**Sinclair Community College**

**Continuous Improvement Annual Update 2016-17**

**Please submit to your Division Assessment Coordinator / Learning Liaison for feedback no later than March 1, 2017**

**After receiving feedback from your Division Assessment Coordinator, please revise accordingly and make the final submission to your dean and the Provost’s Office no later than May 1, 2017**

**Department:** **SME - 0355 - Chemistry / 0357 - Geology**

Year of Last Program Review: FY 2012-2013

Year of Next Program Review: FY 2018-2019

**Section I: Progress Since the Most Recent Review**

Below are the goals from Section IV part E of your last Program Review Self-Study. Describe progress or changes made toward meeting each goal over the last year. Responses from the previous year’s Annual Update are included, if there have been no changes to report then no changes to the response are necessary.

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| **GOALS** | **Status** | **Progress or Rationale for No Longer Applicable** |
| It is the collective goal of the department to have all students successfully complete the courses in which they enroll. Faculty in the department have open-door policies for students who need additional help. | In progress  Completed  No longer applicable | All instructors continue to have an open-door policy to help any student who seeks it. Additionally, we encourage students to visit the Chemistry and Geology Resource Centers when they need help. Students that have taken advantage of the resource centers have stated that it helped them improve their work; we have seen at least a 10% improvement in the grades of those who regularly get help. |
| While Geology has very little attrition, most of which is related to financial issues rather than academic, Chemistry, because of its more mathematical and conceptual character, loses a sizeable percentage of students during the semester. This is often due to students enrolling in the course without the needed skill set or background. Better advising and better control of student enrollment can improve this to some degree, but Chemistry also needs to look for other methods of instruction to meet the students’ needs. This is being addressed in part by redesigning the Introductory Chemistry course to include more interactive activities between small groups of students and tutors employed by the department. | In progress  Completed  No longer applicable | Students who need General Chemistry are still sometimes enrolled into that course with no previous chemistry background. Again, we have found that these students are at a greater risk of failure. This may become a greater challenge now with the changes in the financial support for students. Since classes not directly related to a student’s course of study are no longer supported by financial aid, students are more likely to chance a course for which they may not be prepared. The same is true as it relates to math prerequisites for some courses. We will need to monitor the extent to which these changes affect student success.  The changes that have been made in the advising process appear to have addressed this issue. |

Below are the Recommendations for Action made by the review team. Describe the progress or changes made toward meeting each recommendation over the last year. Responses from the previous year’s Annual Update are included, if there have been no changes to report then no changes to the response are necessary.

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| **RECOMMENDATIONS** | **Status** | **Progress or Rationale for No Longer Applicable** |
| Repairs that are needed to Chemistry labs were mentioned during the meeting with the review team. The team was particularly concerned about ventilation repairs that were reported as being needed. Given the department’s commitment to safety, there is no doubt that the department is interested in seeking repairs as soon as possible, and while it may be too late to address these repair needs in the Capital Request process for this year, other sources of funding for these repairs should be explored with the division dean. | In progress  Completed  No longer applicable | Labs 12343 and 12344 were renovated during the summer of 2015; lab 12393 during the winter break of 2015. After renovation of the first two labs was complete, it was discovered that the bench surface, though impervious to chemicals, was sensitive to heat. The proper material for the lab surfaces in 12393 was not available at renovation; all reaction surfaces are scheduled to be replaced as the correct material becomes available. In the meantime, the labs are functional and the changes made have improved the ability of the instructor to better monitor the students’ activities.  Lab room 12395 was renovated during the summer of 2016. The tabletop surface was replaced in this room, but the decision was made to delay replacing the tabletops in 12343 and 12344. |
| During the meeting with the review team the department noted that students struggled due to inadequate math skills in introductory chemistry courses. The department has done a nice job of identifying the problem, although in the subsequent discussion it was not clear whether there is certainty regarding exactly what is causing the problem. As noted in the commendations, the department has demonstrated skill in the past in using data to solve problems and make decisions, and the review team recommends that the department employ this skill to attempt to resolve this issue. The department is encouraged to explore ways to help students develop the math skills they need to succeed in Chemistry courses, and assess the impact of any measures they implement. There may be opportunities to employ online resources to bolster math skills, perhaps a collaborative effort with the math department could lead to the development of approaches that would help Chemistry students achieve higher levels of success by improving math skills. | In progress  Completed  No longer applicable | Recent changes to the financial aid support for students has introduced new problems for the potential success of students in Introductory Chemistry. The most basic of the prerequisite courses is no longer subject to financial aid. The college is looking for ways to constructively deal with this issue. In the meantime, the Developmental Math team has incorporated more story problems in this course, many of them slanted toward scientific issues. We will continue to monitor student success as it relates to this developmental math course. Success rates will be determined for three groups – those students who do not need the course, those who need it and pass it, and those who need it, but do not take it or pass it.  In the fall and spring semesters of 2016-17, we piloted an online math review exercise that was assigned for extra credit during the first week of each semester in two sections of CHE 1111 (Intro. Chem.). The assignment consisted of math problems selected to assess the basic math skills needed for success. Students who did not perform well voluntarily asked for help with the concepts with which they struggled. We are considering creating something similar to be used in all sections of CHE 1111 and CHE 1211 (Gen. Chem.). If these go well, we can extend the concept to the second semester of Gen. Chem. (CHE 1221), since there are more advanced math skills required in that course. |
| The Geology component of the department lacks visibility, and there is some indication that this may have impacted enrollment. The chair indicated that increasing visibility for Geology has been a concern since he took over leadership of the department, and it is recommended that the department move forward with efforts to once again incorporate Geology into the department name and prioritize other appropriate efforts to increase the visibility of the Geology segment of the department. | In progress  Completed  No longer applicable | This is now complete. Geology is satisfied with the ability for outside entities, including potential students, to find them through the college web site. |
| It was noted that the program outcomes that the department is using are the ones that were used when Chemistry was merely an emphasis area under Liberal Arts and Sciences. Now that Chemistry is being treated as a stand-alone degree program, it would be appropriate to develop some program outcomes that are targeted for Chemistry. The existing outcomes may be kept if that is the department’s wish, but they should be supplemented by outcomes that distinguish Chemistry from other degree programs. It is recommended that the department work with the division learning liaison to develop effective and measurable outcomes. | In progress  Completed  No longer applicable | Program outcomes specific to chemistry have been created. Because this is a new set of outcomes, assessment data will be collected in the coming year.  Among the new program learning outcomes is #3, Demonstrate an ability to use scientific reasoning, etc. Two course outcomes in Organic Chemistry I address this outcome: 1) Use the vocabulary of chemistry, both language and mathematical, to explain concepts, and 2) Produce writing that shows original thinking, depth of analysis, and comprehension of basic course content.  Students in this course are expected to create formal lab reports for each experiment. To do this, they need to articulate the purpose and goals of the experiment, identify the chemicals used and their reactions, describe the procedure in such a way that someone else could reproduce it, organize the results in the form of data collected and/or observations made, then draw conclusions from the data to describe the experimental success or failure with an analysis of any potential sources of error. A rubric has been developed for grading these reports and is currently being piloted in all sections of the lab for this course (CHE 2151). Results obtained are being used to improve the rubric.  The expectation is to include an identically formatted formal lab report to be created by students in the Gen. Chem II lab (CHE 1261). The same rubric used in Organic Chemistry I will be used to grade this lab rrport. This will allow us to better assess progress made by students in terms of their ability to communicate the extent of their understanding of experimental data and results as they progress through the chemistry program. |
| The recommendations from the previous Program Review were not addressed in the current self-study – the department should prioritize work on these recommendations from the last Program Review, as summarized below:  **Recommendations for Action**:   1. Develop evidence of student learning outcomes attainment and share the analyses with associated LHS departments to identify improvement targets 2. Enlist the support of RAR to investigate the promise of prerequisites in courses where student success is compromised due to perceptions of inadequate academic background. 3. Validate the department’s assertion there is a difference in student performance based on instruction by full-time versus part-time faculty through an RAR-supported study 4. Conduct a needs analysis to identify part-time faculty development opportunities; deliver workshops and other training as appropriate. 5. Evaluate and pilot alternative modes of lecture/lab delivery through hybrid course formats and distance learning opportunities (off campus locations, too) as new models emerge    1. Benchmark other institutions and other departments on campus    2. Work with Distance Learning to identify current examples    3. Track students who transfer to obtain systematic feedback for the department’s use in refining curriculum and instruction | In progress  Completed  No longer applicable | Our department identified that one of our weaknesses is the development of measurable, data-driven assessment of our student learning outcomes. To this end, two of our faculty attended the Curriculum and Assessment Track to gain a better understanding of assessment to bring that knowledge back to the department. Both faculty completed the course in Summer 2016. Additionally, one of these faculty also attended the IUPUI Assessment Institute Conference in the Fall of 2016 to look at how assessment is done elsewhere. As of Fall 2016, both of these faculty serve on the College-Wide General Education Assessment Committee. These professional development opportunities have put our department in a position where we feel educated enough to tackle program-level assessment. We have already taken initial steps to develop better assessment methods for our CHEE.AS program.  This assertion is supported by the following data. This data is specific for Introductory Chemistry, but we would expect to see similar data for General Chemistry.  #1: Completed DEV 108 before taking CHE 120  #2; Did not complete DEV 108 before taking CHE 120  #3: Did not need to take DEV 108  % Success Rates for CHE 120 (now CHE 1111)   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | | #1 | 75% | 70% | 62.9% | 61% | 54.6% | 59.5% | | #2 | 61.4% | 61.3% | 56.0% | 53.4% | 51.1% | 53.6% | | #3 | 67.85 | 69.1% | 70.6% | 67.5% | 65.2% | 73.9% | | Overall | 65.9% | 67/2% | 66.5% | 63.1% | 60.3% | 66/6% |   From this data, it is clear that students who do not have the prerequisite background are not as successful as those who have demonstrated the necessary mathematical ability. This data is rather old, but we expect that these observations still exist and will collect more recent data. A survey of the General Chemistry instructors supports this assertion and we will work with RAR in the coming year to collect more recent data for both first-year courses.  In progress. Success rates are being tallied and compared among adjuncts and full-time faculty. Initial results support this assertion to some degree; there are more complaints generated by students of adjunct faculty than are produced by students of full-time faculty. However, we have several adjuncts whose students have given high marks for their classroom presentations. In this next year, we will enlist the aid of RAR to gather more substantive data.  One of the challenges faced by the department is the development of adjunct faculty. Most of the adjunct faculty have full-time jobs elsewhere, so finding the time for them to attend workshops and other training is a challenge. We continue to monitor their work and offer suggestions and intervention where needed and appropriate. Some have completed (or are in process) the Lecturer II training in this past year. Fewer student complaints have been registered toward these instructors as a result.  In progress.  We currently have two Chemistry courses offered online. One of these has online labs. We are exploring the possibility of increasing the number of courses offered online, but are skeptical of including the lab component online. It is the feeling of the department that, for the labs associated with the health-related chemistry and the beginning course for chemistry majors, the students need to learn to properly use lab equipment, something not easily done without the immediate feedback in a normal lab setting that is not readily available in an online format.  As noted above, Geology has created and implemented an online version of the lecture component of Physical Geology.  This is a college-wide issue. We have not been able to systematically contact previous students except as they visit Sinclair or make contact with Sinclair instructors. Generally speaking, each previous student has expressed appreciation for the instruction received at Sinclair. We now have a list of recent graduates from whom we can obtain feedback. A survey was recently sent to these students to elicit feedback regarding their experience at Sinclair. Responses received from this survey will be analyzed by the department to see what shortcomings (if any) are identified, thereby allowing the department to determine how to fill any perceived gaps. |
| Work with the Academic Staffing Coordinator to identify and implement a sustainable strategy to recruit part-time faculty members | In progress  Completed  No longer applicable | This is a major issue for both Chemistry and Geology. It is quite difficult to find qualified instructors, with appropriate knowledge and teaching skills, in both of these areas who are available at the times needed, particularly during the day. It is also getting more difficult for Geology to schedule courses at the outlying campuses at times when current adjuncts are available. Numerous advertisements have been placed in the local papers with limited results, particularly in the Dayton area. In the past year we have hired several new adjunct faculty to replace those who have moved on. We will continue to pursue all leads to create a list of potential adjunct instructors. |
| As experienced faculty members consider retirement, it is recommended that the department develop formal approaches for documenting their knowledge so that as much as possible is preserved before these faculty members transition out of the department. | In progress  Some completed  No longer applicable | We now have documents for both semesters of Introductory and General Chemistry. These documents define the concepts that must be completed by the end of the term, those that can be included at the instructor’s discretion, and topics considered to be beyond the scope of the course. A list of available demonstration kits are included with each document as are other suggestions for concept presentation. These documents will be made available to each instructor to guide their individual classroom preparation. They are also expected to minimize the instructional variability between sections yet allow for some variation in emphasis based on the individual instructor's interests. Implementation of similar documents for College Chemistry and Organic Chemistry are currently being created.  Geology has similar documents available for all of their courses. |
| The Program Review is an opportunity to highlight department successes, innovations, and strengths – it was the sense of the review team that there are a number of impressive things the department is doing and a number of faculty achievements that were not communicated in the self-study. The department should utilize the Program Review and Annual Update processes to spotlight its strengths. Prior to future Annual Update and Program Review submissions, the department should engage in some deep reflection regarding successes that should be shared. The review team also felt that there could have been more reflection regarding opportunities for improvement in the department. While some challenges were mentioned, often solutions were not proposed or discussed in the self-study. The review team requests that the department conduct a more extensive Strengths/Weaknesses/Opportunities/Threats analysis and share it with the Provost’s Office within the next three months to ensure that the department is able to benefit from the self-assessment and thoughtful reflection that are one of the major benefits of the Program Review process and that should guide the development of the self-study. The self-study document isn’t really the end product of Program Review – the opportunity for departmental self-reflection and improvement is really what the process is designed to produce. | In progress  Completed  No longer applicable | The Chemistry Department faculty strongly support the Louis Stokes Alliance for Minority Participation (LSAMP) program here at Sinclair and support its mission to increase the number of under-represented minorities in the STEM fields. Currently, seven of the thirty LSAMP scholars are declared CHEE.AS majors, all of whom were recruited by chemistry faculty.  Three of our faculty either lead or participate in the WISTEM Chemistry Day program at both the Dayton and Courseview campuses.  Two of our faculty participated in the “Think College” program where local pre high school students come to Sinclair to participate in hands-on experiments. The intent is to encourage their interest in STEM programs and to give them a feel for what the college experience is like.  Our faculty perform outreach in the local community. One member of our faculty designed and carried out the chemistry program for the Girl Scout Twilight camp for the Kettering Girl Scouts in 2016. Several faculty serve as judges for science fairs in the southwest Ohio region. Participating in these activities increases the visibility of our department and Sinclair as a whole to the local communities.  As a result of the changes to advising and increased attention by chemistry faculty, the number of chemistry majors and those actually graduating has been increasing. From Fall of 2015 to the Spring of 2017, the number of students declared as chemistry majors has increased from 45 to 52. We anticipate that most of these will complete the associate degree in chemistry. Over the last five years, the number of degrees awarded has shown a five-fold increase.  Textbook costs have increased considerably in the past decade. Students may be spending more than $300 for a single book. This is especially true in science courses and there is concern this may drive financially-disadvantaged students away from STEM programs. To remedy this, one of our faculty is piloting the use of an Open Educational Resource (OER) textbook in General Chemistry (CHE 1211). Students who choose the electronic version of the text can obtain it at no charge; those who wish a paper copy can do so at minimal cost. At the conclusion of the Spring 2017 semester, this faculty member will present his conclusions about the success or failure of its use. If it is successful, the department will consider adopting it for the entire course and looking for similar texts to be adopted in other courses. Currently, similar courses at the desired rigor are not available for Geology, but they will continue to look for solutions to this issue.  Geology has added an associate degree this past year. They have also converted Environmental Geology, a course that was originally offered in the quarter system, to semesters. It is now under review as a transfer module course. An online version of the lecture component of their Physical Geology course has been created and is available to students. Opening one trip of the Geologic Field Trip class to all Sinclair students was productive and may increase interest in their courses.  With nursing moving to the new Health Sciences building, Geology hopes to be able to gain access to the room nursing is vacating on the first level of Building 1. With the increased demand for lab space, due to the expected growth of the online course, and the already full schedule for the two current labs, the availability of an additional room may be critical to the program. |

**Section II: Assessment of General Education & Degree Program Outcomes**

For the FY 2016-17 Annual Update, departments are asked to provide assessment results for **Information Literacy**.

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| **General Education Outcomes** | Year assessed or to be assessed. | Course identified by the department where this outcome could be assessed | Assessment Methods  Used | What were the assessment results?  (Please provide brief summary data) |
| Information Literacy | **2016-2017** | **CHE1211** - General Chemistry I;  **CHE1221** - General Chemistry II;  **CHE2111** - Organic Chemistry I;  **CHE2121** - Organic Chemistry II | In Spring 2017, an assessment project was performed utilizing data from the formal lab reports submitted in CHE 2151, the lab sections of CHE 2111 (Organic Chemistry I) to assess Criterion 1 of the Information Literacy Rubric: Pose valid research or discovery questions based on need and formulate thesis idea and purpose connected to research. A critical aspect of each lab experiment is for the students to understand and to articulate the purpose of the experiment carried out in the lab. At the beginning of each formal lab report, students must write a "clear, detailed, succinct" paragraph explaining the primary objectives of the experiment. To assess if the students' abilities to create a competent purpose section in a lab report increase during a semester, a comparison (using the score for the purpose section of the lab report grading rubric) was made of the average score for the first 3 lab reports of the Spring 2017 semester to the last three lab reports of the semester to assess potential improvement. | Spring is the trailing semester for Organic Chemistry I, so there are fewer students in the course. Nevertheless, there were 19 active students at the end of April 2017. Lab report score data was gathered for 9 students in the course, representing about 47% of the total enrollment. A score of "2" represents competency. A score of "1" represents developing competency. A score of "0" represents missing data.  Average score: (Firt three lab reports)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Student | Lab 1 | Lab 2 | Lab 3 | Avg. | | 1 | 1 | 1 | 2 | 1.3 | | 2 | 0 | 1 | 1 | 0.7 | | 3 | 1 | 2 | 1 | 1.3 | | 4 | 1 | 1.5 | 1.5 | 1.3 | | 5 | 2 | 2 | 2 | 2 | | 6 | 2 | 2 | 2 | 2 | | 7 | 2 | 1.5 | 1 | 1.5 | | 8 | 2 | 0.5 | 1 | 1.2 | | 9 | 1 | 2 | 2 | 1.7 |   Average score: (Last three lab reports)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Student | Lab 10 | Lab 11 | Lab 12 | Avg. | | 1 | 2 | 2 | 2 | 2 | | 2 | 2 | 2 | 2 | 2 | | 3 | 2 | 1.5 | 2 | 1.8 | | 4 | 2 | 2 | 1.5 | 1.8 | | 5 | 2 | 2 | 2 | 2 | | 6 | 2 | 2 | 2 | 2 | | 7 | 2 | 2 | 1.5 | 1.8 | | 8 | 1.5 | 1.5 | 1.5 | 1.5 | | 9 | 2 | 2 | 2 | 2 |   All students in the assessment project showed an improvement in their average lab report "purpose" score ranging from 17% to 67% improvement (ignoring the two students who achieved the maximum score throughout the semester). This demonstrates that over the course of the semester, the students in CHE 2151 are developing the ability to formulate and clearly articulate their understanding of the purpose and primary objectives of the experiments performed in lab. |
| **NEXT YEAR:** | | | | |
| Computer Literacy | **2017-2018** | **CHE1211** - General Chemistry I;  **CHE1221** - General Chemistry II;  **CHE2111** - Organic Chemistry I;  **CHE2121** - Organic Chemistry II |  |  |

The Program Outcomes for the degrees are listed below. Responses from previous years are provided below. **All program outcomes must be assessed at least once during the 5 year Program Review cycle, and assessment of program outcomes must occur each year**.

**YOU MAY ALSO SUBMIT ASSESSMENT RESULTS FOR THIS GENERAL EDUCATION COMPETENCY IF YOU HAVE THEM, BUT IT WILL BE CONSIDERED OPTIONAL**.

Note: In the last Program Review, the team encouraged our department to review the program outcomes that were then current. This has been done and will be reassessed in the coming year. A two-year Geology AS program has been implemented; program outcomes will be determined in the coming year and will be added to the next Annual Report.

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| **Program Outcomes - Chemistry** | To which course(s) is this program outcome related? | Year assessed or to be assessed. | Assessment Methods  Used | What were the assessment results?  (Please provide brief summary data) |
| Apply chemical concepts, mathematical techniques, and critical thinking skills to solve chemical problems. | CHE 1211/1251  CHE 1221/1261  CHE 2111/2151 CHE 2121/2161 | 2016-2017 | Nearly 80% of the final exams for the General Chemistry sequence (CHE 1211/1221) requires critical thinking/problem solving skills. This increases to 100% for the Organic Chemistry courses. | 83% of the students in the General Chemistry sequence exhibited competency in this skill. |
| Demonstrate a foundational knowledge of inorganic and organic chemical principles, theories, and concepts. | CHE 1211/1251  CHE 1221/1261  CHE 2111/2151 CHE 2121/2161 | 2015-2016 | The department uses comprehensive final exams for all these courses. Expected passing rate is 70%. |  |
| Demonstrate an ability to use scientific methods, and scientific reasoning in the laboratory to make observations, gather and analyze data, and evaluate and interpret experimental results from wet chemical and instrumentation methods. | CHE 1251  CHE 1261  CHE 2151  CHE 2161 | 2017-2018 | Both sequences expect students to collect and analyze data. Reports are graded on completeness, accuracy, and correct analysis. Passing is 70% or higher. |  |
| **Program Outcomes - Geology** |  |  |  | Since this is a new program, data are still being collected. |
| Communicate effectively with others in various ways: oral, written, listening, reading, computer literacy; with diverse audiences. |  |  |  |  |
| Demonstrate responsibility and accountability in accomplishing goals. |  |  |  |  |
| Make observations, analyze and synthesize data from various sources and make interpretations. Identify Earth materials and make interpretations in-line with geologic concepts. |  |  |  |  |
| Recognize the complexity of global resource sustainability issues, and natural hazard management in the context of geologic knowledge and application of geologic concepts. |  |  |  |  |

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| **Are changes planned as a result of the assessment of program outcomes? If so, what are those changes?** |  |
| **How will you determine whether those changes had an impact?** |  |

PLO#1: Demonstrate a foundational knowledge of inorganic and organic chemical principles, theories, and concepts.

PLO#2: Apply chemical concepts, mathematical techniques, and critical thinking skills to solve chemical problems.

PLO#3: Demonstrate an ability to use scientific methods, and scientific reasoning in the laboratory to make observations, gather and analyze data, and evaluate and interpret experimental results from wet chemical and instrumentation methods.

**OPTIONAL:**

Please use the space below to keep track of any annual data that your department wishes to maintain. This section is completely optional and will not be reviewed by the Division Assessment Coordinators.