Program/Dept. Name: Science

**Submitted by: Science Dept Date: November 30, 2012**

**1. Program Objective 1:** Students completing a college level science course (Phys& 221, Chem&163) will identify and understand the concepts related to their specific discipline. (Science as a body of knowledge)

Learning Value 9: Understanding specific principles, and analyzing and applying scientific information in a variety of contexts.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2. Intended Outcome** | **3. Criteria or Target** | **4. Comparison** | **5. Assessment method or tools** | **6. When /How Assessment will be accomplished** |
| 2.1 Identify and express concepts, terms and facts related to the specific discipline. | Chem&163 students will score at or above the 50th percentile on a national standardized American Chemical Society General Chemistry Exam (full version).  Phys&221 students will demonstrate a significant pretest/posttest gain on the Force Concept Inventory . | Students with passing course grades versus students at the 50th percentile.  Student gains by year. | American Chemical Society’s Standardized General Chemistry Exam (full version).  Physics – Force Concept Inventory | Assessment will take place at the end of Chem&163.  First week and last week of the Fall quarter as on-line test on Blackboard. |
| 9.1 Demonstrate an understanding of fundamental scientific concepts. |

**June 2007 Results - Program Objective 1:**

**7. What were the results of the assessments?**

*Note: for 2007 and 2008, Biology used embedded pretest (Biology 101) and posttest (Biology 103) questions but did not report any data. In 2009, Biology changed to the Integrated Process Skills Test II and the embedded questions were dropped.*

Biology: no data was collected

Chemistry: Mount Vernon campus mean score was at the 51st percentile. Whidbey campus mean score was at the 48th percentile. (Mount Vernon and Whidbey scores were not reported in the same way and cannot be combined for 2007.) A comparison of Mount Vernon students mean score and final course grade is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 8 | 0 |
| B+, B, and B- | 4 | 8 |
| C+, C, and C- | 2 | 9 |
| D+, D, and D- | 0 | 4 |
| E | 1 | 0 |

Physics: FCI matched score (n = 23): FCI pretest mean = 14.09 (of 30 pts possible), SD = 6.244; posttest: mean = 20.22, SD = 6.075; statistically significant gain using 2-tailed t-test.

**8. How were the results used to improve?**

Biology: no data was collected

Chemistry: nothing noted  
Physics: nothing noted

**June 2008 Results - Program Objective 1:**

**7. What were the results of the assessments?**

*Note: for 2007 and 2008, Biology used embedded pretest (Biology 101) and posttest (Biology 103) questions but did not report any data. In 2009, Biology changed to the Integrated Process Skills Test II and the embedded questions were dropped.*

Biology: no data was collected

Chemistry: Mount Vernon and Whidbey campus mean scores were at the 51st and 50th percentiles, respectively. A comparison of students’ mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 10 | 2 |
| B+, B, and B- | 9 | 11 |
| C+, C, and C- | 2 | 14 |
| D+, D, and D- | 0 | 1 |
| E | 0 | 1 |

Physics: matched pretest/posttest scores

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FCI** | Mean | | SD | | significant gain using 2-tailed t-test? |
|  | pretest | posttest | pretest | posttest |  |
| 2007 (n =23) | 14.09 | 20.22 | 6.244 | 6.075 | yes at .000 |
| 2008 (n = 26) | 14.19 | 21.27 | 5.223 | 5.408 | yes at .000 |

**8. How were the results used to improve?**

Biology: no data was collected   
Chemistry: Although the Mount Vernon students scored at the 51st percentile, an analysis of their examinations revealed significant deficiencies in stoichiometric conversions and balancing oxidation-reduction reactions. During the 2008-09 academic year, Mount Vernon students will receive supplemental instruction on both these topics. Review of the WIC ACS exam results revealed that students often missed problems which could be solved using a simple algorithm. To assist students in mastering such algorithms, WIC will use a new software package next year (ARIS from McGraw-Hill) to determine if an increased emphasis on basic algorithms will improve performance.

Physics: nothing noted

**June 2009 results - Program Objective 1:**

**7. What were the results of the assessments?**

Chemistry: Mount Vernon and Whidbey campus mean scores were at the 59th and 58th percentiles, respectively. A comparison of students mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 13 | 2 |
| B+, B, and B- | 19 | 10 |
| C+, C, and C- | 1 | 7 |
| D+, D, and D- | 1 | 3 |
| E |  |  |

Physics: matched pretest/posttest scores

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FCI** | Mean | | SD | | significant gain using 2-tailed t-test? |
|  | pretest | posttest | pretest | posttest |  |
| 2007 (n =23) | 14.09 | 20.22 | 6.244 | 6.075 | yes at .000 |
| 2008 (n = 26) | 14.19 | 21.27 | 5.223 | 5.408 | yes at .000 |
| 2009 (n = 23) | 14.09 | 20.96 | 4.166 | 6.684 | yes at .000 |

**8. How were the results used to improve?**

Chemistry: nothing noted

Physics: nothing noted

**June 2010 results - Program Objective 1:**

**7. What were the results of the assessments?**

Chemistry: Mount Vernon and Whidbey campus mean scores were at the 61st and 48nd percentiles, respectively. A comparison of students’ mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 5 | 0 |
| B+, B, and B- | 15 | 0 |
| C+, C, and C- | 5 | 14 |
| D+, D, and D- | 2 | 5 |
| E | 0 | 0 |

Physics: matched pretest/posttest scores

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FCI** | Mean | | SD | | significant gain using 2-tailed t-test? |
| Fall | pretest | posttest | pretest | posttest |  |
| 2006 (n =23) | 14.09 | 20.22 | 6.244 | 6.075 | yes at .000 |
| 2007 (n = 26) | 14.19 | 21.27 | 5.223 | 5.408 | yes at .000 |
| 2008 (n = 23) | 14.09 | 20.96 | 4.166 | 6.684 | yes at .000 |
| 2009 (n =38) | 11.82 | 20.07 | 4.920 | 6.104 | yes at .000 |

**8. How were the results used to improve?**

Chemistry: Mount Vernon and Whidbey results were satisfactory and showed no notable deficiencies in any particular area of general chemistry.

Physics: Although the pretest average for 2009 was significantly lower than previous years, their posttest average was consistent with previous year groups - indicating an encouraging gain for the 2009 students. No specific items were noted for improvement.

**June 2011 results - Program Objective 1:**

**7. What were the results of the assessments?**

Chemistry: Mount Vernon and Whidbey campus mean scores were both at the 65th percentiles. A comparison of students mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 14 | 0 |
| B+, B, and B- | 14 | 0 |
| C+, C, and C- | 15 | 1 |
| D+, D, and D- | 2 | 6 |
| E | 0 | 0 |

Physics: matched pretest/posttest scores

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FCI** | Mean | | SD | | significant gain using 2-tailed t-test? |
| Fall | pretest | posttest | pretest | posttest |  |
| 2006 (n =23) | 14.09 | 20.22 | 6.244 | 6.075 | yes at .000 |
| 2007 (n = 26) | 14.19 | 21.27 | 5.223 | 5.408 | yes at .000 |
| 2008 (n = 23) | 14.09 | 20.96 | 4.166 | 6.684 | yes at .000 |
| 2009 (n =38) | 11.82 | 20.07 | 4.920 | 6.104 | yes at .000 |
| 2010 (n = 30) | 13.09 | 19.73 | 6.838 | 5.836 | yes at .000 |

**8. How were the results used to improve?**

Chemistry: During this past year at Whidbey, students were required to take many more practice quizzes and grades rose substantially. However, there has always been high variability from year to year so it is not clear that the increased number of quizzes caused the improvement. No changes were noted at the Mount Vernon campus.

Physics: Indicative of this year-group, only 30 of the 48 students in this course took both the pretest/posttest so could be included in a matched score t-test. With both class sizes and the number of under-prepared students increasing, we will be looking at alternatives to homework to 1) better develop understanding of the material and 2) allow for efficient and productive use of the instructor's time (video-lectures of worked problems, etc. will be explored).

**June 2012 results - Program Objective 1:**

**7. What were the results of the assessments?**

Chemistry: Mount Vernon and Whidbey campus mean scores were both at the 64th and 56th percentiles, respectively. A comparison of students mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 18 | 1 |
| B+, B, and B- | 14 | 6 |
| C+, C, and C- | 8 | 8 |
| D+, D, and D- | 1 | 3 |
| E | 0 | 1 |

Physics: matched pretest/posttest scores

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FCI** | Mean | | SD | | significant gain using 2-tailed t-test? |
| Fall | pretest | posttest | pretest | posttest |  |
| 2006 (n =23) | 14.09 | 20.22 | 6.244 | 6.075 | yes at .000 |
| 2007 (n = 26) | 14.19 | 21.27 | 5.223 | 5.408 | yes at .000 |
| 2008 (n = 23) | 14.09 | 20.96 | 4.166 | 6.684 | yes at .000 |
| 2009 (n =38) | 11.82 | 20.07 | 4.920 | 6.104 | yes at .000 |
| 2010 (n = 30) | 13.09 | 19.73 | 6.838 | 5.836 | yes at .000 |
| 2011 (n = 29) | 13.55 | 19.66 | 5.336 | 5.582 | yes at .000 |

**8. How were the results used to improve?**

Chemistry: Despite two very low ACS exam scores, the Whidbey campus class average was 56th percentile – above their five-year average. The Mount Vernon campus class average did not show noticeable change from last year (64th percentile in 2012, 65th percentile in 2011). No particular change is indicated for 2012-2013 for either campus.

Physics: Although the pretest FCI score average has dipped slightly in the last few years, posttest scores are fairly constant and the pretest/post gains continue to be statistically significant. Indicative of recent year-groups, only 29 of the 45 students in this course took both the pretest/posttest so could be included in a matched score t-test. With both class sizes and the number of under-prepared students increasing, we continue to look at alternatives to homework to 1) better develop understanding of the material and 2) allow for efficient and productive use of the instructor's time (video-lectures of worked problems, etc. are being explored).

**Program Objective 2:** Students completing a college level science course (Biol&213, Chem&163) will identify, interpret, evaluate, understand and express pertinent data using the scientific method. (Science as a process)

Learning Value 9: Understanding specific principles, and analyzing and applying scientific information in a variety of contexts.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2. Intended Outcome** | **3. Criteria or Target** | **4. Comparison** | **5. Assessment method or tools** | **6. When /How Assessment will be accomplished** |
| 2.3 Identify, interpret and evaluate pertinent data and previous experience to reach conclusions. | Intention: Biol&213 students will score at or above 50th percentile on national exam.  Actuality: No national score available. Students will score at or above 75 percent on Integrated Process Skills Test II.  Chem&163 students will score at or above the 50th percentile on a national standardized American Chemical Society General Chemistry Exam (full version). | Biol&213 student average scores will be compared to a growing battery of previous years scores. Target will be an increase in the annual average score trajectory.  Students with passing course grades versus students at the 50th percentile. | The Integrated Process Skills Test II will be used as the annual assessment of student gains. Comparisons will be made to average scores from previous years.  American Chemical Society’s Standardized General Chemistry Exam (full version). | Assessment exam will be administered at the end of Spring quarter in Biology 213 (the final course in the major’s biology series).  Assessment will take place at the end of Chem 143. |
| 9.2 Demonstrate their understanding of the principles of scientific methods, analysis and reasoning. |
| 8.3 Interpret information and reasoning expressed mathematically. |

**June 2007 results - Program Objective 2**

**7. What were the results of the assessments?**

*Note: for 2007 and 2008, the Classroom Test of Scientific Reasoning (CTSR) was administered at the end of Physics 219, and the Mathematical Modeling Conceptual Evaluation (MMCE) Part II was administered as a pretest in Physics 217 and posttest in Physics 219. Biology used embedded pretest (Biology 101) and posttest (Biology 103) questions but did not report any results. In 2009, Biology changed to the Integrated Process Skills Test II and the MMCE and MMCE were dropped.*

Biology: no data was collected

Chemistry: Mount Vernon campus mean score was at the 51st percentile. Whidbey campus mean score was at the 48th percentile. (Mount Vernon and Whidbey scores were not reported in the same way and cannot be combined for 2007.) A comparison of Mount Vernon students mean score and final course grade is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 8 | 0 |
| B+, B, and B- | 4 | 8 |
| C+, C, and C- | 2 | 9 |
| D+, D, and D- | 0 | 4 |
| E | 1 | 0 |

Physics: MMCE (n = 20): mean = 9.15 (of 12 pts possible), SD = 2.87; CTSR (n = 21): mean = 18.9 (of 24 pts possible), SD = 2.57

**8. How were the results used to improve?**

Biology: no data was collected

Chemistry: nothing noted

Physics: Although the CTSR scores were above national levels, the responses on the graphing portion of the MMCE were of some concern. Next year graphs will be more explicitly discussed during labs with the goal of improving student’s abilities to analyze graphs.

**June 2008 results - Program Objective 2**

**7. What were the results of the assessments?**

*Note: for 2007 and 2008, the Classroom Test of Scientific Reasoning (CTSR) was administered at the end of Physics 219, and the Mathematical Modeling Conceptual Evaluation (MMCE) Part II was administered as a pretest in Physics 217 and posttest in Physics 219. Biology used embedded pretest (Biology 101) and posttest (Biology 103) questions but did not report any results. In 2009, Biology changed to the Integrated Process Skills Test II and the MMCE and MMCE were dropped.*

Biology: no data was collected

Chemistry: Mount Vernon and Whidbey campus mean scores were at the 51st and 50th percentiles, respectively. A comparison of students mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 10 | 2 |
| B+, B, and B- | 9 | 11 |
| C+, C, and C- | 2 | 14 |
| D+, D, and D- | 0 | 1 |
| E | 0 | 1 |

Physics:

CTSR: 2007 (n = 21): Mean = 18.904; SD = 2.567

2008 (n = 18): Mean = 19.278; SD = 4.322

Is gain significant using independent two-tailed t-test? no - the scientific reasoning skills of our students remain consistent and slightly above reported Community College students

MMCE: 2008 (n = 18): Pre/post means: 8.571 / 10.143; Pre/post SDs: 3.227/2.713

Is gain significant using paired two-tailed t-test? Yes at 0.013

**8. How were the results used to improve?**

Biology: no data was collected  
Chemistry: nothing noted  
Physics: Last year the results of the MMCE were of some minor concern. Although this year there was a significant gain from pre to posttest scores, explicit discussion of graphs during labs will continue with the goal of improving student’s abilities to analyze graphs.

**June 2009 results - Program Objective 2:**

**7. What were the results of the assessments?**

Biology - no data reported (see June 2010 report)

Chemistry: Mount Vernon and Whidbey campus mean scores were at the 59th and 58th percentiles, respectively. A comparison of students’ mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 13 | 2 |
| B+, B, and B- | 19 | 10 |
| C+, C, and C- | 1 | 7 |
| D+, D, and D- | 1 | 3 |
| E |  |  |

**8. How were the results used to improve?**

Biology: no data reported

Chemistry: *nothing noted*

**June 2010 results - Program Objective 2**

**7. What were the results of the assessments?**

Biology: Administration of the assessment exam on the Mount Vernon Campus in Spring 2009 and Spring 2010 yield average class scores of 80% and 87% respectively.

Chemistry: Mount Vernon and Whidbey campus mean scores were at the 61st and 48nd percentiles, respectively. A comparison of students’ mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 5 | 0 |
| B+, B, and B- | 15 | 0 |
| C+, C, and C- | 5 | 14 |
| D+, D, and D- | 2 | 5 |
| E | 0 | 0 |

**8. How were the results used to improve?**

Biology: Scores on individual questions (correct or incorrect) will be used to identify subject matter where student understanding may be lacking. This information will be used to develop course material to better address those topic areas.

Chemistry:Mount Vernon and Whidbey results were satisfactory and showed no notable deficiencies in any particular area of general chemistry.

**June 2011 results - Program Objective 2**

**7. What were the results of the assessments?**

Biology: no data was collected

Chemistry: Mount Vernon and Whidbey campus mean scores were both at the 65th percentiles. A comparison of students mean scores and final course grades is provided below:

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| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 14 | 0 |
| B+, B, and B- | 14 | 0 |
| C+, C, and C- | 15 | 1 |
| D+, D, and D- | 2 | 6 |
| E | 0 | 0 |

**8. How were the results used to improve?**

Biology: no data was collected

Chemistry: During this past year at Whidbey, students were required to take many more practice quizzes and grades rose substantially. However, there has always been high variability from year to year so it is not clear that the increased number of quizzes caused the improvement. No changes were noted at the Mount Vernon campus.

**June 2012 results - Program Objective 2**

**7. What were the results of the assessments?**

Biology: \_\_\_none\_\_\_\_\_\_\_

Chemistry: Mount Vernon and Whidbey campus mean scores were both at the 64th and 56th percentiles, respectively. A comparison of students’ mean scores and final course grades is provided below:

|  |  |  |
| --- | --- | --- |
| Final Course Grade | Number of Students at or Above 50th Percentile | Number of Students Below 50th Percentile |
| A and A- | 18 | 1 |
| B+, B, and B- | 14 | 6 |
| C+, C, and C- | 8 | 8 |
| D+, D, and D- | 1 | 3 |
| E | 0 | 1 |

**8. How were the results used to improve?**

Biology: \_\_\_none\_\_\_\_\_\_\_\_\_

Chemistry: Chemistry: Despite two very low ACS exam scores, the Whidbey campus class average was 56th percentile – above their five-year average. The Mount Vernon campus class average did not show noticeable change from last year (64th percentile in 2012, 65th percentile in 2011). No particular change is indicated for 2012-2013 for either campus.