper-level chemistry courses offered. Some of the upper level chemistry courses are also taken by students in the biology program. With the number of students in the B.S. Biology program increasing, this need for additional chemistry instructors will be intensified.

(b) Five-year enrollment summary by gender & race/ethnicity

	2009-10	2010-11	2011-12	2012-13	2013-14	% Change
Gender						
Female	3	19	18	26	40	1233.33%
Male	4	16	26	40	41	925%
Race/Ethnicity						
American Indian	0	0	0	0	0	N/A
Asian	1	0	0	2	2	100%
African-American	0	0	1	3	8	N/A
Hispanic	0	1	1	9	10	N/A
White	5	26	35	49	52	940%
Multiracial	0	1	0	0	4	N/A
Undeclared	1	7	7	3	5	400%

Analysis and comments:
The number of both male and female students has increased significantly in the last five years. The number of male and female students is nearly the same. The highest percent increase was seen among White students. Increases were also seen among African-American, Hispanic, Asian, and multiracial students. With the low numbers in some race/ethnicity groups, the percent changes are insignificant.

(c) Average class size, GPA, faculty/student ratios, and credit hours

	2009-10	2010-11	2011-12	2012-13	2013-14
Average class size	15.9	16.1	12.6	11.9	15.8
Student credit hours	757	1078	1135	1246	1406
Credit hours/FTE faculty	15	15	15	15	15

Analysis and comments:
Average class size and credit hours/FTE faculty have remained constant. The number of student credit hours has significantly increased over the last five years.

(d) Faculty teaching in program

	2009-10	2010-11	2011-12	2012-13	2013-14
Total Faculty	3	5	4	4	5
Full-time Faculty	3	4	4	4	5
Part-time Faculty	0	1	0	0	0
Gender					
Male	2	3	2	2	3
Female	1	2	2	2	2
Race/Ethnicity					
American Indian/Pacific	0	0	0	0	0
Asian	0	0	0	0	0
African-American	0	0	0	0	0

Hispanic	0	0	0	0	0
White	3	5	4	4	5
Multiracial	0	0	0	0	0
Tenure Status (full-time)					
Tenured	1	1	2	2	2
On-tenure track	2	3	2	2	2
Non-tenure track	0	0	0	0	1
Rank (full-time)					
Professor	0	0	0	0	0
Associate Professor	1	1	3	3	4
Assistant Professor	1	1	1	1	1
Instructor/Lecturer	0	0	0	0	0
Highest Degree (full-time)					
Doctorate	2	2	4	4	5
Specialist	0	0	0	0	0
Master's	0	0	0	0	0
Bachelor's	0	0	0	0	0
Associate's/Other	0	0	0	0	0

Analysis and comments:
The number of full-time faculty has increased over the last four years while the number of part-time faculty has decreased. The number of both male and female faculty has increased. The majority of faculty continues to be male and white. All the chemistry faculty members that have taught in the program during the period under review have doctoral degrees. There has been an increase in the number of faculty members with tenure and with the rank of associate professor.

(e) Percent of classes taught by full-time faculty

2009-10	2010-11	2011-12	2012-13	2013-14
100 %	80%	100%	100%	100%

Analysis and comments:
The percentage of classes taught by full-time faculty has been between 80% and 100% over the five years under review.

(f) Number of degrees conferred

2009-10	2010-11	2011-12	2012-13	2013-14
1	4	4	2	5

Analysis and comments:
The number of degrees conferred increased from 1 in 2011 to 5 in 2014.

(g) Placement rates: Five-year summary of job placement rates, if applicable

2009-10	2010-11	2011-12	2012-13	2013-14
				0%

Analysis and comments:
100% of the students that replied to our survey indicated they were planning on attending graduate school after completion of our program and none of the students were employed in the field. Job placement survey data was not collected before 2013-2014. The survey is now developed and we are collecting contact information and sending a survey by email. In addition, the Office of Counseling and Career Services will begin administering a graduate survey and collecting this data.

(h) Summary and evidence of achievement of program outcomes

Describe the extent to which students have achieved current program outcomes

Program Outcome 1. High job placement of B.S. Chemistry graduates in their related fields or in post-graduate programs.

Measure: Survey of Graduates

Evidence/Results of assessment: 100% of the students that replied to our survey indicated they were planning on attending graduate school after completion of our program and none of the students were employed in the field.

Program Outcome 2. High employer satisfaction with B.S. Chemistry graduates.

We have no data on employer satisfaction with our graduates. We need to survey employers to obtain data about students' performance. None of the students were employed in jobs related to chemistry. The problem of determining employer satisfaction with graduates of this program will be discussed at a STEM Advisory Council meeting and a plan to obtain good data will be implemented based on the recommendations of the Council.

Program Outcome 3. High graduate satisfaction with the B.S. Chemistry program.

Measure: Survey of Graduates

Evidence/Results of assessment: 100% of the students that replied to our survey indicated that they were satisfied or highly satisfied with the Chemistry program provide by Dalton State College.

(i) Summary and evidence of achievement of student learning outcomes

Describe the extent to which students have achieved current student learning outcomes in Area F and/or upper-division courses, if applicable. (current year)

1. Students will acquire detailed, in-depth knowledge and be able to integrate and apply these principles to solve complex scientific problems.

Below is the assessment data from CHEM 3311K, a required course for the program.

Combine knowledge of aqueous chemical reactions to understand theoretical titrations
Target: Seventy percent of students will earn a score of at least 70% on an assignment to use a spreadsheet to prepare a titration curve.
Findings: Students used spreadsheets to prepare theoretical titration curves in three assignments, for a precipitation titration, titration of a strong acid with a strong base, and titration of a weak acid with a strong base. In these theoretical titrations, 76.9%, 76.9%, and 61.5% of students met the criterion for the individual assignments and 84.6% of students met the criterion for at least one of the assignments. Zeros for non-completion and penalties for late submission (-30) were included in these scores.

2. Students will acquire laboratory skills necessary to answer questions of chemical relevance.
Below is the assessment data from CHEM 3311K, a required course for the program.

1: Perform volumetric analysis with 0.5% accuracy and precision
Target: Eighty percent of students will report a value for analysis of a certified test sample that is within 0.5% of the certified value and 80% of students will obtain a 95% confidence interval that is no more than 0.5% of the certified value.
Findings: Only 69% of students achieved the accuracy goal and only 54% of students achieved the precision goal.
To increase the percentage of students who demonstrate an ability to perform volumetric analysis, links will be added to the course site in the learning management system to provide pre-lab instruction for the use of major lab equipment and to show the color changes to be expected for each titration. In addition, a student teaching assistant will be available in each lab. The teaching assistants will be undergraduate students who have done well in the course. They will be able to offer guidance and answer questions. Students may feel more comfortable asking questions of a TA and being observed by a TA; some students get nervous when the instructor carefully observes their lab technique.

2: Ability to use standard statistical techniques
Target: 90% of students will correctly estimate the margin of error in a laboratory report for the analysis of a certified test sample.

Findings: 100% of students correctly estimated the margin of error in all laboratory reports for the analysis of certified test samples.

3. Students will effectively use primary literature and communicate scientific information in written and oral forms.

Below are the assessment data from CHEM 4000 the capstone course for the program.

1. Student will gain awareness of topics currently of interest to the chemical community. The students will present 2 seminars.
   Target: Seventy percent of students will average 80% or higher.
   Findings: Four of five students scored higher than 80% on each of their seminars

2. Student will become familiar with means of gaining information about chemical topics. The students will present 2 seminars and 1 poster.
   Target: Seventy percent of students will average 80% or higher.
   Findings: Students presented 2 scientific seminars. One hundred percent achieved 80% or higher.

3. Student will acquire skills necessary to effectively present material related to chemical topics. Students presented 2 scientific seminars.
   Target: Seventy percent of students will average 80% or higher.
   Findings: Students presented 2 scientific seminars. One hundred percent achieved 80% or higher.

4. Students will perform foundational mathematical operations and express data graphically or mathematically.
Below are the assessment data from CHEM 3211K, a required course for the program.

1. The final formal laboratory report in CHEM 3211K will be used to assess students' knowledge and understanding in laboratory methodology including data observation, recording, analysis, and reporting.
   Target: Seventy percent of students will receive a grade of 70 or higher on the final formal laboratory report in CHEM 3211K.
   Findings: Analysis of the final formal laboratory report revealed that 100% of students achieved a grade of 70 or higher. Points on the formal laboratory report were awarded by section as follows: Cover page (5 points), Introduction and Purpose (10 points), Main reaction and mechanism (5 points), Table of Reactants and Products (10 points), Procedure (25 points), Results and Calculations (25 points), Conclusions (10 points), Questions (5 points), and References (5 points).

(j) Evidence of program viability

Based on enrollment history, retention rates, degree completion/graduation rates, and other program outcomes, comment on whether continued resources should be devoted to this program. Your comments should consider external factors such as the following: Are your students getting jobs? What is the job outlook for graduates? Are students prepared for the jobs they get? How is the field changing? Are the program faculty members in touch with employers and getting feedback on our students' performance? Do employers see a need for changes in the program?

Based on enrollment history and the needs of our community for trained chemists this program is viable and resources should continue to be devoted to it. Through the STEM Advisory Committee, members of local industry have expressed an increasing need for graduates from this program. The small number of graduates is to be expected for a B S in Chemistry program, which typically have low enrollment numbers.
One hundred percent of the students that replied to our survey indicated they were planning on attending graduate school after completion of our program and none of the students were employed in the field.

3. USE OF ASSESSMENT RESULTS FOR PROGRAM IMPROVEMENT

What improvements have occurred since the last program review or assessment?

The hiring of two new chemistry faculty members has expanded expertise of the faculty into areas of analytical chemistry, quantitative chemistry, and instrumentation.
The list of options for upper-level electives has been expanded.
CHEM 2000, Scientific Communication, was developed and approved to replace BIOL 2270 in Area F.

4. REVIEW OF CURRICULUM

What changes or revisions have been made to the program, its curriculum, or its student learning outcomes since the last program review or assessment?

CHEM 2211K and CHEM 2212K were replaced with CHEM 3211K and CHEM 3212K in the program.

CHEM 2000, Scientific Communication, was developed and has replaced BIOL 2270 in Area F.

The list of options for upper level electives has been expanded.

A minor in Chemistry was approved.

5. PROGRAM STRENGTHS AND WEAKNESSES

Strengths:
The chemistry program at Dalton State College has demonstrated consistent increases in enrollment and maintains a quality group of faculty members. For the last three years, all of program's faculty members have been full-time. With recent changes in curriculum the options for electives have been increased, and opportunities for student research and service learning have been expanded.

Weaknesses and concerns:
The number of graduates was inconsistent over the time period under review. In the future we would like to see the number of graduates increase as the number of students in the program increases.

6. RECOMMENDATIONS FOR FOLLOW-UP AND/OR ACTION PLANS (if needed)

Issue/concern:
We have a need to gather data about the job outlook for graduates, how prepared students are for the jobs they get, and how the field is changing. We also need to obtain feedback on our students' performance from employers and feedback from employers about the need for changes in the program.

Specific action(s):
Develop a STEM Advisory committee that can help bring leaders in local industry together with faculty members and administrators of the college. Agenda items for the meetings will include the issues and concerns stated above. In particular, we will ask employers for recommendations concerning gathering data from employers concerning our graduate performance and preparation

Expected outcomes:
The STEM Advisory Committee should give School administrators insight gathered from local industry regarding employment prospects for our graduates, the preparedness level of our students, and constructive changes to the program.

Time frame:
The first meeting of the STEM Advisory Committee will be scheduled for spring 2015.

Person(s) responsible:
Dr. Randall Griffus

Resources needed:
The members on the STEM Advisory Committee will be volunteers so few resources should be required initially.

Prepared by:

Randall Griffus
Dean, School of Science, Technology and Mathematics

_____ **Date** 9/17/16

Kerry Dunbar
Chair, Department of Natural Sciences

Kerry B. Dunbar **Date** 8/17/16

Reviewed by Chair of Program Review Subcommittee

M. Marilyn M. Helms **Date** 7/21/2016

Reviewed/Approved by Vice President for Academic Affairs

Pat Chute **Date** 8/16/2016