Assessment of Student Learning Outcomes in General Education
Summary Report
GER 2 – The Natural Sciences

Use this form to provide a summary report on campus-based assessment of student learning outcomes in General Education

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GER (name and #): Natural Sciences (GER 2) **Academic Year:** 2019-2020

Submitted by: William Rivers (coordinator)

Improvements Made as a Result of Previous Assessment

1. What program improvements in curriculum and/or teaching were made as a result of the previous assessment of General Education? If no program improvements were made, please provide a rationale for why recommendations made in previous assessment report were not implemented.

Response: Three courses (BIOL209, CHEM150, and ENVS101) used course-embedded assessments of Outcome 1 rather than a uniform set of 15-questions. This required a change in teaching of these courses to more explicitly teaching the scientific method, hypothesis generation, and data analysis. The remaining 9 courses used the previously utilized generalized quiz that is not course specific.

Deviations from Approved Methodology

2. Were there any significant deviations from the GER assessment plan that was approved by the Academic Assessment Committee? If so, please comment on why these changes were necessary and how these changes may have affected the reported results, if at all.

Response: There were no deviations from the approved assessment plan.

Major Findings of this Asselssment

3. What are the major findings for the assessment of all GER SLOs assessed? Please include a narrative outlining these findings and an interpretation of these results in addition to completing the table.

Assessment Results

Previous Cycle's Assessment Results:

SLO	# Students Assessed	% Exceeding Standards	% Meeting Standards	% Not Meeting Standards
1. An understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.	683	43	23	34
2.An understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines of the course.	846	32	29	38

Current Cycle's Assessment Results:

SLO	# Students Assessed	% Exceeding Standards	% Meeting Standards	% Not Meeting Standards
1. An understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.	656	30	34	37
2. An understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines of the course.	732	40	36	24

Assessment Results Narrative and Interpretation

Response: The Science Faculty assessed 12 courses for objective one and two (Table 1). Objective one was assessed using a 15 questions multiple-choice test addressing the scientific method, or various assessment tools embedded in courses. The goal was for 70% of students to reach 70% or higher. There were 656 students assessed and 64 % met or exceeded standards. Objective two was assessed using course embedded questions on the final exam. Again, the goal was for 70% of students to score 70% or higher on the final exam. There were 732 students assessed and 76% met or exceeded standards (Table 1). The results of this assessment indicate that students do not, on average meet the goal of the Student Learning Outcome 1 (on the scientific method) but do meet the goal of Outcome 2 (on generalized discipline knowledge) although there is large variation. SLO1 had a met or exceeded range from a low of 24% to a high of 87%. SLO 2 had a met or exceeded range from a low of 45% to a high of 96%.

Compared with the previous cycle, on average, there was a slight improvement for both outcomes. Interestingly, all three courses that embedded the assessment tool for outcome 1 in their courses had worse outcomes compared with the previous assessment. Explanations for this are not immediately clear and will be investigated and discussed. One reasonable hypothesis is that the embedded assessment tools for SLO1 are more difficult than the general tool. Another is that students actually have a clearer (less muddied) ability to answer the scientific methodology questions when presented with a novel situation without prior experience. These and other ideas will be discussed as part of a taskforce (see No. 7 below).

Recommendations for Improvement in Student Learning

4. Based on the assessment results, what changes to curriculum and/or teaching should be made to improve student learning?

Response: Several changes to curriculum and teaching have been identified as a result of this assessment (Table 2 below). These include: revising assessment tools, adding new instructional units and videos on scientific methodology, and employing software to better insure academic integrity, and adding project-based learning.

5. Based on the assessment results, what other resources, if any, are needed to improve student learning? Please check all that apply and include a rationale below (academic support services, equipment, software, etc.)

☒ Academic support services (tutoring, accommodative services, etc.)	☐ Classroom equipment needed	☒ Software needed	☐ Other (please specify below)

Response: Additional tutoring, especially in more advanced courses is recommended. For example, tutors are often not available for Biol 209 and 335. Continued institutional licensing of the software Respondus-Monitor LockDown browser is requested in order to maintain or improve academic integrity. This will help reduce suspected academic dishonesty on the online final exam in some classes (e.g. Biol 335).

Closing the Loop

6. What mechanisms are in place for documenting and sharing assessment results, closing the loop processes, and intended changes resulting from these assessment results?

Response: This report gets shared with faculty members who teach GER 2 courses and is posted on the online GER data repository. Standardized assessment report forms are fill out by most, but not all, faculty. Additionally, some (not all) faculty enter their course assessment data on TaskStream. A GER 2 assessment taskforce (see below) has formed and is investigating how to improve closing the loop processes.

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7. What closing the loop activities, such as ongoing professional development activities for faculty and staff, will be implemented as a result of these assessment results?

Response: The GER 2 Assessment Taskforce will reconvene and re-evaluate the assessment process with the intention of addressing the following questions: 1) Do faculty need more support to embed the assessment of outcome 1 into their courses? 2) Would doing so make the assessment process more meaningful and relevant (i.e. provide more useful information)? And 3) How can the assessment methodology be modified to better identify actionable items for course improvement and professional development? This last question is in response to the fact that several of the courses did not identify any changes to help improve the outcomes.

8. What changes to the assessment process should be made for the following cycle?

Response: The above-mentioned taskforce will be addressing this question in more detail and will be soliciting broader input from science faculty on how to improve the assessment process. What this taskforce will be focused on is how to best to generate more accurate, meaningful, and actionable assessment data. It is also the hope of this coordinator that the submission process of results (e.g. standard reporting form, artifacts, and TaskStream utilization) will be followed by most (all?) of the GER2 faculty.

Appendix A: Individual Course Results for GER 2 Outcomes 1 and 2

Table 1. GER 2 Assessment Data for Outcome 1 and 2 for 2019.								
Course	**Enrolled**	**Assessed**	**Exceeding**	**%**	**Meeting**	**%**	**Not Meeting**	**%**
BIOL 101								
Outcome 1	158	141	44	**31**	25	**18**	72	**51**
Outcome 2	158	141	39	**28**	68	**48**	32	**23**
BIOL 150								
Outcome 1	77	76	59	**78**	7	**9**	10	**13**
Outcome 2	77	76	30	**39**	25	**33**	21	**28**
BIOL 209								
Outcome 1	98	95	8	**8**	15	**16**	72	**76**
Outcome 2	98	96	12	**13**	56	**58**	28	**29**
BIOL 217								
Outcome 1	111	86	26	**30**	26	**30**	34	**40**
Outcome 2	111	104	50	**48**	18	**17**	36	**35**
BIOL 335								
Outcome 1	49	40	11	**28**	21	**53**	8	**20**
Outcome 2	49	46	21	**46**	23	**50**	2	**4**
CHEM 101								
Outcome 1	23	11	3	**27**	6	**55**	2	**18**
Outcome 2	23	18	11	**61**	5	**28**	2	**11**
CHEM 150								
Outcome 1	111	76	21	**28**	28	**37**	27	**36**
Outcome 2	111	111	19	**17**	31	**28**	61	**55**
ESCI 101								
Outcome 1	43	43	2	**4**	35	**80**	7	**15**
Outcome 2	43	43	6	**13**	32	**73**	6	**14**
PHYS 115								
Outcome 1	23	16	3	**19**	5	**31**	8	**50**
Outcome 2	23	22	8	**36**	6	**27**	8	**36**
PHYS 121								
Outcome 1	50	43	27	**63**	7	**16**	9	**21**
Outcome 2	50	46	27	**59**	8	**17**	11	**24**
PHYS 122								
Outcome 1	7	6	1	**17**	1	**17**	4	**67**
Outcome 2	7	6	3	**50**	2	**33**	1	**17**
PHYS 131								
Outcome 1	24	23	5	**22**	10	**43**	8	**35**
Outcome 2	24	23	15	**65**	4	**17**	4	**17**
Averages	Total Enrolled	Total Assessed						
Outcome 1	**774**	**656**		**30**		**34**		**37**
Outcome 2	**774**	**732**		**40**		**36**		**24**

Appendix B: Faculty Responses

Table 2.	**Recommended changes based upon assessment outcomes**
Course	**Changes?**
BIOL 101	
Outcome 1	None
Outcome 2	None
BIOL 150	
Outcome 1	None
Outcome 2	None
BIOL 209	
Outcome 1	Because of poor performance on question 31 concerning variation, I will be introducing a short unit on the concepts of precision vs accuracy when collecting and interpreting data.
Outcome 2	This final exam will be revised and require use of a LockDown Browser.
BIOL 217	
Outcome 1	I plan on completing a rewrite of the questions to make them course specific before the next assessment cycle, and I have also started incorporating discussions of important experiments in Anatomy and Physiology history explaining how they were set up and what was discovered to give students a better appreciation of how science works.
Outcome 2	I continue to change and improve the course semester by semester. I have now added interactive software based on the book with associated points to get students to use the material and work with it.
BIOL 335	
Outcome 1	An embedded course-content specific assessment tool will be used for assessing this outcome for the next cycle.
Outcome 2	This online final exam will be revised and require use of a LockDown Browser.
CHEM 101	
Outcome 1	82% of students met or exceeded expectations (the majority of students met, and nearly 1/3 exceeded). I will continue highlighting the important lessons about the scientific method and continue to answer student questions and help them to achieve understanding in this objective
Outcome 2	89% of students met or exceeded expectations (nearly 2/3 exceeding). This demonstrates the effectiveness of teaching tools used. I will continue offering narrated PowerPoints, demonstrations of important calculations, and being responsive to student inquiries and requests.
CHEM 150	
Outcome 1	Spend more time covering the Scientific Concepts in the course and applying these concepts into the lab assignments
Outcome 2	Offer more supplementary material on-line for students to review before and after class meets as well as labs, such as video demonstrations and tutorials

ESCI 101	
Outcome 1	Videos explaining the scientific method; linking scientific method to concepts in every module so that students' concepts are revised more frequently [will be added]
Outcome 2	Day to day examples of the concepts covered in the modules [and] constructivist methods using knowledge that students already have and build upon that understanding [will be added}.
PHYS 115	
Outcome 1	Based on this outcome, I plan to introduce project-based learning incorporated into the course as resources allow.
Outcome 2	Based on this outcome, I plan to introduce project-based learning incorporated into the course as resources allow.
PHYS 121	
Outcome 1	Based on this outcome, I plan to introduce project-based learning incorporated into the course as resources allow.
Outcome 2	Based on this outcome, I plan to introduce project-based learning incorporated into the course as resources allow.
PHYS 122	
Outcome 1	None
Outcome 2	None
PHYS 131	
Outcome 1	None
Outcome 2	None