

FLORIDA GULF COAST UNIVERSITY  
 College of Arts and Sciences  
**Chemistry Program**  
**Integrated Program Matrix**  
 Synthesis & Revision – November 2008

University and Program Learning Goals and Outcomes	Program Assessment Plan and Criteria	Use of Assessment Results for Continuous Program Improvement 2005-06 (Due February 06)	Use of Assessment Results for Continuous Program Improvement 2006-07 (Due February 07)	Use of Assessment Results for Continuous Program Improvement 2010-11 (Due October 11)
<p><u>Aesthetic Sensibility</u> (University Level)</p> <p>A. Know and understand the variety of aesthetic frameworks</p> <p>B. Analyze and evaluate aesthetic principles at work</p> <p>C. Collaborate in projects involving aesthetic awareness and/or analysis</p> <p><u>Aesthetic Sensibility</u> (Program Level)</p> <p>All Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>• Demonstrate the development of a knowledge base that includes the prevailing scientific models used in chemistry, the historical nature of these models, and aesthetic considerations of that knowledge.</li> <li>• Understand the organization and increasing complexity of chemical systems from atoms through the biosphere.</li> </ul>	<p><u>Plan:</u> As a direct measure of student success in meeting aesthetic sensibility outcomes, faculty will review student performance on identified assignments and exam items in CHM xxxx Chemistry and Society, a course which connects the science of chemistry to art, ethics and cultural diversity. For direct assessment, the faculty will develop a rubric to assess student performance on the identified activities as Exemplary, Satisfactory, Beginning or Developing. Evaluators may also choose to not rate on some items. For indirect assessment, the faculty will develop new questions and analyze responses for the Chemistry Senior Student Survey as an indirect measure of the extent to which the program is meeting this goal.</p> <p><u>Criteria:</u> Successful achievement of the Aesthetic Sensibility Goal will require that the mean level of student achievement using the direct assessment rubric be at least Satisfactory (3) in the direct assessment. Successful achievement of the Aesthetic Sensibility Goal using the Chemistry Senior Student Survey will require an average score of two or less where 1 is Strongly Agree and 2 is Agree on the indirect assessment.</p> <p><u>Use of Results:</u> A committee will be appointed to examine the results of these assessments and draft a summary of the program's strengths and weaknesses. The committee will present these findings to the division at large. The committee's report will be discussed and possible amendments made before final approval. The Chemistry Major Program will then implement the agreed upon strategies for improving the program.</p>			<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p> <p>There were 52 majors as of Fall 08 (6 are seniors and 10 or less are juniors). All assessment occurs in junior and senior courses so it is recommend that criteria for annual assessment should be 15-20 at the senior-junior level (or some other suitable number for a statistically valid sample).</p>

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<p><u>Culturally Diverse Perspective</u> (University Level)</p> <p>A. Know and understand diversity in local/global communities</p> <p>B. Analyze and evaluate the impact of cultural differences</p> <p>C. Participate in projects involving interaction with diverse people, ideas, &amp; values</p> <p><u>Culturally Diverse Perspective</u> (Program Level)</p> <p>All Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>• Demonstrate knowledge of the interactions between science and society.</li> <li>• Display an understanding of the ethical complexities of chemical research.</li> <li>• Solve problems in individual and group settings incorporating a diversity of values and approaches.</li> </ul>	<p><u>Plan:</u> As a direct measure of student success in meeting culturally diverse perspective outcomes, faculty will review student performance on identified assignments and exam items in CHM xxxx Chemistry and Society, a course which connects the science of chemistry to art, ethics and cultural diversity. For direct assessment, the faculty will develop a rubric to assess student performance on identified activities as Exemplary, Satisfactory, Beginning or Developing. Evaluators may also choose to not rate on some items. For indirect assessment, the faculty will develop new questions and analyze responses for the Chemistry Senior Student Survey as an indirect measure of the extent to which the program is meeting this goal.</p> <p><u>Criteria:</u> Successful achievement of the Culturally Diverse Perspective Goal will require that the mean level of student achievement using the direct assessment rubric be at least 3 (Satisfactory). Successful achievement of the Culturally Diverse Perspective Goal using the Senior Student Survey will require an average score of two or less where 1 is Strongly Agree and 2 is Agree.</p> <p><u>Use of Results:</u> A committee will be appointed to examine the results of these assessments and draft a summary of the program's strengths and weaknesses. The committee will present these findings to the division at large. The committee's report will be discussed and possible amendments made before final approval. The Chemistry Major Program will then implement the agreed upon strategies for improving the program.</p>			<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Ecological Perspective</u> (University Level)</p> <p>A. Know issues of ecological/economic sustainability</p> <p>B. Analyze and evaluate local &amp; global ecological issues</p> <p>C. Participate in ecological/environmental projects</p> <p><u>Ecological Perspective</u> (Program Level)</p> <p>This outcome is covered by student participation in the university required course IDS 3920 Colloquium</p>	<p><u>Plan and Criteria:</u> The University Quality Enhancement Plan provides an assessment strategy to determine how well students meet the learning goal of an Ecological Perspective.</p> <p>Feedback from the QEP will be used to determine how well students at FGCU develop an ecological perspective; changes that derive from this analysis will be used to revise our programs.</p>	<p><u>Direct Assessment:</u> Instruments have included a Summary Response assignment based on an ecological issue or perspective that stresses critical thinking and writing. The goal was for a 1 point improvement in overall scores (on a 6 point scale) from students in Composition I (8% assessed) and Connections (20% assessed) moving from the lower range (1-2) to the middle range (3-4). Students in Liberal Studies Capstone (69% assessed) course were also given the instrument, with a 1 point improvement (upper range of 5-6) expected in their average score over and above that of Connections. The goal for Composition I was exceeded, with average scores at 2.7. The goal for Connections course students was met, with average scores in the middle range (3.31). The Capstone course goal was not met, with scores at 3.95 (native students scoring 4.0 and upper level transfers scoring 3.91). Final results suggest that students in the Connections class are achieving the level desired. However, those completing the Liberal Studies degree and Capstone course had lower than expected results, perhaps due to lack of abilities in critical thinking, writing, or in knowledge of ecological issues. Overall inter-rater reliability was at 86%.</p> <p><u>Indirect Assessment:</u> Students in the Connections class took a survey relating to their knowledge of ecological perspective and responded on a Likert Scale of 1-5 (5 being the highest); an overall average score of 4 was expected for all students. Average scores were below the expected 4.0 level. Students scored their understanding of the program's overall goals at 3.83; their understanding of ecological perspective importance at 3.62; and their understanding of Community Involvement and Awareness at 3.75. Students that completed both the on campus workshop and community service project exceeded the 4.0 expected level, those who completed only one or the other did not.</p> <p><u>Plans for Continuous Improvement:</u> No immediate changes are planned for the Composition I class, although this class might become a site for advancing ecological literacy in the future. In Connections, the ecological literacy program (Wings of Hope) has been streamlined to be introduced slightly later in the semester. A detailed assignment sheet has been developed, providing instructors and students a clear indication of what the program entails along with a clear grading rubric detailing how students will be graded. In addition, the number of Wings of Hope programs in the spring semester have been reduced so that several Connections sections will not have a designated service learning activity; students in these sections will need to work towards developing their own activity. Finally, no immediate changes were proposed for the upper level courses until feedback has been gathered from the QEP assessment.</p>		<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Effective Communication</u> (University Level)</p> <p>A. Know principles for effective communication</p> <p>B. Organize thoughts and compose ideas</p> <p>C. Participate in collaborative communication projects</p> <p><u>Effective Communication</u> (Program Level)</p> <p>All Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>Effectively communicate in a professional setting, including technical writing, oral presentations, and the use of available technology</li> <li>Effectively assess their own performances on projects involving analysis of contemporary issues, collaboration with others, and presentation of ideas.</li> </ul>	<p><u>Plan:</u></p> <ol style="list-style-type: none"> <li>Analyze the results of the Research Proposal Rubric (from the Scientific Process class). This rubric allows faculty to judge student mastery of objectives as Excellent, Very Good, Good, Fair, or Poor. Evaluators may also choose to not rate on some items or to rate as not applicable.</li> <li>Analyze student responses on the Student Survey for Scientific Processes and the Senior Student Survey as indirect measures of the extent to which the program is meeting the Effective Communication goal.</li> </ol> <p><u>Criteria:</u></p> <ol style="list-style-type: none"> <li>Successful achievement of the Effective Communication Goal will require that the mean level of student achievement using the Research Proposal Rubric be at least Good (3) and that no student be judged poor (1).</li> <li>Successful achievement of the Effective Communication Goal using the Scientific Processes Survey required that the average response be at least Good (3) and that no student self-judge as poor (1).</li> <li>Successful achievement of the Effective Communication Goal using the Senior Student Survey required an average score of two or less where 1 is Strongly Agree and 2 is Agree.</li> </ol>	<p>Effective Communication was assessed in the first round of assessment.</p> <p><u>Assessment Tools:</u></p> <ul style="list-style-type: none"> <li>Direct Assessment using the Research Proposal Rubric</li> <li>Indirect Assessment using the Student Survey for Scientific Processes</li> <li>Indirect Assessment using the Senior Student Survey</li> </ul> <p><u>Plans for Continuous Improvement:</u></p> <p>The number of oral presentations will increase and assessment rubrics will be developed for the oral presentations in the Scientific Process class. The oral presentation of material relevant to courses in the chemistry program will assist in improved oral communication skills and will enhance learning course material by active learning and reflection.</p>		<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Ethical Responsibility</u> (University Level)</p> <p>A. Know and understand ethical issues</p> <p>B. Analyze and evaluate ethical issues in a variety of contexts</p> <p>C. Participate in collaborative projects involving ethical analysis and/or decisions</p> <p><u>Ethical Responsibility</u> (Program Level)</p> <p>All Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>• Demonstrate knowledge of the interactions between science and society.</li> <li>• Display an understanding of the ethical complexities of chemical research.</li> <li>• Solve problems in individual and group settings incorporating a diversity of values and approaches.</li> </ul>	<p><u>Plan:</u> As a direct measure of student success in meeting ethical responsibility outcomes, faculty will review student performance on identified assignments and exam items in CHM xxxx Chemistry and Society, a course which connects the science of chemistry to art, ethics and cultural diversity. For direct assessment, the faculty will develop a rubric to assess student performance on identified activities as Exemplary, Satisfactory, Beginning or Developing. Evaluators may also choose to not rate on some items. For indirect assessment, the faculty will develop new questions and analyze responses for the Chemistry Senior Student Survey as an indirect measure of the extent to which the program is meeting this goal.</p> <p><u>Criteria:</u> Successful achievement of the Culturally Diverse Perspective Goal will require that the mean level of student achievement using the direct assessment rubric be at least 3 (Satisfactory). Successful achievement of the Culturally Diverse Perspective Goal using the Senior Student Survey will require an average score of two or less where 1 is Strongly Agree and 2 is Agree.</p> <p><u>Use of Results:</u> A committee will be appointed to examine the results of these assessments and draft a summary of the program's strengths and weaknesses. The committee will present these findings to the division at large. The committee's report will be discussed and possible amendments made before final approval. The Chemistry Major Program will then implement the agreed upon strategies for improving the program.</p>			<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Information Literacy</u> (University Level)</p> <p>A. Identify and locate sources of information</p> <p>B. Analyze and evaluate information in a variety of contexts</p> <p>C. Participate in collaborative analysis/application of information</p> <p><u>Information Literacy</u> (Program Level)</p> <p>All Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>Gather and critically evaluate information including development of library research skills and the use of technology for gathering information.</li> <li>Analyze information</li> <li>Synthesize information through formation of hypotheses, the use of statistical techniques and simulation models, and the application of a system approach.</li> <li>Locate, evaluate, and employ information relevant to their analysis of contemporary issues.</li> </ul>	<p><u>Plan:</u> For direct assessment, faculty will analyze the results of the Research Proposal Rubric (in Scientific Process). This rubric allows faculty to judge student mastery of objectives as Excellent, Very Good, Good, Fair, or Poor. Evaluators may also choose to not rate on some items or to rate as not applicable. In addition, faculty will analyze the results of the Physical Chemistry Poster Rubric. This rubric allows faculty to judge student mastery of objectives as Exemplary, Satisfactory, Developing and Beginning. Evaluators may also choose to not rate on some items or to rate as not applicable.</p> <p>For indirect assessment, faculty will analyze student responses on the Student Survey for Scientific Processes and the Senior Student Survey as indirect measures of the extent to which the program is meeting the Information Literacy goal.</p> <p><u>Criteria:</u> For the direct assessment, successful achievement of the Information Literacy Goal will require that the mean level of student achievement using the Scientific Process Research Proposal Rubric be at least Good (3) and that no student be judged poor (1). Successful achievement of the Information Literacy Goal using the Physical Chemistry Poster Rubric require the mean level of student of achievement be at least Satisfactory (3).</p> <p>For the indirect assessment, successful achievement of the Information Literacy Goal using the Scientific Processes Survey required that the average response be at least Good (3) and that no student self-judge as poor (1). Successful achievement of the Information Literacy Goal using the Senior Student Survey required an average score of two or less where 1 is Strongly Agree and 2 is Agree.</p>		<p><u>Direct Assessment:</u>          A poster assignment was given in CHM 3005C, Physical Chemistry for the Life Sciences to assess information literacy, measuring the students' ability to search scientific literature to find relevant, important information regarding instrument design and operating principles and then to communicate the information in a written format, presented in a poster. The assessment indicates 40% of the students scored at a level of 'exemplary' and 60% were at a level of 'satisfactory.'</p> <p><u>Indirect Assessment:</u>          A survey was administered to six students, constituting 27% of those in the program. This assessment indicated that 83% of the students ranked themselves as 'exemplary' with 16.7% ranked as 'satisfactory,' considered a false-high perception of their abilities. Information literacy is a learning outcome in which the students are fairly competent; however, it appears they do not completely understand the chemistry topic, with literature searches sometimes lacking important information. They will continue to use and develop the ability to perform scientific literature searches in the remaining chemistry classes as well as for their Senior Project and Presentation.</p> <p><u>Plans for Continuous Improvement:</u>          Emphasis will be placed on exercises that require data analysis, problem solving and information literacy in 4000 level courses, such as Instrumental Analysis. Further assessment will be done in 4000 level courses. No program changes will be made at this time given the small student sample and newness of the program.</p>	<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Critical Thinking and Problem-Solving Abilities</u> (University Level)</p> <p>A. Understand multi/interdisciplinary nature of knowledge</p> <p>B. Apply critical, analytical creative and systems thinking</p> <p>C. Work individually and collaboratively to recognize and solve problems</p> <p><u>Critical Thinking and Problem-Solving Abilities</u> (Program Level)</p> <p>Students must demonstrate the ability to evaluate and implement the scientific process and its application in different settings and to explore creative alternative problem solving approaches within the context of standard scientific conventions, including the ability to:</p> <ul style="list-style-type: none"> <li>• Gather and critically evaluate information including development of library research skills and the use of technology for information for gathering information.</li> <li>• Demonstrate an understanding of chemical reactivity and the ability to predict products from common reactions. (Academic Learning Compact 1.1)</li> <li>• Demonstrate an understanding of chemical structure and properties. (Academic Learning Compact 1.2).</li> <li>• Analyze information by interpreting whether data from laboratory experiments are accurate and statistically valid using knowledge of chemistry reactions, physical properties and understanding the errors and limitations inherent in laboratory techniques and instruments (Academic Learning Compact 1.3).</li> </ul>	<p><u>Plan:</u></p> <ol style="list-style-type: none"> <li>1. Analyze the results of the Research Proposal Rubric in the Scientific Process class. This rubric allows faculty to judge student mastery of objectives as Excellent, Very Good, Good, Fair, or Poor. Evaluators may also choose to not rate on some items or to rate as not applicable.</li> <li>2. Analyze student responses on the Student Survey for Scientific Processes and the Senior Student Survey as indirect measures of the extent to which the program is meeting the Problem Solving Goal.</li> <li>3. Analyze results of rubrics used in multiple 3000 and 4000 level chemistry courses which assess student ability to analyze and evaluate data correctly. The rubrics allow faculty to judge student mastery of objective as Beginning, Developing, Satisfactory, or Exemplary</li> </ol> <p><u>Criteria:</u></p> <ol style="list-style-type: none"> <li>1. Successful achievement of the Problem Solving Goal will require that the mean level of student achievement using the Research Proposal Rubric be at least Good (3) and that no student be judged poor (1).</li> <li>2. Successful achievement of the Problem Solving Goal using the Scientific Processes Survey required that the average response be at least Good (3) and that no student self-judge as poor (1).</li> <li>3. Successful achievement of the Problem Solving Goal using the Senior Student Survey required an average score of two or less where 1 is Strongly Agree and 2 is Agree.</li> <li>4. Successful achievement of the Problem Solving Goal will require that the mean level of student achievement using the Chemistry course rubrics be at least satisfactory (3).</li> </ol>		<p><u>Direct Assessment:</u></p> <p>An exam question was given in CHM 3120C to assess problem-solving abilities, measuring the student's ability to read a description about a laboratory experiment, understand the information to visualize the situation, identify probable sources of error and then describe semi-quantitatively how the errors would affect their results. The assessment indicated 25% as 'exemplary' and 75% as 'satisfactory' for demonstration of problem-solving abilities.</p> <p><u>Indirect Assessment:</u></p> <p>A survey was administered to six students, constituting 27% of those in the program. This assessment indicated that 83% of the students rated themselves as 'exemplary' and only 16.7% as 'satisfactory,' greatly exceeding the evaluators' assessment ratings. This ability will be further developed and assessed during CHM 4139C, Instrumental Analysis and other upper level chemistry courses.</p> <p><u>Plans for Continuous Improvement:</u></p> <p>The faculty decided against having students work individually in lab experiments, evidence shows they learn more effectively in pairs or groups. Emphasis will be placed on exercises that require data analysis, problem solving and information literacy in 4000 level courses, such as Instrumental Analysis. Further assessment will be done in 4000 level courses. No program changes will be made at this time given the small student sample and newness of the program.</p>	<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Technological Literacy</u></p> <p>A. Develop knowledge of modern technology</p> <p>B. Process information through use of technology</p> <p>C. Collaborate with others using technology tools</p> <p><u>Technological Literacy</u>            All Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>Effectively communicate in a professional setting (as demonstrated in the Scientific Process class), including technical writing, oral presentations, and the use of available technology.</li> <li>Gather and critically evaluate information including development of library research skills and the use of technology for information for gathering information.</li> <li>Develop, organize, and effectively present an analysis of a contemporary issue in oral, written, and technological forms.</li> <li>Explain the principles of operation for common laboratory instrumentation and other equipment, using knowledge of chemical structure and instrument design, so that they may function effectively as chemical professionals.(Academic Learning Compact 1.4)</li> </ul>	<p><u>Plan:</u></p> <ol style="list-style-type: none"> <li>Analyze the results of the Research Proposal Rubric. This rubric allows faculty to judge student mastery of objectives as Excellent, Very Good, Good, Fair, or Poor. Evaluators may also choose to not rate on some items or to rate as not applicable.</li> <li>Analyze student responses on the Student Survey for Scientific Processes and the Senior Student Survey as indirect measures of the extent to which the program is meeting Technological Literacy goal.</li> <li>Analyze the results of the Chemistry Course Rubrics used in 3000 and 4000 level chemistry courses. These rubrics allows faculty to judge student mastery of objectives as Exemplary, Satisfactory, Beginning and Developmental. Evaluators may also choose to not rate on some items or to rate as not applicable.</li> </ol> <p><u>Criteria:</u></p> <ol style="list-style-type: none"> <li>Successful achievement of the Technological Literacy Goal will require that the mean level of student achievement using the Research Proposal Rubric be at least Good (3) and that no student be judged poor (1).</li> <li>Successful achievement of the Technological Literacy Goal using the Scientific Processes Survey required that the average response be at least Good (3) and that no student self-judge as poor (1).</li> <li>Successful achievement of the Technological Literacy Goal using the Senior Student Survey required an average score of two or less where 1 is Strongly Agree and 2 is Agree.</li> <li>Successful achievement of the Problem Solving Goal will require that the mean level of student achievement using the Chemistry course Rubrics be at least satisfactory (3).</li> </ol>			<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>

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<p><u>Community Awareness and Involvement</u></p> <p>A. Know and understand relationships between individuals and their communities</p> <p>B. Analyze, evaluate and assess human needs and practices</p> <p>C. Participate collaboratively in community service projects</p> <p><u>Community Awareness and Involvement</u></p> <p>Chemistry students are expected to:</p> <ul style="list-style-type: none"> <li>Demonstrate knowledge of the interactions between science and society.</li> </ul>	<p><u>Plan:</u> As a direct measure of student success in meeting community awareness and involvement outcomes, faculty will review student performance on identified assignments and exam items in CHM xxxx Chemistry and Society, a course which connects the science of chemistry to art, ethics and cultural diversity. For direct assessment, the faculty will develop a rubric to assess student performance on the identified activities as Exemplary, Satisfactory, Beginning or Developing. Evaluators may also choose to not rate on some items. For indirect assessment, the faculty will develop new questions and analyze responses for the Chemistry Senior Student Survey as an indirect measure of the extent to which the program is meeting this goal.</p> <p><u>Criteria:</u> Successful achievement of the Community Awareness and Involvement Goal will require that the mean level of student achievement using the direct assessment rubric be at least Satisfactory (3) in the direct assessment. Successful achievement of the Aesthetic Sensibility Goal using the Chemistry Senior Student Survey will require an average score of two or less where 1 is Strongly Agree and 2 is Agree on the indirect assessment.</p> <p><u>Use of Results:</u> A committee will be appointed to examine the results of these assessments and draft a summary of the program's strengths and weaknesses. The committee will present these findings to the division at large. The committee's report will be discussed and possible amendments made before final approval. The Chemistry Major Program will then implement the agreed upon strategies for improving the program.</p>			<p>Because the Chemistry Program is new and relatively small (fewer than 40 total majors, from Freshmen to Seniors), the program will complete a Program Assessment every four years. When the program grows beyond 40 majors, we will move to biennial program assessment.</p>