**General Education**

**Natural World**

**Breadth Requirement**

**Assessment of Learning Outcomes**

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**Spring 2012**

**Prepared by GE Committee team:**

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Office of Institutional Research and Assessment

**Executive Summary**

The purpose of this assessment is to evaluate how well the student learning outcomes (SLO) are accomplished through courses designated to meet the Natural World breadth requirement.

**Methods**

The following student learning outcomes were evaluated:

I: Demonstrate an understanding of the basic principles, concepts, discovery process, power, and limitations of the life and/or physical sciences (Knowledge)

II: Apply the principles, concepts, and methods of the life and /or physical sciences to everyday life (Application)

III: Demonstrate an understanding of the roles of science and technology in society and their impact on the sustainability of the planet (Sustainability)

Altogether ten courses were targeted that were designated to meet the Natural World General Education requirement during the spring semester of 2010. For direct measures, the types of student work used to evaluate learning outcomes included final exams, tests, quizzes, one group project, reflective essays, lab reports and review papers. For indirect measures, student responses to the 2009 and 2012 College Senior Survey, and the CIRP 2010 Freshman Survey questions related to science and sustainability were used. Faculty whose courses were targeted evaluated the SLOs using a 5-point rubric developed by the assessment team composed of three faculty members from the General Education Committee with support from the Office of Institutional Research and Assessment. For each student work or assignment, one-third of the students were randomly selected. In addition to the rubric evaluations faculty submitted the grades for the assignments. A total of 292 instances of student work was generated for assessment: 102 for SLO I, 86 for SLO II, and 104 for SLO III. Mean rubric ratings as well as percentage of instances in each of the rubric rating level were examined.

**Findings**

Overall, while all three SLOs seem to be relatively well developed and accomplished, learning about the impact of technology and society on sustainability of the planet (SLO III), and the application of science to everyday life (SLO II) are somewhat higher, with two-thirds of student work achieving Developed or Accomplished levels. There appears to be room for improvement in SLO I dealing with understanding of basic principles, concepts, discovery process, power, and limitation of life and/or physical sciences.

Between 2009 and 2012, seniors showed noticeable gains on the sustainability items of the CSS, and generally scored higher than peer private colleges. On common items their sustainability scores were also somewhat higher than the freshman, suggesting noticeable gains on sustainability as students are exposed to the La Verne curriculum.

**Recommendations**

1. Faculty teaching the Natural World GE courses could pay closer attention to the way basic principles, concepts and limitations of life and physical sciences are addressed.

2. Rethink the way SLOs are phrased, perhaps articulate in more specific terms

3. Ensure that faculty are incorporating SLOs on the Syllabus and make these goals clear to students.

**Purpose**

The purpose of this assessment was to evaluate how well the student learning outcomes (SLO) are accomplished through courses designated to meet the Natural World breadth requirement.

**Method and Procedure**

A. Natural World Student Learning Outcomes

The following are student learning outcomes identified for the Natural World breadth area:

**Learning Outcome I: Demonstrate an understanding of the basic principles, concepts, discovery process, power, and limitations of the life and/or physical sciences (Knowledge)**

Elements to look for:

1. Demonstrate knowledge and understanding of basic principles and concepts of science

2. Demonstrate knowledge and understanding of discovery processes and methods of science

3. Demonstrate knowledge and understanding of the power and limitations of sciences

**Learning Outcome II: Apply the principles, concepts, and methods of the life and /or physical sciences to everyday life (Application)**

Elements to look for:

4. Apply principles and concepts of science to everyday life

5. Apply discovery methods of science to everyday life

**Learning Outcome III: Demonstrate an understanding of the roles of science and technology in society and their impact on the sustainability of the planet (Sustainability)**

Elements to look for:

6. Identify and evaluate role of science and technology in society and on quality of life

7. Identify and evaluate impact of science and technology on sustainability of the planet

B. GE Assessment Team

The General Education Committee identified Dr. Kat Weaver, Professor of Biology, as the lead person to conduct the assessment. The other team members were, Dr. Denise Kennedy, Assistant Processor of Education, and Dr. Paul Alvarez, Professor of Movement and Sports Science

C. Targeted Courses

From the schedule of Spring 2012 the following ten courses were targeted:

1. Biology 101: Life Science: The Human Environment (one section)

2. Biology 204: Plant Biology

3. Biology 205: Animal Biology

4. Chemistry 103: Introduction to Chemistry (one section)

5. Chemistry 280: Topics in Modern Chemistry

6. Chemistry 303: Energy Issues

7. Natural Science 102: Physical Science: The Human Environment (one section)

8. Physics 105: Introduction to Physics

9. Physics 203: Energy Issues

10. Physics 204: Electricity and Magnetism

D. Types of Student Work

The following types of student work were used to evaluate the learning outcomes:

1. Final exams

2. Tests

3. Quizzes

4. Group projects

5. Reflective Essays

6. Laboratory Reports

7. Review papers

E. Assessment tool

**1. Direct measure:** A 5-point rubric was developed to assess the three student learning outcomes (Appendix A). The rating scale ranged from zero to four: 0 = Missing/Incorrect, 1 = Undeveloped, 2 = Developing, 3 = Developed, and 4 = Accomplished. Several elements in each of the SLOs were identified to assist in the evaluation process.

**2. Indirect measure:** The College Senior Survey, which La Verne administers periodically, has several items that address the Natural World learning outcomes. Responses of seniors across the University from the 2009 and the 2012 administrations are compared, together with responses from peer private schools with medium selectivity. Responses of freshmen to the CIRP 2010 survey on common related questions are also presented for comparison, even though they represent a different cohort than the seniors.

F. Procedure

The faculty of the Natural Sciences Division decided that the faculty members whose courses were targeted would evaluate the GE SLOs in their courses. They were instructed at the start of the spring 2012 semester to select assignments, lab report, exams, etc. or relevant parts or aspects of such work that would best reflect the Natural World SLOs. For each student work they were asked to select a random number of students, such as alphabetically every third student, and evaluate their work using the rubric. Along with the rubric rating they were asked to provide the grade, points or percentage score the student earned on that work, or part of the work. In the one group project that was selected, the group report was considered as a single piece of student work. Faculty members were informed that the findings would be blind to students and blind to faculty.

There were instances where the same student’s work was evaluated for multiple SLO’s, and there were instances where an assignment was used for the assessment of a single SLO. Thus, the unit of analysis was the instance of assessment rather than the student.

**Analysis and Findings**

Direct Measure

Altogether, there were 292 instances of assessments of student learning outcomes. There were 102 instances of assessment of SLO I, 86 instances of SLO II, and 104 instances of SLO III (See Table 1). Appendix B shows the courses, types of assignment or student work used, and the rubric ratings for each of the three SLOs.

To partially determine the reliability of the rubric ratings, the accompanying grades (percentage scores) were correlated with the ratings. Twenty-two pairs of rubric ratings and grades were randomly selected from each SLO, and Pearson’s bivariate correlation was conducted. The mean scores of the samples were also computed to establish the comparability of the samples to the total instances of assessments. As shown below, the mean scores were very comparable to the total means (Table 2). The correlations were highly significant without being perfect, ranging from .58 to .75, which would be expected since grades do incorporate other elements of content than what the SLOs stipulate:

SLO I: Sample mean = 2.50 (n = 22); total mean = 2.53 (n =102); r = .64, p < .01.

SLO II: Sample mean = 2.90 (n = 22); total mean = 2.91 (n = 86); r = .58, p < .01.

SLO III: Sample mean = 3.00 (n = 22); total mean = 3.16 (n = 104); r = .75, p < .001.

Table 1 Summarizes the percentages of the different degrees of accomplishment of student learning outcomes evaluated by the rubric. SLO III that deals with impact of technology and society on sustainability of the planet appears to have the highest level of accomplished rating (43%) followed by SLO II (37%) dealing with the application of science to everyday life, and SLO I (20%) dealing with acquisition of basic knowledge, principles and concepts.

To establish if the apparent differences were statistically significant, the two highest rubric rating categories were combined ( Developed and Accomplished) and tests of proportions were conducted comparing the three SLOs. The results as notes under Table 1 show that SLO II (66%) was not significantly different from SLO I (56%) and SLO III (71%). However, SLO III was significantly higher than SLO I in the proportion of assessed instances that received Developed and Accomplished ratings.

The comparisons using analysis of variance of the total mean rubric rating scores of the SLOs in Table 2 show the same patter of accomplishment. Table 2 also shows the mean rubric ratings of student work from 4 different science areas: Biology, Chemistry, Natural Science, and Physics.

While ratings in Chemistry show the same pattern as the total mean scores, the other areas do not show differences in the mean ratings of the SLOs.

Overall, while all three SLOs seem to be relatively well developed and accomplished, learning about the impact of technology and society on sustainability of the planet (SLO III), and the application of science to everyday life (SLO II) are somewhat higher, with two-thirds of student work (66% and 71%, respectively) achieving Developed or Accomplished levels. There appears to be room for improvement in SLO I dealing with understanding of basic principles, concepts, discovery process, power, and limitation of life and/or physical sciences (56% achieving a Developed or Accomplished rating).

Table 1

Percentage of different degrees of accomplishment of student learning outcomes (SLO) in the GE Natural World breadth requirement, Spring 2012

|  |  |  |  |
| --- | --- | --- | --- |
| **Rubric Scale** | **SLO I**  **Knowledge** | **SLO II**  **Application** | **SLO III**  **Sustainability** |
|  | N %  Instances | N %  Instances | N %  Instances |
| 0 = Missing/Incorrect | 8 8% | 2 2% | 0 0% |
| 1 = Undeveloped | 7 7% | 7 8% | 8 8% |
| 2 = Developing | 30 29% | 20 23% | 22 21% |
| 3 = Developed | 37 36% | 25 29% | 29 28% |
| 4 = Accomplished | 20 20% | 32 37% | 45 43% |
| Total | 102 100 % | 86 99% | 104 100% |

Notes:

1. N = Number of instances the SLO was assessed

2. Chi Square = 4.97 (df = 2), p < .10 (Combined rubric scales: 0, 1 and 2 VS 3 and 4)

3. Comparison of combined percentages of rubric scales 3 and 4 showed the following:

a) z = 1.41 (Not significant) for SLO I = 56% VS SLO II = 66%

b) z = 2.24 (p < .05) for SLO I = 56% VS SLO III = 71%

c) z = 0.75 (Not significant) for SLO II = 66% VS SLO III = 71%

Table 2

Means and standard deviations of 5-point rubric ratings (0 = Missing/incorrect; 4 = Accomplished) for student learning outcomes (SLO) by type of science classes that meet the GE breadth requirement in Natural World

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of Science Class** | **SLO I**  **Knowledge** | **SLO II**  **Application** | **SLO III**  **Sustainability** |  |
|  | N Mean (SD)  Instances | N Mean (SD)  Instances | N Mean (SD)  Instances | F/t |
| Biology | 47 2.48 (1.43) | 36 2.83 (1.14) | 45 3.13 (1.04) | F = 1.62 |
| Chemistry | 31 2.42 (.79) | 31 3.00 (1.08) | 31 3.32 (1.02) | F = 10.16\* |
| Natural Science | 5 2.60 (.49) | - - - | 9 3.44 (.83) | t = 1.92 |
| Physics | 19 2.79 (.69) | 19 2.89 (.85) | 19 2.84 (.59) | F = .23 |
| **Total** | **102 2.53 (1.12)** | **86 2.91 (1.06)** | **104 3.07 (.98)** | **F 37.65\*** |

\* p < .001

Notes

1. N = Number of instances SLO was evaluated by the rubric

2. Pairwise comparison test (HSD) of the **total** mean SLO scores as well as **Chemistry** mean SLO scores show:

SLO I VS SLO II Significant, p < .05

SLO I VS SLO III Significant, p < .05

SLO II VS SLO III Not significant

3. Mean SLO score differences for other programs are not significantly different

Indirect Measure

Table 3 summarizes the responses of La Verne seniors who responded to chosen related questions in 2009 and 2012 CSS, as well as responses from other peer private college with medium selectivity. The number of La Verne respondents to individual items varied from 245 to 317 across both years. The responses from other privates exceeded 3,000. These data should be taken to reflect the general impact of the curriculum, and not the impact of the targeted courses selected for this study. The responses of freshmen to the CIRP 2010 survey to related common questions are also presented for comparison even thought they are a different cohort.

From 2009 to 2012, there appears to be a noticeable increase among La Verne seniors in their satisfaction (Satisfied and Very Satisfied) with the GE or core curriculum, going from 72% to 89%. In the same period, the satisfaction among peer colleges seems have decreased form 86% to 75%. Such a positive shift in satisfaction with the GE program is encouraging to see since the 2012 group of seniors would have graduated mostly under the new general education curriculum, giving the new GE their stamp of approval.

A similar positive shift (from 65% to 79%) is also noticeable in the general satisfaction with science and mathematics courses from 2009 to 2012. While this is complimentary, the reasons for such a shift are worth exploring further, perhaps by using course evaluations.

Positive shifts are also noticeable on the sustainability items of the CSS. There is an increase from 23% to 41% in the percentage of seniors who considered essential or vary important to become involved in programs to clean up the environment. However, the percentages are on the low side. A similar trend is also present among the peer colleges. Among the 2010 La Verne freshmen, a somewhat lower percentage (30%) endorse this statement compared to the 2012 senior cohort.

On the more personalized question, around 60% of La Verne students in both years considered essential or very important to personally adopt “Green” practices. Around 50% of peer colleges had similar responses. Again, the 2010 La Verne freshman cohort score lower on this item compared to the two 2009 and 2012 seniors.

On the behavioral (supplemental) question, 58% in 2009 and 72% in 2012 indicate they often or very often act in ways that helps sustain a healthy environment including purchasing, transportation, and waste disposal. It is encouraging to see six to seven out of ten seniors report sustainable behavior, suggesting the possible impact of exposure to courses or general campus practices regarding sustainability. Again, the 2010 freshmen score somewhat lower then the 2012 seniors (64%).

In a consistent fashion in both years, high percentage of seniors strongly or somewhat agree that addressing global warming should be a federal priority, 79% and 73%, respectively. Here too the 2010 freshmen score somewhat lower (64%).

Overall, lower scores by the freshmen on the sustainability questions compared to seniors (even though they are not the same cohort) suggests some gains in the sustainability aspects of the student learning outcomes as students are exposed to La Verne’s curriculum related to the Natural World learning requirements. Attempted freshmen-senior matched comparison did not yield adequate sample size to make such comparison meaningful (Ns were around 10 to 15).

**Recommendations**

1. Faculty teaching the Natural World GE courses could pay closer attention to the way basic principles, concepts, and limitations of life and physical sciences are addressed.

2. Rethink the way SLOs are phrased, perhaps articulate in more specific terms.

3. Ensure that faculty are incorporating SLOs on the syllabus and make these goals clearer to students.

Table 3

Percentage of responses to the **2009 and 2012 College Senior Survey (CSS)** **and CIRP 2010 Freshman survey** questions related to science, and sustainability by La Verne seniors and seniors from other private colleges of medium selectivity; La Verne respondent Ns to these questions varied 245 – 317 across both years for seniors and the Freshman

Seniors Freshman

CSS 2009 CSS 2012 CIRP 2010

La Verne (Other Privates) La Verne (Other Privates) La Verne

General GE and Science/Math

1. How satisfied are you with GE or Core Curriculum?

Very Satisfied/Satisfied 72% (86%) 89% (75%) \_\_

2. How satisfied are you with Science and Mathematics courses?

Very Satisfied/Satisfied 65% (64%) 79% (60%) \_\_

Sustainability

3. How important is it for you personally to become involved in programs to clean up the environment?

Essential/Very Important 23% (22%) 41% (33%) 30%

4. How important is it for you personally adopting “green” practices to protect the environment?

Essential/Very Important 62% (55%) 57% (49%) 45%

5. How often do you act in ways that helps sustain a healthy environment such as purchasing, transportation, and waste disposal (La Verne Supplemental Question)?

Often/Very Often 58% 72% 64%

6. Addressing global warming should be a federal priority

Agree Strongly/Somewhat 79% (81%) 73% (66%) 64%

Appendix A

Rubric

**University of La Verne**

**GE Assessment**

**Natural World**

**Rubric**

1-11-12

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student**  **Learning Outcomes** | **4**  **Accomplished** | **3**  **Developed** | **2**  **Developing** | **1**  **Undeveloped** | **0**  **Missing/Incorrect** |
| **SLO I: Demonstrate and understanding of the basic principles, concepts, discovery process, power, and limitations of the life and/or physical sciences** |  |  |  |  |  |
| **Element 1. Demonstrate knowledge and understanding of basic principles and concepts of science** | Describes **completely and correctly** scientific terms, facts, concepts, principles, and theories | Describes **mostly completely and correctly** scientific terms, facts, concepts, principles, and theories | Describes **somewhat completely and correctly** scientific terms, facts, concepts, principles, and theories | Describes **minimally or correctly** scientific terms, facts, concepts, principles, and theories | All descriptions of scientific terms, facts, concepts, principles, and theories are **missing and/or incorrect** |
| **Element 2. Demonstrate knowledge and understanding of discovery processes and methods of science** | **Clearly** describes the advantages and disadvantages of various discovery processes/methods, their underlying assumptions, and **readily matches** the appropriate design to the problem at hand | Able to **assess the appropriateness** of research designs for a variety of situations, settings or problems, and can **apply or use simple processes or methods** in uncomplicated cases | Recognizes **readily** inappropriate design applications, and the need for different processes for different situations, but **requires considerable guidance** in determining appropriate methods | Recognizes **minimally** the advantages and disadvantages of different processes, assumptions required or  how the problem affects the choice of process and method | Assumes **all research is alike** or that one method is as good as another, and **completely misses** the need to match the method and the process to a problem |
| **Element 3. Demonstrate knowledge and understanding of the power and limitations of science** | **Thoroughly analyzes and describes** the strengths and limitations of scientific processes and methods to understanding and influencing the natural world | **Able to identify** strengths and limitations of **most** scientific processes and methods to understanding and influencing the natural world | **Recognizes the need** for variety of ways of understanding and influencing the natural world, and **somewhat** able to evaluate the strengths and limitations of alternative process and methods | Has **considerable difficulty evaluating** strengths and limitations of scientific processes and approaches in understanding and influencing the natural world | **Is incapable of** identifying strengths and limitations of alternative scientific process and methods |
| **SLO II: Apply the principles, concepts, and methods of life and/or physical sciences to everyday life** |  |  |  |  |  |
| **Element 1. Apply principles and concepts of science to everyday life** | Applies **expertly and with ease and accuracy** scientific concepts and principles to guide everyday decisions and actions | Applies **quite well** scientific concepts and principles to guide **most instances** of everyday decisions and actions | Applies with  **occasional inaccuracy** scientific concepts and principle to everyday decisions and actions | Has **considerable difficulty** seeing how scientific concepts and principles can be applied to everyday decisions and actions | Is **unable to seeing relationships** of scientific concept and principles to everyday decisions and actions |
| **Element 2. Apply discovery methods of science to everyday life** | Applies **expertly and with ease and accuracy** scientific methods to guide everyday decisions, and actions | Applies **quite well** scientific methods to guide **most instances** of everyday decisions and actions | Applies with  **occasional inaccuracy** scientific methods o everyday decisions and actions | Has **considerable difficulty** seeing how scientific methods can be applied to everyday decisions and actions | Is **unable to seeing relationships** of scientific methods to everyday decisions and actions |
| **SLO III: Demonstrate an understanding of the roles of science and technology in society and their impact on the sustainability of the planet** |  |  |  |  |  |
| **Element 1. Identify and evaluate role of science and technology in society and on quality of life** | **Identifies and evaluates in depth** the role of science and technology in addressing quality of life issues (i.e. reduced poverty, improved health, increased food production, population control) and **articulates multiple aspects** of issues | **Identifies and evaluates the general** role of science and technology in addressing quality of life issues (i.e. reduced poverty, improved health, increased food production, population control) and **articulates some aspects** of issues | **Identifies with some difficulty and evaluates partially the general** role of science and technology in addressing quality of life issues (i.e. reduced poverty, improved health, increased food production, population control) and **articulates some aspects** of issues | **Has considerable difficulty identifying and evaluating** therole of science and technology in addressing quality of life issues (i.e. reduced poverty, improved health, increased food production, population control) and **does not articulates any aspects** of issues | Is **unable to identify or evaluate** the role of science and technology in addressing quality of life issues (i.e. reduced poverty, improved health, increased food production, population control) |
| **Element 2. Identify and evaluate impact of science and technology on sustainability and environmental challenges of the planet** | **Identifies and evaluates in depth** the scientific basis for concerns over environmental problems (i.e. pollution, deforestation, global warming) and **recognizes the role and limitations** of science and technology in addressing the problems | **Identifies and evaluates in general** the scientific basis for concerns over environmental problems (i.e. pollution, deforestation, global warming) and **generally recognizes the role and limitations** of science and technology in addressing the problems | **Identifies with some difficulty and evaluates partially** the scientific basis for concerns over environmental problems (i.e. pollution, deforestation, global warming) and **generally recognizes the role and limitations** of science and technology in addressing the problems | **Has considerable difficulty identifying** the scientific basis for concerns over environmental problems (i.e. pollution, deforestation, global warming) and **see a limited role** for science and technology in addressing the problems | **Does not recognize** or **is suspicious** of the scientific basis for concerns over environmental problems (i.e. pollution, deforestation, global warming) and **sees no role** for science and technology in addressing the problems |

Appendix B

Rubric Ratings of Individual Instances of Student Work

G.E. Natural World Requirement

Rubric-based Assessment of Three Student Learning Outcomes

Raw Data

Spring 2012

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Instances of assessment**  **or**  **students** | **Course** | **Type of Assignment** | **SLO I** | **SLO II** | **SLO III** |
| 1 | Physics 105 | Final Exam | 1 | 1 | 2 |
| 2 | “ | “ | 3 | 4 | 3 |
| 3 | “ | “ | 2 | 2 | 3 |
| 4 | “ | “ | 3 | 3 | 3 |
| 5 | “ | “ | 3 | 3 | 3 |
| 6 | “ | “ | 2 | 2 | 2 |
| 7 | “ | “ | 3 | 3 | 3 |
| 8 | “ | “ | 3 | 4 | 3 |
| 9 | “ | “ | 2 | 2 | 2 |
| 1 | Physics 203 | Group Project | 3 | 3 | 3 |
| 2 | “ | “ | 3 | 3 | 3 |
| 3 | “ | “ | 3 | 3 | 3 |
| 4 | “ | “ | 3 | 3 | 3 |
| 5 | “ | “ | 3 | 3 | 3 |
| 6 | “ | “ | 2 | 2 | 2 |
| 1 | Physics 204 | Final Exam | 4 | 4 | 3 |
| 2 | “ | “ | 4 | 2 | 4 |
| 3 | “ | “ | 3 | 4 | 2 |
| 4 | “ | “ | 3 | 4 | 4 |
| 1 | Chem 103 | Final Exam | 4 | 4 | 4 |
| 2 | “ | “ | 2 | 3 | 4 |
| 3 | “ | “ | 3 | 4 | 4 |
| 4 | “ | “ | 2 | 3 | 4 |
| 5 | “ | “ | 4 | 4 | 4 |
| 6 | “ | “ | 2 | 4 | 4 |
| 7 | “ | “ | 3 | 3 | 1 |
| 8 | “ | “ | 1 | 4 | 4 |
| 9 | “ | “ | 2 | 0 | 4 |
| 10 | “ | “ | 4 | 4 | 4 |
| 1 | Chem 280 | Quiz | 3 | 3 | 4 |
| 2 | “ | “ | 2 | 4 | 4 |
| 3 | “ | “ | 3 | 4 | 4 |
| 4 | “ | “ | 1 | 2 | 3 |
| 5 | “ | “ | 3 | 3 | 3 |
| 6 | “ | “ | 2 | 4 | 4 |
| 7 | “ | “ | 3 | 2 | 1 |
| 8 | “ | “ | 2 | 4 | 4 |
| 1 | Chem 303 | Quiz | 2 | 3 | 4 |
| 2 | “ | “ | 3 | 4 | 3 |
| 3 | “ | “ | 2 | 1 | 1 |
| 4 | “ | “ | 2 | 2 | 2 |
| 5 | “ | “ | 2 | 1 | 2 |
| 6 | “ | “ | 1 | 2 | 3 |
| 7 | “ | “ | 2 | 2 | 4 |
| 8 | “ | “ | 3 | 2 | 2 |
| 9 | “ | “ | 2 | 4 | 4 |
| 10 | “ | “ | 3 | 3 | 2 |
| 11 | “ | “ | 2 | 4 | 4 |
| 12 | “ | “ | 2 | 3 | 4 |
| 13 | “ | “ | 3 | 3 | 4 |
| 1 | NASC 102 | Test | 2 | - | - |
| 2 | “ | “ | 3 | - | - |
| 3 | “ | “ | 3 | - | - |
| 4 | “ | “ | 3 | - | - |
| 5 | “ | “ | 2 | - | - |
| 1 | NASC 102 | Essay | - | - | 3 |
| 2 | “ | “ | - | - | 2 |
| 3 | “ | “ | - | - | 4 |
| 4 | “ | “ | - | - | 4 |
| 5 | “ | “ | - | - | 4 |
| 6 | “ | “ | - | - | 4 |
| 7 | “ | “ | - | - | 2 |
| 8 | “ | “ | - | - | 4 |
| 9 | “ | “ | - | - | 4 |
| 1 | BIO 101 | Exam Quest. | 3 | 2 | 3 |
| 2 | “ | “ | 2 | 4 | 4 |
| 3 | “ | “ | 2 | 2 | 2 |
| 4 | “ | “ | 4 | 1 | 3 |
| 5 | “ | “ | 3 | 1 | 2 |
| 6 | “ | “ | 2 | 2 | 4 |
| 7 | “ | “ | 2 | 3 | 4 |
| 8 | “ | “ | 3 | 2 | 2 |
| 9 | “ | “ | 2 | 2 | 4 |
| 10 | “ | “ | 2 | 2 | 1 |
| 11 | “ | “ | 2 | 2 | 2 |
| 12 | “ | “ | 3 | 3 | 4 |
| 13 | “ | “ | 1 | 2 | 2 |
| 14 | “ | “ | 2 | 3 | 2 |
| 1 | BIO 204 | Assignment | 4 | - | - |
| 2 | “ | “ | 4 | - | - |
| 3 | “ | “ | 4 | - | - |
| 4 | “ | “ | 0 | - | - |
| 5 | “ | “ | 4 | - | - |
| 6 | “ | “ | 4 | - | - |
| 7 | “ | “ | 1 | - | - |
| 8 | “ | “ | 0 | - | - |
| 9 | “ | “ | 4 | - | - |
| 10 | “ | “ | 3 | - | - |
| 11 | “ | “ | 0 | - | - |
| 1 | “ | Final Exam | 4 | - | - |
| 2 | “ | “ | 4 | - | - |
| 3 | “ | “ | 4 | - | - |
| 4 | “ | “ | 0 | - | - |
| 5 | “ | “ | 4 | - | - |
| 6 | “ | “ | 4 | - | - |
| 7 | “ | “ | 4 | - | - |
| 8 | “ | “ | 0 | - | - |
| 9 | “ | “ | 4 | - | - |
| 10 | “ | “ | 4 | - | - |
| 11 | “ | “ | 0 | - | - |
| 1 | “ | Lab Report | - | 4 | - |
| 2 | “ | “ | - | 3 | - |
| 3 | “ | “ | - | 4 | - |
| 4 | “ | “ | - | 1 | - |
| 5 | “ | “ | - | 3 | - |
| 6 | “ | “ | - | 4 | - |
| 7 | “ | “ | - | 1 | - |
| 8 | “ | “ | - | 0 | - |
| 9 | “ | “ | - | 4 | - |
| 10 | “ | “ | - | 4 | - |
| 11 | “ | “ | - | 3 | - |
| 1 | “ | Final Exam | - | - | 4 |
| 2 | “ | “ | - | - | 3 |
| 3 | “ | “ | - | - | 4 |
| 4 | “ | “ | - | - | 4 |
| 5 | “ | “ | - | - | 3 |
| 6 | “ | “ | - | - | 4 |
| 7 | “ | “ | - | - | 4 |
| 8 | “ | “ | - | - | 1 |
| 9 | “ | “ | - | - | 4 |
| 10 | “ | “ | - | - | 2 |
| 11 | “ | “ | - | - | 3 |
| 1 | BIO 205 | Final Exam | 3 | - | - |
| 2 | “ | “ | 1 | - | - |
| 3 | “ | “ | 3 | - | - |
| 4 | “ | “ | 3 | - | - |
| 5 | “ | “ | 3 | - | - |
| 6 | “ | “ | 0 | - | - |
| 7 | “ | “ | 3 | - | - |
| 8 | “ | “ | 0 | - | - |
| 9 | “ | “ | 3 | - | - |
| 10 | “ | “ | 2 | - | - |
| 11 | “ | “ | 3 | - | - |
| 1 | “ | Exper. Report | - | 4 | - |
| 2 | “ | “ | - | 3 | - |
| 3 | “ | “ | - | 4 | - |
| 4 | “ | “ | - | 4 | - |
| 5 | “ | “ | - | 4 | - |
| 6 | “ | “ | - | 3 | - |
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| 1 | “ | Lab Exam | - | - | 1 |
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| 15 | “ | “ | - | - | 3 |
| 16 | “ | “ | - | - | 4 |
| 17 | “ | “ | - | - | 3 |
| 18 | “ | “ | - | - | 4 |
| 19 | “ | “ | - | - | 2 |
| 20 | “ | “ | - | - | 3 |
|  |  |  |  |  |  |
| **N = 292** | **N = 10** | **N = 9** | **N = 102** | **N = 86** | **N = 104** |
|  |  |  | **Mean = 2.45** | **Mean = 2.87** | **Mean = 2.99** |