EWU Programmatic SLO Assessment
AY 2014-15 and "Closing the Loop" for AY 2013-14

Introduction:

Assessment of student learning is an important and integrated part of faculty and programs. As part of ongoing program assessment at Eastern Washington University, each department is asked to report on assessment results for *each* program and *each* certificate for *at least one* Student Learning Outcome (SLO) this year. To comply with accreditation standards, the programs must also demonstrate efforts to "close the loop" in improving student learning and/or the learning environment. Thus, this template has been revised into two parts.

Resources:

Check this site for sample reports (created with the previous year's template) by EWU programs and other assessment resources: http://access.ewu.edu/undergraduate-studies/faculty-support/student-learning-assessment/program-slo-assessment.xml

Additional resources and support are available to:

1) Determine whether students can do, know or value program goals upon graduation and to what extent;
2) Determine students' progress through the program, while locating potential bottlenecks, curricular redundancies, and more; and
3) Embed assessments in sequenced and meaningful ways that save time.

Contact Dr. Helen Bergland for assistance with assessment in support of student learning and pedagogical approaches: hbergland@ewu.edu or 359.4305.

Use this template to report on your program assessment. **Reports are due to your Dean and to Dr. Helen Bergland (hbergland@ewu.edu), Office of Academic Planning, by Nov. 2, 2015.**

Degree/Certificate: BS

Major/Option: Biology
Submitted by: M. O'Connell
Date: 31 October 2015

Part I – Program SLO Assessment Report for 2014-15

Part I – for the 2014-15 academic year: Because Deans have been asked to create College-Level Synthesis Reports annually, the template has been slightly modified for a) clarity for Chairs and Directors, and b) a closer fit with what the Deans and Associate Deans are being asked to report.

1. **Student Learning Outcome:** The student performance or learning objective as published either in the catalog or elsewhere in your department literature.

1. Demonstrate knowledge of evolution, diversity of life, form and function of living organisms
2. Interpret observations through the creation, testing, analysis of hypotheses
3. Design laboratory or field experiments
4. Inspect data and apply basic statistics to their analysis and communication
5. Write reports and prepare and deliver oral reports on scientific findings that • **Demonstrate ability to use scientific journals, periodicals, and electronic media to access current biological information** • **Demonstrate ability to evaluate journal articles from the primary literature**

SLOs in bold were assessed for 2014-2015; these are the SLOs aimed to educate students on the process of "how to do science."

2. **Overall evaluation of progress on outcome:** Indicate whether or not the SLO has been met, and if met, to what level.

_____*SLO is met after changes resulting from ongoing assessments, referencing assessment results from the previous year to highlight revisions;*
_____*SLO is met, but with changes forthcoming;*
___*x*__*SLO is met without change required*

3. **Strategies and methods:** Description of assessment method and choices, why they were used and how they were implemented.

DESCRIPTION OF and RATIONALE for COURSES EVALUATED for SLOs 2-5:

Biology's stand alone introduction lab (Biological Investigation BIOL 270) and capstones (BIOL 490) are designed to have our students interpret observations through the creation, testing, analysis of hypotheses, design laboratory or field experiments, inspect data and apply basic statistics to their analysis and communication, and write reports and prepare and deliver oral reports on scientific findings that demonstrate and ability to use and evaluate scientific literature. To assess these SLO's 2-5, research proposals and research reports and presentations,

assignments, or tests were reviewed for Biological Investigation (BIOL 270) and the Senior Capstones (BIOL 490) in Microbial Physiology, Animal Physiology, Plant Ecophysiology, Developmental Biology, Molecular Biology for Fall, Winter, and Spring. In all classes, students design (hypothesis creation, use of scientific literature), conduct (lab or field experiments and data analysis), and present (written and oral) group research projects. provide data on hypothesis creation, testing and analysis, on the design of experiments, on the application of basic statistics, and on the writing and presentation of reports Students are assessed on their research proposals (=design), their written reports (= execute and communicate), and their oral presentations (=communicate). The scores on each of these different types of assignments were analyzed and compiled. Assessment is based on the review of 287 students (174 for BIOL 270s and 113 for BIOL 490s).

Provided below are examples of typical assignments for the Biological Investigation (BIOL 270) and Capstones (BIOL 490). Given that both stress the same concepts but at different levels, descriptions are similar but content expectations for the capstone are much higher.

Proposals:

The purpose of your formal written proposal is for me to determine if you have thought through your group's project and have a clear idea how you will get to a finished study by the end of the quarter. Additionally, writing proposals is an important component of how scientists start new projects. A proposal is necessary whenever funding is being requested, whether it is through the scientist's own institution or an outside agency. A successful proposal demonstrates that you have thought through your methods, have clear and realistic goals and that your study has the potential to provide useful information. You will turn in one written proposal as a group on October 10th. You will receive a group grade on your proposal.

Your written proposal should include the following sections:

The **Purpose** should explain in about a paragraph why your project is interesting and worth conducting. In a separate short paragraph give a clear statement of your hypothesis and the specific predictions of that hypothesis that you will be testing.

The **Methods** section should provide a complete description of how you plan to test your predictions. Include all of the essential features of experimental design; state what your treatments are, what replication you will have, the arrangement of your experiment and what your independent and dependent variables will be. State what equipment and supplies you anticipate using. This will likely be the longest portion of your proposal.

Include a **Possible Results** section, in which you describe possible outcomes of your experiment and how you would interpret them. What result would support your hypothesis? What result would clearly indicate that your hypothesis was incorrect? Can you think of any unexpected results that would suggest other explanations? Try to be as complete as possible.

Your proposal should be between 3 – 5 pages, typed, double-spaced.

In addition, complete the questions on the next page which ask for information about your experimental design. Much of this information should be included in the written proposal, but the list of questions may help clarify your thoughts.

Finally, include a separate sheet listing all the supplies and equipment you think you will need, and whether you plan to obtain the items yourselves and be reimbursed, or will need your TA and I to get them for you. This portion of the proposal will not be graded, and does not need to be in paragraph form, etc. It will allow us to make sure you get the supplies you need.

Group project experimental design questions

Type answers to the following questions on a page separate from your written proposal. Answers should be in complete sentences and answer the question fully, but can be succinct. You may find it useful to answer all of these questions before writing the proposal.

1. What is the working hypothesis for your group's project? If you are testing more than 1 hypothesis, include each hypothesis.

2. What are the null and alternative hypotheses for your group's project?

H_0:
H_A:

3. Is your study experimental or correlative?

4. What is the independent variable? If you are performing an experiment, what are your treatments, and how do they relate to your independent variable? How will you physically apply them? (Don't forget to include a control treatment). If you are performing a correlative study, how will you measure the independent variable? Be as concrete and specific as possible in your answer. Include the units for anything that you will measure.

5. What is/are the dependent variables? Explain exactly how you will measure them; be as specific and concrete as possible. Include the units for anything that you will measure.

6. What is your total sample size for the study? How many replicates will there be per treatment? Explain exactly what will make up a replicate for your study (e.g. 1 person, 1 petri plate, 1 pond, 1 pot with 6 seeds planted, etc).

7. Explain how you will randomly assign treatments (for an experimental study) or select subjects without bias (for a correlative study).

<u>Final Written Report:</u>

Individually write a report with the following sections. Be sure to follow the guidelines that we learned when writing the duckweed report, and throughout the class (how to write results, how to write discussion, how to write about data analyses, organization of the methods, etc.).

a) Abstract – should in less than 400 words summarize the whole project including some introduction, objectives, methods, results, and implications. Need to write this well – the first thing people see.
b) Introduction
c) Objectives and hypotheses

d) Methods - include, in sequence: study area or organism as appropriate, study design (factors, levels, treatments), details of methods, data analyses
e) Results – remember to write in terms of the biology, not the statistic, but use the statistics to support the results
f) Discussion – be sure to address hypotheses, implications of study, compare results to other studies, talk about limitations and recommended further research
g) References – use the format of the journal: *Bioscience* (See in Refworks).
h) Figures (should have axes labeled and include a caption below the figure). Figures include maps, photos, or graphs. Any maps you included on your poster should be included in this report as well. Put all your figures and tables at the end of the document.
i) Tables. All table columns should be clearly labeled and should include a caption above the table.

Format: Reports should be typed, double-spaced, 12 point font, 1 inch margins. Include your name and the date on the top right side of the report. Include a title at the top of the report. Print on both sides of the paper is recommended. All units should be metric. Scientific names should be used, and should be correctly capitalized (Genus, not specific epithet) and italicized.

The following (lettered) sections will be ranked from 0 to 5, with 0 being not done, and 5 being excellent.

Grammar/Format

A. Grammatically Correct (used proper verb tense, spelling, etc.)
B. Concise – not too wordy
C. Title include, clearly written, related to topic
D. Page numbers included
E. 12 point font, 1 inch margins, double space
F. Subheaders used on sections

Organization

A. Paragraphs organized with one topic per paragraph, paragraphs flow logically one to the next
B. Each paragraph has a topic sentence followed by supporting evidence
C. Paragraphs and sentences transition well from one to the other.

Abstract

A. Includes a summary of introduction
B. Includes a summary of objectives
C. Includes brief summary of methods
D. Includes a brief summary of key results
E. Includes a little bit of discussion or implications
F. Less than 400 words
G. Well organized and flows

Introduction

A. Background organized from broad to narrow, flows
B. Relevant research synthesized and cited in adequate depth
C. Significance of project is clear
D. Context given behind all hypotheses that will be made

Objectives/Hypotheses:

A. Objectives included
B. Hypotheses included
C. Objectives and hypotheses flow from the background (make sense given the background presented)

Methods:

A. Study area or organism is adequately explained
B. Study design describes factors, levels, treatments, and replicates
C. Controls or references are included
D. Study design is understandable as written
E. Specific research methods are sufficiently detailed (or cited) so that you can envision how to conduct the study (include how solutions made, concentrations used, amount of soil used, etc.)
F. Unnecessary details (e.g. how bags labeled) not included (these are details not needed to repeat the experiment)
G. Data analyses are clearly presented

Results:

A. Facts presented in adequate depth
B. Results are complete: all findings included
C. Factual results only, no interpretation here
D. The biology is the focus of sentences, not statistics or 'treatment 1'
E. Statistical results included

Figures and Tables

A. Figures and tables have caption that clearly explains them
B. Axes on figures are properly labeled including measurement units; for maps, include a scale bar
C. Figures and tables are referred to in the text
D. Table columns and rows are clearly labeled
E. Error bars are included on figures (for bar charts)

Discussion

A. Findings interpreted
B. Findings related to hypotheses
C. Possible explanations for findings, including why hypotheses were or were not met clearly discussed
D. Findings not overstated (e.g. if explanations for hypotheses are speculative, this is clear)
E. Limitations of study discussed
F. Implications of study discussed
G. Recommendations for future research discussed

Final Report – Poster with Oral Presentation:

Posters are used at conferences as a way for researchers to present a brief synopsis of their research. You and your group will produce a poster summarizing your project. Your group will turn in a single poster, which can be printed in the MARS lab (located in the JFK Commons). You can make your poster in PowerPoint as a single "slide". Your poster should be 36" tall by 48" wide (91.4cm by 121.9cm), so go to Page Setup and set the dimensions of your slide to 36" by 48". You can paste text into PowerPoint from Word (or by inserting text boxes) and can paste graphs into PowerPoint from Excel. You can also insert or paste photographs.

Posters follow a format similar to a scientific paper, but the text is dramatically reduced and some points are shuffled around. The idea of a poster is to convey the most important points from your study in just a minute or two of reading. A poster is much more dependent on visuals, including graphs, diagrams and photos. Your poster should use the format below.

In addition to the physical poster, your group should be prepared to provide a verbal summary of your study to those who come by to evaluate your poster. The summary should include the most important points of the objective, methods, results and conclusion and be ~ 3 min long.

4. **Observations gathered from data**: Include findings and analyses based on the strategies and methods identified in item #3.

    a. Findings:
    b. Analysis of findings:

5. **What program changes will be made based on the assessment results?**

    a) Describe plans to improve student learning based on assessment findings (e.g., course content, course sequencing, curriculum revision, learning environment or student advising).
    b) Provide a broad timeline of how and when identified changes will be addressed in the upcoming year.

6. Description of revisions to the assessment process the results suggest are needed and an evaluation of the assessment plan/process itself.

Statistics:
Students were given multiple data sets and had to determine which statistical test was appropriate for analyzing the data and conduct the analysis. These concepts were also assessed through tests.

IMPLEMENTATION:

The mean (± sd) for each assignment for the BIOL 270 and for the BIOL 490 were provided and are summarized below. Note that most instructors have students turn in multiple drafts (or practice presentations) that are both peer- and instructor-reviewed prior to final grading.

	Proposal	**Written Report**	**Oral Presentation**	**Statistics**
BIOL 270	88.9 ± 4.9	84.9 ± 11.7	93 ± 3.1	90 ± 5.2
BIOL 490	90.8 ± 1.0	92 ± 7.5	90.8 ±6.9	91 ± 14

The similarity of scores for proposals, oral, presentations, and statistics work between introductory and capstone courses indicate that students are meeting these SLOs for the respective levels. The higher means for written reports in our capstone as compared to introductory courses hopefully reflect the emphasis that Biology faculty put on writing across the curriculum.

NEW: PART II – CLOSING THE LOOP
FOLLOW-UP FROM THE 2013-14 PROGRAM ASSESSMENT REPORT

In response to the university's accrediting body, the Northwest Commission on Colleges and Universities, this section has been added. This should be viewed as a follow up to the previous year's findings. In other words, begin with findings from 2013-14, and then describe actions taken during 2014-15 to improve student learning along, provide a brief summary of findings, and describe possible next steps.

PLEASE NOTE: The College-Level Synthesis report includes a section asking Deans to summarize which programs/certificates have demonstrated "closing-the-loop" assessments and findings based on the previous year's assessment report.

> ***Working definition for closing the loop:*** *Using assessment results to improve student learning as well as pedagogical practices. This is an essential step in the continuous cycle of assessing student learning. It is the collaborative process through which programs use evidence of student learning to gauge the efficacy of collective educational practices, and to identify and implement strategies for improving student learning." Adapted 8.21.13 from http://www.hamline.edu/learning-outcomes/closing-loop.html.*

1. **Student Learning Outcome(s)** assessed for 2013-14
   The Department of Biology revised its SLOs so that current SLOs differ from previous ones. The previous SLO that most closely resembles current ones assessed was: " Become informed, critically thinking scientists who can design, execute and communicate original research in the field of biology." Our assessment of this SLO concluded: The introductory level BIOL 270 class provides a good foundation to address our SLO. In addition to BIOL 270, Biology students are exposed to the process of designing, executing, and presenting research in a variety of upper division elective classes. By the time students participate in the capstone course their scores suggest that they have met the objectives of our SLO.

2. **Strategies implemented** during 2014-15 to improve student learning, based on findings of the 2013-14 assessment activities.
   Faculty teaching the introductory BIOL 270 and those teaching capstone BIOL 490 have developed a better network for sharing teaching strategies and having open sessions for students to present their research to a broader audience of undergraduate students, graduate students, and faculty.

3. **Summary of results** (may include comparative data or narrative; description of changes made to curriculum, pedagogy, mode of delivery, etc.): Describe the effect of the changes towards improving student learning and/or the learning environment.
   The Department of Biology is meeting the SLOs aimed to educate students on the process of "how to do science".

4. What **further changes to curriculum, pedagogy, mode of delivery,** etc. are projected based on closing-the-loop data, findings and analysis?

The Department of Biology is in the process of refining its SLOs and revamping its process of SLO assessment to meet the university mandate for assessment of every course every quarter. Based on the NSF "Partnership in Undergraduate Life Science Education" program, we have developed a rubric to identify key concepts and where each class in our curriculum falls into the rubric.

Definitions:

1. **Student Learning Outcome**: The student performance or learning objective as published either in the catalog or elsewhere in your department literature.
2. **Overall evaluation of progress on outcome:** This checklist informs the reader whether or not the SLO has been met, and if met, to what level.
3. **Strategies and methods used to gather student performance data,** including assessment instruments used, and a description of how and when the assessments were conducted. Examples of strategies/methods: embedded test questions in a course or courses, portfolios, in-class activities, standardized test scores, case studies, analysis of written projects, etc. Additional information could describe the use of rubrics, etc. as part of the assessment process.
4. **Observations gathered from data**: This section includes findings and analyses based on the above strategies and methods, and provides data to substantiate the distinction made in #2. For that reason this section has been divided into parts (a) and (b) to provide space for both the findings and the analysis of findings.
5. **Program changes based on the assessment results:** This section is where the program lists plans to improve student learning, based on assessment findings, and provides a broad timeline of how and when identified changes will be addressed in the upcoming year. Programs often find assessment is part of an ongoing process of continual improvement.
6. **Description of revisions to the assessment process the results suggest are needed.** Evaluation of the assessment plan and process itself: what worked in the assessment planning and process, what did not, and why.

Some elements of this document have been drawn or adapted from the University of Massachusetts' assessment handbook, "Program-Based Review and Assessment: Tools and Techniques for Program Improvement" (2001). Retrieved from http://www.umass.edu/oapa/oapa/publications/online_handbooks/program_based.pdf