



**II. Program Learning Outcomes:** A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities\*.

a. Program Learning Outcomes:

The program learning outcomes for Liberal Arts and Sciences that are applicable to the Chemistry sequence (CHE 151-152-153) are:

- Communicate the significance of facts, concepts, and ideas in spoken and written English, which is clear, precise and logical.
- Demonstrate a problem-solving capability through analysis/synthesis.
- Recognize the ways in which a scientific approach can be used to formulate an understanding of the observable world.
- Demonstrate an academic proficiency comparable to students completing the second year of a baccalaureate degree program.

b. End-of-sequence learning outcomes for Chemistry

The end-of-sequence learning outcomes for CHE 151-152-153 are:

- Classify matter and energy using chemical terms.
- Perform calculations using chemical formulas and chemical equations.
- Understand and use atomic and bonding theory.
- Understand and use acid/base theory and oxidation reduction theory.
- Understand and use the theory of kinetics and equilibrium.

No changes have been made to the sequence learning outcomes during the past year. As part a previous external evaluation, the chemistry learning outcomes were validated. Four-year institutional models have also been used to validate the chemistry learning outcomes to meet the needs of transfer students.

**III. Assessment Method(s):** A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

a. Formative Assessment Method(s) and Description: a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Chemistry did a paper and pencil assessment pre and post test in the classroom from Winter 94 to Summer 96. The pre-test was administered during the first week of class in CHE 151. It was administered again as a

post-test during the last week of the quarter in CHE 153. This process was used to gather data about the amount of student growth that occurred during the time they were enrolled in the chemistry sequence. Neither the pre nor post-test was used to calculate student grades. The chemistry faculty developed the pre/post test in 1993.

Chemistry then transferred the tests to the Chemical Resource Center (CRC) in Fall 96. The tests were put on Question Mark ® and students were given the tests on their own time. The results from both the paper and pencil and Question Mark ® assessments were similar and very positive. On average, the tests showed an increase from about 50% to 67% from the first week of Chemistry 151 to the last two weeks of Chemistry 153. Individual questions could be analyzed to see which areas were being learned and which areas need improving.

- b. Summative Assessment Method(s) and Description: a measurable indicator of end-of-program success in attaining the stated program learning outcome(s).

Not applicable to end-of-sequence assessment.

Refer to section on summative assessment of the program learning outcomes for Liberal Arts and Sciences.

**IV. Results:** A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

The spring 1999 CHE 153 post-test assessment could not be completed due to network problems. The CHE 151 pre-test was administered during fall of 1998 and winter of 1999. The comparison of pre to post-test data could not be completed without CHE 153 data. The network problems began when ISS came in and said that Chemistry needed to put their image on the computers if Chemistry were to be part of the three-year cycle of upgrading computers. That was the last Chemistry saw of their tests due to a firewall problem. A faculty member found a way around the firewall, but then ISS came to work on the CRC computers (Fall 2001), and again took all the Chemistry software off the computers and left it to the faculty to put it back on. The faculty simply do not have the time to do this, and as a result, will not perform the assessment test until there is a change in ISS policy.

That having been said, in the past, the chemistry sequence assessment results show that scores have increased 50% from the entry scores (pre-test in CHE 151) to the exit scores (post-test in CHE 153). The scores have remained stable since collection of assessment data began.

Results from the 1996 assessment report indicate that students scored an average of 51% on the pre-test and 67% on the post-test. This represents a statistically significant increase and affirms there is significant gain made by students in the chemistry sequence. Six quarters of data had been collected at that time.

Feedback from former students and faculty from other institutions indicates that chemistry students who transfer from SCC are successful in entering medical schools, four-year institutions, and graduate programs. A few students from SCC have entered Master's Degree programs and achieved a high level of success. SCC transfer students have praised the chemistry laboratories at SCC. They point out that Sinclair's labs provide a much higher quality and richer experience and more opportunity for interaction than those at other institutions. In addition, students report that graduate assistants generally teach the undergraduate chemistry classes in neighboring four-year institutions and they do not provide near the quality of instruction that is provided by faculty at SCC.

Course completion data indicates the following: CHE 151 - approximately 75%; CHE 152 - approximately 90%; CHE 153 - approximately 95%. The chemistry pre/post assessment test data also provides demographic information such as students' language, age, ethnic background, and chemistry background. This information will be used over a longer period of time to review trends and/or changes.

- V. **Analysis/Actions:** From analysis of your assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

No action is being contemplated. The results of the chemistry pre/post assessment indicate that students are "on target" in acquiring the stated learning outcomes.

- VI. **General Education:** A description of where and how the three primary general education outcomes\* (combination, thinking, values/citizenship/community) are assessed.

- a. Where do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

Written communication activities are course-embedded throughout the sequence. Informal assessment indicates that students are competent in writing. Standards for written work are included on course syllabi and with assignment handouts. The department does not use the writing checklist currently, but it might be possible to use in assessing lab reports.

- b. Where do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available

Oral communication activities are course-embedded throughout the sequence.

- c. Where do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

Thinking activities are course-embedded throughout the sequence. The chemistry sequence emphasizes problem solving and deriving creative solutions. Analytical thinking is developed through use of the scientific method. The pre and post-test used in CHE 151 and 153 measures thinking.

- d. Where do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, and service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

Values and citizenship are addressed through knowledge and compliance with safety procedures. Knowledge of safety procedures is assessed on tests. Individual faculty emphasizes diversity within the course activities. Efforts are made to draw more women into the field of chemistry through discussion of the career opportunities in chemistry for women. Students and faculty are involved in the community through Chemistry Club field trips to the Natural History Museum and through teaming efforts with Wright State. In addition, CHE 151, 152, and 153 sponsors a field trip to an industrial setting. Here students are offered the opportunity to witness chemistry taking place in a “real life” environment.