Annual Assessment Report

Department: General Education
Academic Year: 2017-2018
Date of Submission:
Department Chair: Paul Delaney. Committee members: Michelle Hardley, Jana Mayfield Mullen, Tatiana Nazarenko, Steve Rogers and Rachel Winslow.

I. Response to the previous year PRC's recommendations

Item:	**Response:** Both assessors awarded the "Highly-Developed" scores in all rubric categories for the 2017 GE Annual Assessment Report. No recommendations were made.
Notes: We appreciated the reviewers' attention to our report and their high grade for our assessment work.	

II A. General Education Learning Outcome (GELO) assessment

GELO	Students will generalize how the scientific method can be used to investigate the physical and living world.
Who is in Charge /Involved?	Steve Rogers; BNS department chairs; faculty teaching courses fulfilling the GE Exploring the Physical Science or Exploring the Life Science requirements, General Education Committee.
Direct Assessment Methods	In 2017-2018, students in five courses fulfilling both GE areas completed a Student Learning Outcomes Assessment Quiz (see Appendix 1) based on a National Science Foundation Quiz. This quiz was selected in consultation with the department chairs of Biology, Chemistry, Kinesiology, and Psychology (the department chair for Physics elected not to participate). Portions of this quiz were used in the 2007-2008 Exploring the Physical Science GE Assessment. The first five items of the quiz, which are knowledge-based, were designed to assess students' basic understanding of the nature of science, also allowing for a determination of how well students understand the scientific method. Items 6 and 7 were intended to assay students' ability to interpret graphical data, and the last set of items (8-10) assessed students' ability to read and interpret general science articles. The last five items were skills/applied assessments that examine how well students can generalize the scientific method to investigate the physical and living world.

	In the fall of 2017, this quiz was administered in LS-012: Introduction to Life Science and the lab section of CHN-005: General Chemistry I. In the spring of 2018, it was administered in two sections of PSY-001: General Psychology and one section of LS-012: Introduction to Life Sciences. CHM-005: General Chemistry I is a course that fulfills the GE criteria for Exploring the Physical Sciences, whereas PSY-001 General Psychology and LA-012: Introduction to Life Sciences are courses that fulfill GE criteria for Exploring the Life Sciences. A total of 377 students completed the quiz, which constitutes 60% of all students enrolled in the Exploring the Physical/Life Science courses in the 2017-2018 academic year. Of these, 191 were women, and 120 were men (the gender for 66 were not provided). The majority (47%) were first-year students, followed by sophomores (16%), juniors (6%), and seniors (5%), with remaining students not having information about class rank available.
Indirect Assessment Methods	In Spring 2018, the GE Committee developed and administered the GE Senior Survey (see Appendix 2). The Committee received complete respopnses from 158 senior students, which constitutes 45% of all senior students graduated in the 2017-2018 academic year. The survey respondents represented all college majors except Data Analytics, English-Modern Languages, European Studies, French and Physics. Students majoring in Engineering Physics participated in the survey. Below is the information about the survey participants' major distribution: •Economics & Business – 14% •Kinesiology – 12% •Psychology – 12% •Biology – 11% •English – 11% •Liberal Studies – 6% •Art – 4% •Sociology – 4% •History – 3% •Computer Science – 3% •All other programs – 20% 11% of respondents came to Westmont as transfer students.

Major Findings Direct Assessment Methods

The direct assessment findings are presented in *Table 1* and *Table 2*.

Table 1: Items 1 and 2

	True	False	Missing
1. The scientific method *does not* require experimental results to support a theory	33 (8.75%)	**343 (91%)**	1 (.27%)
2. An experiment that does not produce the predicted results is flawed and the results always should be discarded.	6 (1.59%)	**370 (98.14%)**	1 (.27%)

Note. Correct responses are highlighted in bold.

Table 2: Items 3-5

	a	b	c	d
3. Which of the following statements best describes a scientific theory?	A theory is a highly tentative form of scientific knowledge and has little evidence to support it. 21 (5.57%)	**A theory is one of the highest forms of scientific knowledge and an established theory has a great deal of evidence to support it.** **259 (68.70%)**	A theory is an initial guess that a scientist makes in order to understand a particular phenomenon. 96 (25.46%)	Science is concerne with facts, and theo have no place in sci 0 (0%)
4. Which of the following statements most closely characterizes scientific work?	Science is deductive (it proceeds in a logical manner from initial statements or facts to final conclusions). 53 (14.05%)	Science can address all kinds of questions (including questions concerning ultimate meaning, beauty, and morality). 23 (6.10%)	Science relies *primarily* on the intuition of scient*i*sts. 4 (1.06%)	**Science is empirical relies on observatio experiment to supp ideas).** **296 (78.51%)**
5. Which of the following best describes a scientific law (such as the law of conservation of energy)?	Scientific laws represent absolute truth and once established can never be falsified. 57 (15.12%)	**Scientific laws are generalizations made from observations and have great predictive power.** **80 (21.22 %)**	Scientific laws provide fundamental reasons and explanatory underlying mechanisms for observations. 240 (63.66%)	

Note. Correct responses are highlighted in bold.

Commented [1]: It might be helpful to say here that the correct responses are in bold type.

As delineated in Tables 1 and 2, the vast majority of students provided correct responses on items 1-4. The only item on which the majority of students endorsed the wrong response was item 5. The Life and Physical Science faculty conjectured that this might be because students are confused about the differences between a theory and a law, or between a hypothesis and law. Overall, however, students in Exploring Physical and Life Science courses seem to well understand the nature of science.

Descriptive statistics for items 6-7, which assess students' ability to interpret graphical data, are presented in Figures 1 and 2. The majority of students selected the correct response to both items (items d and c, respectively).

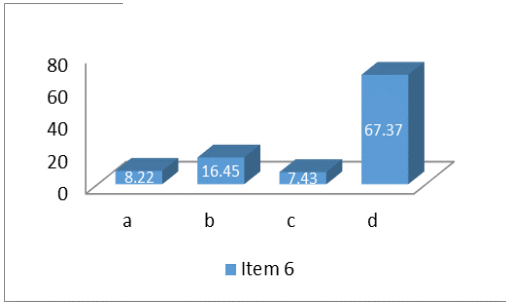

Figure 1.

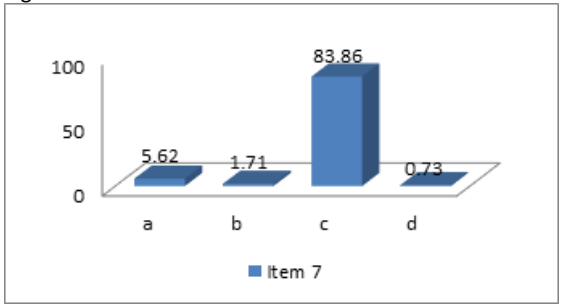

Figure 2.

Students in the GE Exploring the Life and Physical Sciences courses seem capable of interpreting scientific data presented in graphic form.

Reading and Interpreting General Science Articles

Descriptive statistics for items 8-10, which assess students' ability to read and interpret general science articles, are presented in Figures 3-5.

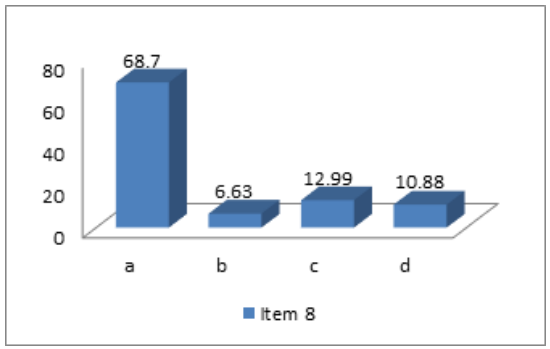

Figure 3.

Commented [2]: Not sure what's going on here with the data scramble

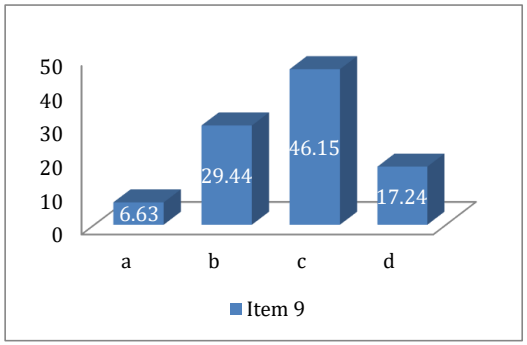

Figure 4.

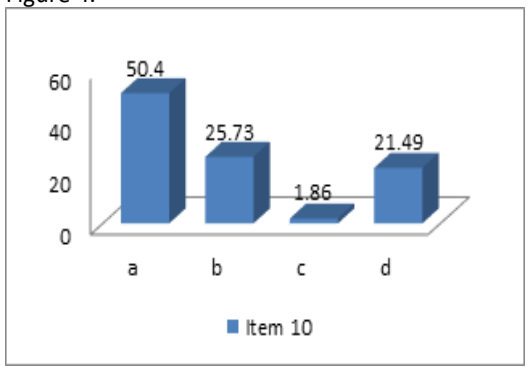

Figure 5.

The majority of students provided correct responses to items 8 and 9 (responses a and c, respectively, were correct), but not item 10 (response b was correct). The Life and Physical Science faculty conjectured that this might be because students did not carefully read the article, got confused with the concepts, did not have an example of an exemplary response, or struggled to critically extrapolate implications from the article findings. Based on responses to items 8 and 9, however, students in Exploring Physical and Life Science courses seem to be somewhat adept at reading and interpreting information in scientific articles.

Major Findings Indirect Assessment Methods	The GE Exploring the Physical /Life Science areas were mentioned in student responses to seven survey questions out of 14. More specifically, 7 % of respondents (n=140) mentioned the courses fulfilling these GE areas in response to Question 4, "Are there any GE courses that should be dropped?" The major concern of those respondents was the requirement to fulfill both areas instead of one. 10% of respondents (n=148) named science courses in response to Question 5, "Which GE courses in your mind, stand out as a waste of time?" Student comments included course irrelevance to the respondents' major; the requirement to fulfill both areas rather than choosing one; rote memorization; and narrow disciplinary focus. 6% of students (n=148) mentioned science courses in response to Question 6, "Which GE courses, if any, stand out in your mind as particularly valuable." Respondents named predominantly to Astronomy and Psychology courses and stated that those courses were enlightening and fascinating and that they have learned a lot by taking them. 7% of respondents (n=145) found science courses "unreasonably difficult" (Question 7), and 20% of the students who responded positively to Question 8 (n=59) named science courses as "more geared to prospective majors than to the education of students not planning to major in that filed." 18% of respondents -- out of 34 students who admitted that had to delay taking a GE class because it was not offered during the year they wanted to take it -- mentioned science courses (Question 11). 5% of students out of 42 stated that they were not able to take a science course because no space was available by the time they registered (Question 12). 6% of students (n=158) named science courses as their outside of major favorites, Astronomy and Psychology courses being mentioned more often than other science courses. The GE Committee discussed the survey results and concluded that it would be difficult to draw any meaningful conclusions given the number of responses relevant to the Exploring the Physical Scieces and Exploring Life Sciences areas. The Committee is pleased that the survey did not reveal any glsaring issues concerning the aforementioned areas.
Closing the Loop Activities	Based on these findings, the Life and Physical Sciences faculty are comfortable saying that students in Exploring Physical and Life Science courses "generalize how the scientific method can be used to investigate the physical and living world." Students in these courses seem to well understand the nature of science and the scientific method. They can effectively interpret scientific data presented in graphic form, and they are somewhat adept at reading and interpreting information in scientific articles. In general, students in the courses assessed seem more competent in interpreting visual or graphical data than reading and interpreting scientific writing. There were no statistical differences in responses between men and women in their responses to any items on the quiz (p >.05) or between those in the various courses of the Life and Physical Sciences (p >.05) suggesting equivalent competency in knowledge about the scientific method and its application and generalization toward investigating the physical and living world. Considering these findings, instructors who teach courses that fulfill the GE criteria for Exploring the Physical and/or Life Sciences should be encouraged that their courses are fulfilling the Student Learning Outcomes. The two areas for student improvement are (a) understanding the difference between a theory and a law, or between a hypothesis and a law, and (b) extrapolating implications and conclusions from scientific articles or writing. To address these areas of weakness,

	instructors for courses that fulfill the GE criteria for Physical and/or Life Sciences can devote greater time to delineating differences between theories, hypotheses, and laws, both in conceptual understanding and application. It is also recommended that instructors help students more critically extrapolate implications and conclusions from scientific articles (e.g., reviewing studies in class, requiring assignments that require careful reading and extrapolation of scientific conclusions and implications). At this time, the department chairs of Biology, Chemistry, Kinesiology, and Psychology are not recommending any changes to the GE Student Learning outcome.
Collaboration and Communication The findings were discussed by faculty teaching the courses fulfilling Exploring the Physical and Life Science requirements, presented to the GE Committee on September 4 and discussed by the Committee on October 16, 2018.	

or/and

II B. Key Questions

Key Question	How effective is the GE curriculum from the perspective of graduating seniors?
Who is in Charge/Involved?	GE Committee members
Direct Assessment Methods	
Indirect Assessment Methods	The GE Committee developed and administered the GE Senior Survey in the spring of 2018; 158 graduating seniors provided complete responses to this survey. The Committee members are in the process of reviewing and interpreting the survey data and discussing its results with selected department chairs. They will report their finding in the next GE Annual Assessment Update report.
Major Findings	
Recommendations	

V. Adjustments to the Multi-year Assessment Plan (optional)

Proposed adjustment	Rationale	Timing

VI. Appendices

A. Appendix 1: Exploring the Physical and Life Science SLO Assessment Quiz
B. Appendix 2: 2018 General Education Survey Questions.