ANNUAL ASSESSMENT REPORT FOR 2009-2010
Due October 2010

Department/Program: **Biology**
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Authors: Jim Shellhaas, Kathy Schmidt, Travis Ryan, Philip Villani, Tom Dolan, Chris Hess, Jennifer Kowalski, Nat Hauck, Charissa Osborne, Erin Gerecke, Shelley Etnier, Carmen Salsbury, Mike Maloney, Marva Meadows, and Lori Moore.

Student Learning Outcome (SLO)	**For each SLO, list two methodologies and the criteria for successful performance (such as a measurement, rubric or scale that indicates a baseline for competency).**				**Term Assessed**
	Methodology 1	***Criteria for Success***	***Methodology 2***	***Criteria for Success***	
1. Demonstrate a broad knowledge of all general areas of biology.	Commercial Exam: total score on Major Field Test (MFT)	Measurement At or above the national mean.	Completing the Biology Major Curriculum.	Graduation	F2007 & S2008
2. Analyze and interpret qualitative and quantitative data using graphic and statistical analyses.	MFT (itemized section)	Measurement At or above the national mean.	Embedded exam questions or assignments throughout the biology curriculum.	10 point scale. Baseline score 7 or above.	F2007 & S2008
3. Recognize the unifying role of evolution to the field of biology.	Embedded exam questions or assignments throughout the biology curriculum.	10 point scale. Baseline score 7 or above.	MFT (itemized section)	Measurement At or above the national mean.	F2009
4. Read, critique, and properly use scientific literature.	Embedded exam questions or assignments throughout the biology curriculum.	3 point scale. Average score for all questions of a 2 or higher.	Capstone course	Passing score on presentation and assignment grades.	**F2010**

Student Learning Outcome (SLO)	**For each SLO, list two methodologies and the criteria for successful performance (such as a measurement, rubric or scale that indicates a baseline for competency).**				**Term Assessed (F09 or S10)**
	Methodology 1	***Criteria for Success***	***Methodology 2***	***Criteria for Success***	
5. Design and perform research using the accepted scientific technique of hypothesis testing.	Curriculum Survey (for within courses across curriculum)	Measurement -A minimum # of times a student should be exposed to this.	Exit Survey (for activities outside of curriculum) E.g., participation in BSI, independent study, honors theses, internships, URC.	Measurement	F2009
6. Demonstrate proficiency in basic laboratory skills.	Locally developed exam	Measurement 70% or above score on exam.	Exit survey in biology capstone.	5 point scale 70% indicating at least 3 or above on survey.	F2007
7. Communicate scientific ideas/concepts through writing and speaking.	Curriculum Survey (for within courses across curriculum)	Measurement -A minimum # of times a student should be exposed to this.	Capstone course	Passing score on presentation and assignment grades. Departmental rubric	F2009
8. Question and formulate new ideas through the synthesis of scientific information.	Curriculum Survey (for within courses across curriculum)	Measurement -A minimum # of times a student should be exposed to this.	Capstone course Standardized Capstone assignment	Passing score on presentation and assignment grades. 3 point scale Average score for all questions of a 2 or higher.	**F2010**
9. Appreciate the importance of science in shaping our past, present, and future societies.	Curriculum Survey (for within courses across curriculum)	Measurement -A minimum # of times a student should be exposed to this.	Exit Survey	We're still not sure yet.	**F2010**

1. **Findings—***Summarize the findings from the assessment activities for each SLO that was assessed. Identify the SLO # and append supporting documentation such as rubrics, scales, pass rates, test scores, or other measurements used to assess each SLO.*

SLO 4: Read, critique, and properly use scientific literature.

Method 1: Embedded exam questions or course assignments.

During the summer of 2010, we designed a course assignment and grading rubric that can be used in the Senior Capstone course as well as other courses in which students read the primary literature (see Appendix 1). Given the broad administration of this exercise expected throughout the curriculum, it took some time for the department to settle on the final assessment instrument. As such, we have not yet administered the instrument in our courses but we plan do so widely, at all levels throughout the 2009-2010 academic year. We anticipate that the instrument will be administered at a minimum in 2009-2010 to all graduating seniors through their capstone courses as well as a sizable number of our sophomore and junior majors as nearly every upper-level course we offer emphasizes SLO #4 through the exposure of students to the primary literature (see table on page 9).

Method 2: Grades received by students on their Senior Capstone paper.

All senior biology majors must complete the Senior Capstone course in biology. This course is a topic driven, seminar based course that strongly emphasizes student exploration of the primary literature in a subfield of biology, student presentations, and an extensive writing assignment that at a minimum requires an in depth literature review of a topic within biology (see Appendix 2 for an overview of the Capstone course). Thus, it is our opinion that the final papers that Capstone students generate are excellent examples of their ability to read, critique, and utilize primary scientific literature.

Out of 45 students enrolled in Capstone during 2009–2010, all but two students (96%) scored at or above 80% (B-) on the final draft of their final paper. One student did not complete the final paper but received an incomplete grade (I) for the semester. 24 of 45 students (53%) earned 90% or above on their paper (A-). Therefore, by the end of the Capstone experience, the vast majority of our students are able to effectively read primary scientific literature, synthesize the ideas contained therein, and write about those ideas in a culminating exercise.

SLO 8: Question and formulate new ideas through the synthesis of scientific information

Method 1: Curriculum survey

In order to assess SLO #8, the departmental faculty were asked to provide input as to whether SLO #8 was an integral component of the course(s) they offer for the major. Courses that fit this criterion are those where students are specifically asked to question and generate testable hypotheses, either in the classroom or the laboratory, that are based on their understanding of scientific information presented in class (see Appendix 3 for a more in depth examination of course activities as they relate to SLO's). Based on faculty assessment, several courses within the biology curriculum satisfy this SLO and they include BI302 (Principles of Botany), BI303 (Principles of Physiology), BI305 (Vertebrate Histology and Microtechnique), BI310 (Evolution), BI316 (Mammalogy), BI322 (Vertebrate Biology), BI330 (Tropical Field Biology), BI350 (Cell Biology), BI357 (General Genetics), BI355 (Plant Development), BI364 (Population and Community Ecology), BI370 (Conservation Biology), BI420 (Animal Behavior), BI408 (Topics in Biology), BI425 (Landscape ecology), and BI458 (Molecular Genetics).

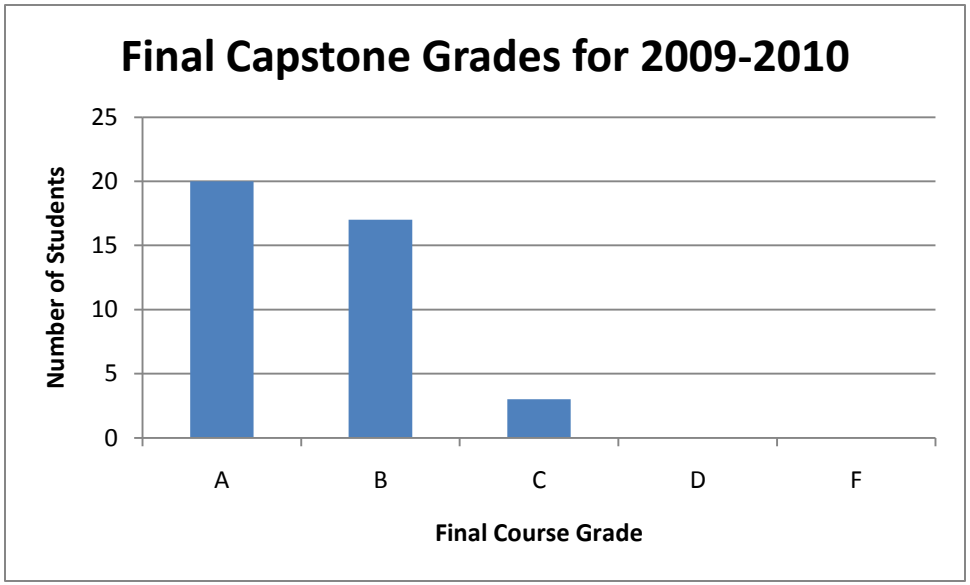
In order to assess the satisfactory completion of this SLO by graduating seniors, senior audit forms were amended so as to reflect which courses satisfied this particular SLO. At the time of the senior audit, the coursework of each student was assessed and a note was made of which of the qualifying courses they had satisfactorily completed.

The department graduated a total of 45 students in the 2009-2010 academic year. Each student had successfully completed at least three courses that satisfied SLO #8. As can be seen in the graph, many students completed several courses (up to eight) that satisfied this SLO.

Method 2: Capstone course – passing scores on presentations and satisfactory completion of a standardized Capstone assignment.

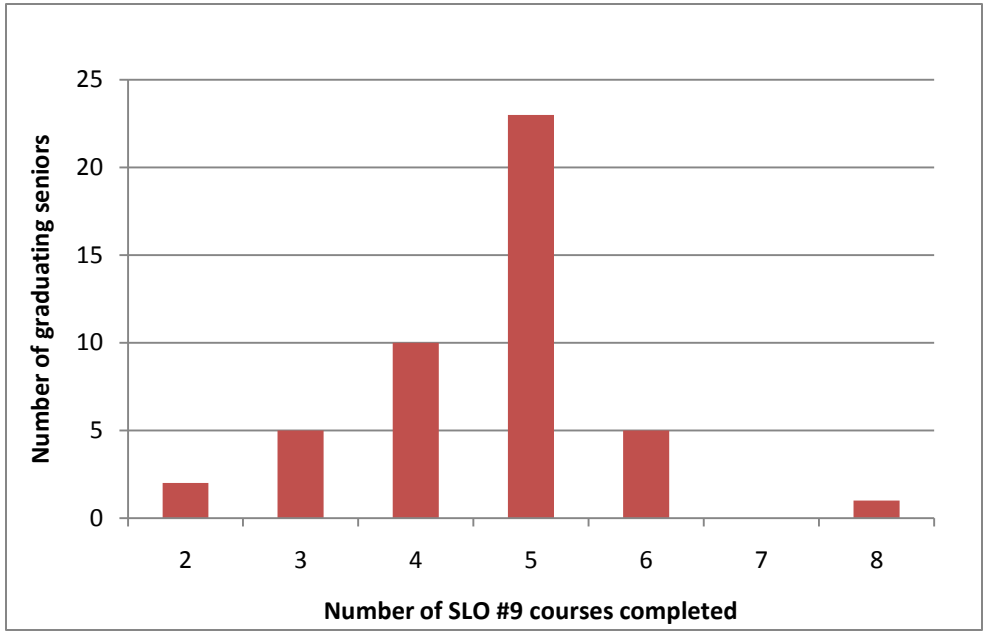
Forty-four of the 45 students enrolled in the Senior Capstone course in 2009-2010 satisfactorily completed the course. Each student is required to give two presentations (each a minimum of 25 minutes in length) during the course of the semester and these presentations along with the final paper, constitute the majority of points to be earned in the course. Each presentation is generally centered on one or more works of primary literature that the students must summarize, critique, and speak to with regard to its significance in the field and to future study. Students must also facilitate a broader discussion of the work with classmates. Thus through the presentation and discussion, Capstone students must clearly demonstrate an ability to not only organize and summarize information but to also explore and synthesize the material in a way to stimulate new ideas and questions. Passing grades on the Capstone presentations suggests that students have accomplished this objective and have satisfied SLO #8. While we have not yet standardized grading of the presentations across Capstone sections, we can report

on the overall performance of the seniors who took the Capstone course in the 2009-2010 academic year. Since the presentations constitute a large portion of the total grade, the final course grades should reflect to some extent the ability of our seniors to meet SLO #8. Of the 45 students who took Capstone in 2009-2010 (four sections were offered), the majority earned A's or B's in the course (see graph). This suggests that our graduating seniors have the ability to synthesize scientific information as called for by SLO #8.



In an effort to further standardize our assessment of SLO #8, the department recently developed a rubric that will be used in each Capstone course to assess student performance on presentations (see Appendix 4). This rubric will be used to assess both SLO #7 and SLO #8. The assumption is that students that score highly using this rubric are adept at meeting SLO #8, i.e. they are able to synthesize scientific information and generate new ideas and related questions. We intend to begin using this instrument immediately to assess student performance in the Capstone courses offered in the 2010-2011 academic year and beyond.

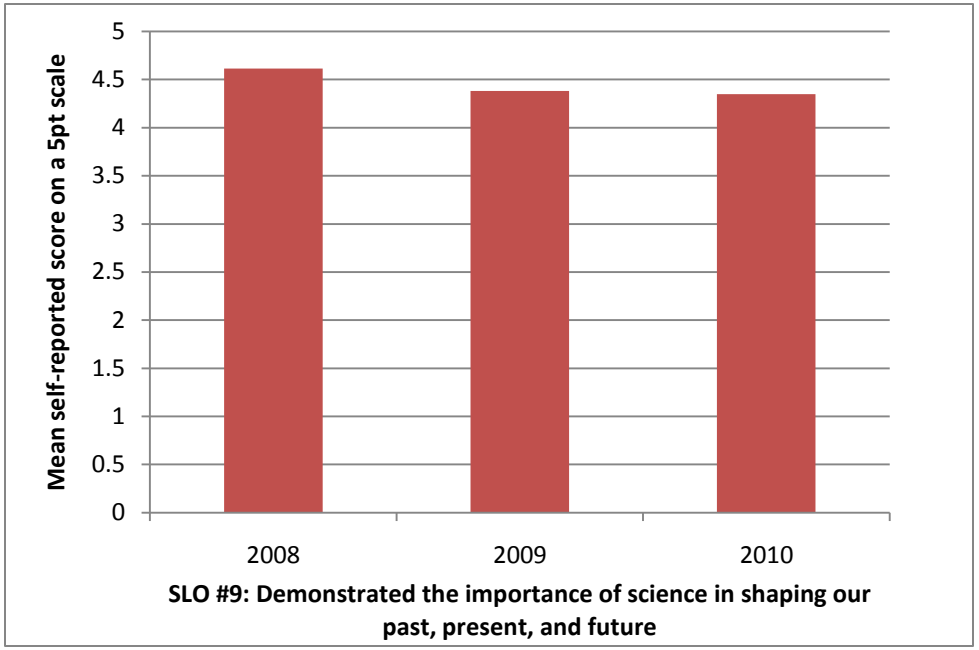
Further, the department also developed an additional exercise and grading rubric that will be administered to all senior Capstone students beginning in the 2010-2011 academic year (see Appendix 5). This exercise is designed to directly assess a student's ability to develop a functional understanding of scientific information such that they are able to generate new and testable ideas that could potentially advance the field. Students will be asked to complete this exercise towards the end of their Capstone experience and we suggest that an average score of two or above across all questions using the suggested grading rubric will indicate satisfactory achievement towards meeting SLO #8.



SLO 9: Appreciate the importance of science in shaping our past, present, and future societies.
Method 1: Curriculum Survey
Courses in the Biology curriculum that provide students with historical information about science and opportunities to explore and discuss the intersection between science and culture and society reinforce SLO #9. Faculty in the department were polled to

determine which courses provided this perspective of science and these are listed in the table on page 9. We used a modified senior audit form to examine how many courses satisfying SLO #9 were completed by each senior graduating during the 2009-2010 academic year. The data indicate that graduating seniors completed no fewer than two courses meeting this criterion and the majority took five courses. By our assessment, the vast majority of our students are receiving sufficient exposure to this SLO to develop an appreciation of the importance of science in past, present, and future societies.

Method 2: Senior exit survey
Graduating seniors fill out a senior survey prior to graduation. One question on the survey, #35, directly asks students to rate how well their biology major "demonstrated the importance of science in shaping our past, present and future." On the graph to the right, the mean value of their responses falls between agree (4) and strongly agree (5) for the last three years, indicating that students believe their major has demonstrated the intersection between science and culture and society.



2. **Use of Results—**W*hat programmatic changes, if any, were made in response to the findings? Reference the SLO #.*

There were no programmatic changes made in response to our assessment findings for this report. We firmly believe that some time is needed to perfect our assessment techniques before using the data to direct curricular adjustments or changes. Even so, most indicators seem to suggest we are serving our students well. This is clearly exemplified by the performance of our students on the Major Fields Test in Biology over the last four years (see Appendix 6). More data still must be collected to fully assess our efforts however. This is especially true for the SLO's that are a bit harder to directly test such SLO's #8 and 9 that involve quantifying or qualifying the higher level thinking skills of students and their opinions about science.

3. What **support services or resources** for faculty would help your department assess its SLOs better?

The primary concern of the department still remains the extensive amount of time and organization it takes to gather the appropriate information for the assessment process. In the past, we assigned this task to the departmental Curriculum Committee as it seemed a logical fit. Since the beginning of the University assessment process, we have learned that our Curriculum Committee has become far too burdened by generating data for assessment and this has been at the expense of dealing with other necessary curricular issues in the department. We simply cannot keep up. Now that we have reported on all of our departmental SLO's the prospect of keeping up with 9 SLO's, each assessed two ways, each year is daunting and we must come up with a different system to manage the task. We would like to

respectfully request once again that the job of carrying out or coordinating such a massive assessment effort each year be somehow compensated. The value of the information gathered is ultimately going to be directly proportional to the time and effort people have to dedicate to the task. As it stands now, we are struggling to carry out each of the 18 assessment methodologies given the other demands on our time coincident with being the fastest growing and the second largest major on campus.

The second request, as it was last year, is to provide specific discipline guidance in how to develop useful assessment programs. This might be done by inviting other institutions or professionals to share specific examples of assessment activities in biology, in our case.

4. What **revisions**, if any, to current SLOs did you make or are under consideration?

   The only revisions are included in **bold** on the first and second page of the current report. We adjusted the "Criteria for Success" for the first methodology of SLO #4 now that we have settled on a standard instrument (see Appendix 1). This change simply involved changing the point scale and the acceptable score. We made a similar change for the second methodology of SLO #8. We clarified the methodology we plan to use to include a standardized capstone activity and we specified the point scale and acceptable score for the exercise now that it has been developed.

5. Map each of your program's SLOs to the University Learning Outcomes. Make annual updates only if your SLOs changed.

Butler University students will:

1. Explore various ways of knowing in the humanities, social and natural sciences, quantitative and analytic reasoning, and creative arts. (Know)
2. Articulate and apply required content knowledge within their area(s) of study. (Know)
3. Find, understand, analyze, synthesize, evaluate and use information, employing technology as appropriate. (Know)
4. Explore a variety of cultures. (Know)
5. Recognize the relationship between the natural world and broader societal issues. (Know)
6. Communicate clearly and effectively. (Do)
7. Demonstrate collaborative behavior with others. (Do)
8. Practice ways and means of physical well-being. (Do)
9. Acquire the skills to make informed, rational and ethical choices. (Do)
10. Appreciate diverse cultures, ethnicities, religions and sexual orientations. (Value)
11. Share their talents with Butler and the greater community at large. (Value)
12. Be exposed to the value of lifelong learning. (Value)

Biology Student Learning Outcomes:	**Butler University Learning Outcomes**

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. Demonstrate a broad knowledge of all general areas of biology.	√	√	√		√				√			
2. Analyze and interpret qualitative and quantitative data using graphic and statistical analyses.	√	√	√			√			√			
3. Recognize the unifying role of evolution to the field of biology.	√	√	√		√				√			
4. Read, critique, and properly use scientific literature.	√	√	√			√			√			√
5. Design and perform research using the accepted scientific technique of hypothesis testing.	√	√	√				√		√			
6. Demonstrate proficiency in basic laboratory skills.	√	√	√				√		√			
7. Communicate scientific ideas/concepts through writing and speaking.		√	√			√					√	√
8. Question and formulate new ideas through the synthesis of scientific information.		√	√						√			
9. Appreciate the importance of science in shaping our past, present, and future societies.	√			√	√					√		√

6a. List all courses in the program and map each of your SLOs to the **curriculum** in which the learning occurs, indicating the extent to which the outcome is introduced (I) or refined (R). For a detailed list of the types of classroom activities in each course that involve a SLO see appendix 5.

Biology Student Learning Outcomes:

1. Demonstrate a broad knowledge of all general areas of biology.
2. Analyze and interpret qualitative and quantitative data using graphic and statistical analyses.
3. Recognize the unifying role of evolution to the field of biology.
4. Read, critique, and properly use scientific literature.
5. Design and perform research using the accepted scientific technique of hypothesis testing.
6. Demonstrate proficiency in basic laboratory skills.
7. Communicate scientific ideas/concepts through writing and speaking.
8. Question and formulate new ideas through the synthesis of scientific information.
9. Appreciate the importance of science in shaping our past, present, and future societies.

Course (No.)	SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6	SLO 7	SLO 8	SLO 9
BI120-123	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
BI 301	I		R	R		I	R		R
BI 302	R	R	R	R	R	R	R	R	R
BI 303	R	R	R	R			R	R	
BI 305				R		R	R	R	
BI 310	R		R	R			R	R	R
BI 316	I	R	R	R	R		R	R	
BI 322	I	I	I	I		I	I	I	
BI 330	I	R	R	R	R		R	R	R
BI 350	I	R				R	RI	R	I
BI 355			R	R			R	R	
BI 357		R		R	R		R	R	R
BI363		R	R	R	R	R	R		
BI 364	R	R	R	R	R		R	R	
BI 370	R		R	R			R	R	R
BI 410		I	I	I	I	I	I		
BI412			R	R		R			
BI 420		I	I	I	I	I	I	I	I
BI 425		R		R	R		R	R	
BI 430	I		R			R	I	R	
BI 440		R			R	R	R		
BI 458	I		I				R	I	I

6b. **Learning/developmental opportunities for students outside the classroom—***If any SLO was addressed outside the classroom, explain where and how the learning/developmental opportunities were provided to students in your program? (i.e., internships, field experiences, visiting lectures, collaborative projects, and other creative ideas you may have employed.)*

[The following is an excerpt from the Biology Department Program Review document of 2008. We have included it in the last two Assessment Reports as we think it nicely captures the multitude of opportunities our students have for learning and development outside of the classroom.] Students majoring in biology have a number of opportunities, both through the required curriculum and voluntary individual pursuits, to engage in independent inquiry-based research experiences. Within the curriculum, students are exposed to research techniques, data collection and analysis, inquiry-based lab experiences, and scientific writing in the first-year sequence course. For example, during the first-semester course, students are provided an experimental system (Wisconsin Fast Plants, yeast, etc.) and prompted to develop a hypothesis and experimental protocol to address a question that interests them. A similar laboratory experience occurs in the second semester. In addition, introductory students are required to attend several science seminars during the academic year; these can include those provided by the biology department seminar series, the J. James Woods Lecture Series, or other events around campus (e.g., the Herbarium Open House, Butler Undergraduate Research Conference, etc.).

Independent or inquiry-based activities or research exercises continue in many of our upper-level courses: Instructors report that open-ended or investigational activities are included in two-thirds of our biology elective courses. In their final year, students take a capstone course that requires them to choose a topic, become familiar with the relevant primary literature, and write extensively on their chosen topic. The capstone experience gives students an opportunity to learn more about formal scientific inquiry, scientific communication, and research methods as they immerse themselves in a focused topic in biology.

Although our curriculum introduces students to the processes of biological inquiry, it is at best only a partial introduction, due to the brevity of the projects in a classroom context. To provide motivated students with a chance to participate more fully in the research process, we provide opportunities for students to enroll in an independent study course. For these courses, students work one-on-one with a faculty member on a research project of their own that usually stems from the research interests of the faculty mentor. Also, a university-wide summer research program, the Butler Summer Institute (BSI), attracts about 3–4 students per year to work with a faculty mentor on an independent project. Many independent study students continue—or start—their research projects through the BSI program. Students conducting independent research learn invaluable scientific, technical, writing, and oral communication skills as they plan their work, present written proposals for the projects, conduct experiments, and present their findings at appropriate venues, such as the BSI symposium, departmental seminars, or the Butler Undergraduate Research Conference (which features students from many institutions).

Other students have chosen to participate in internships in the biological sciences to extend their learning beyond the classroom. Students can seek internships through the campus-wide internship office or biology majors can use the Center for Urban Ecology. In addition to fostering skills in scientific inquiry, such experiences are often multidisciplinary or provide students with valuable contacts at potential future employers, while allowing them to accrue course credit for the experience. On average, the biology department sponsors 47 credit hours per year (an average of 20 students) for independent studies and internships combined.

Students may also gain additional exposure to the processes of scientific inquiry through employment in the department as a paid laboratory assistant to a specific course. In this role, students work with an instructor to helping to prepare the lab "behind-the-scenes" and thus learn specific methodology for preparing solutions, media, equipment, or other items needed for the course.

Appendix 1: Read and critique exercise plus grading rubric for SLO #4

The purpose of this exercise is to give you an opportunity to summarize your understanding of a primary research paper. Please answer the questions below about a paper that your instructor has provided for this assignment.

1. In your own words, what is the hypothesis of this paper?

2. In a few sentences, summarize what background information is presented in the introduction that supports the rationale for the hypothesis of the paper?

3. Comment on whether or not the results support the initial hypothesis.

4. Do you have any criticisms or concerns with regard to any aspect of the paper?

Grading Rubric for Read and Critique Exercise

Question 1:

0 – Identified hypothesis incorrectly.
1 – Identified hypothesis but did not articulate it well; for example, (s)he missed a significant point.
2 – Clearly identifies the hypothesis.
3 – Clearly identifies the hypothesis and demonstrates a clearer understanding through a more comprehensive explanation.

Question 2:

0 – Does not summarize correct/relevant background information that supports hypothesis.
1 – Summarizes correct/relevant background information that supports hypothesis but not with a clear understanding of why.
2 – Summarizes correct/relevant background information that supports hypothesis with a clear understanding of why.
3 – Summarizes correct/relevant background that supports hypothesis with a clear understanding why and does so in a more comprehensive nature, e.g. provides examples or points out reasons not explicitly stated in the paper.

Question 3:

0 – Does not link appropriate results with hypothesis being tested in paper.
1 – Links some results with hypothesis being tested in paper or does so but does not correctly demonstrate why it supports hypothesis.
2 – Clearly points out relevant results in paper that support/refute hypothesis.
3 – Clearly points out specific results (in fig. 1 …) in paper that support/refute hypothesis and demonstrates a clear synthesis of the material.

Question 4:

0- Does not respond to the question.
1- Criticizes or is concerned about some aspect of the paper that is rather insignificant.
2- Has a substantial criticism/concern of the paper but does not clearly articulate their ideas with supporting arguments.
3- Has a substantial criticism/concern of the paper and demonstrates a clear understanding by articulating ideas with logical supporting arguments.

Appendix 2: Biology Capstone Course Guidelines.

Writing

Capstone is a writing intensive course. Therefore, the following should be present in the course:

Weekly writing assignments
Some graded and non-graded assignments
Some in-class and out-of-class writing assignments
Students should receive constructive comments on their writing often.

One major piece of writing (e.g., literature review or grant proposal)
Rough draft with comments from instructor is required.
Body of the paper should be a minimum of 10 pages in length.
The paper should cite a minimum of 10 primary resources.
Students should complete departmental "Capstone Synthesis" exercise.

Presentations

Students should give 2 oral presentations during the semester.
Presentations should be 25 minutes minimum in length.
Presenter is expected to lead the discussion after the presentation.
Every student is expected to participate in discussion.
Use of the departmental assessment rubric

Major Field Test

Taking the MFT should count for at least 5% of the grade in the course.
Student will earn the points by 1) taking the exam, AND 2) passing with a score in the 70^{th} percentile (140/200 points).

Senior Survey

Students in the *spring* semester should take the departmental senior survey.
It should be given in the last few weeks of the course.

Appendix 3: A survey of course activities in Biology courses that could contribute to the assessment of select student learning outcomes.

SLO #2 Analyze and interpret qualitative and quantitative data using graphic and statistical analyses.	302 research project and lab activities 357 research project fruit flies 316 report of independent project 364 any of the spreadsheet modeling assignments; poster presentations which require some statistical analysis 425 computer simulation exercises; research project report 420 exams, lab exercises 322 exams, assignments 350 Lab report
SLO #4 Read, critique, and properly use scientific literature.	302 library research project 357 research project 355 project 303 Lab work and reports 310 literature review/term paper capstone (CS) mock grant proposal capstone literature reviews 330 species report based in part on primary literature 364 students have to use literature in the development of the poster presentation of their research projects 370 students write term papers based on primary and secondary literature 425 students regularly present primary literature to class 420 individual project 322 term paper 305 Students had to present primary literature and lead a discussion on a particular topic. 312 Phytoplankton Survey
SLO #5 Design and perform research using the accepted scientific technique of hypothesis testing.	302 research project 357 research project 316 – report of independent project capstone (CS) mock grant proposal 364 students complete a class-wide project and a small group project 425 students complete a class-wide project and a small group project 420 individual Project 312 Phytoplankton Survey
SLO #7 Communicate scientific ideas/concepts through writing and speaking.	Capstone Projects 302 2 projects 357 project and oral present. 303 paper 303 summary papers 301 summary papers 310 lit review/term paper 316 report of ind project 330 species report 364 students write a scientific paper based on class project, and develop a

SLO #7 cont.	poster presentation based on the small group project 370 students give a case study presentation and write a synthetic term paper 425 students give primary literature presentations and write a paper based on the class project 420 individual Project paper and presentation 322 term paper 350 Exams 430 Exams 458 Exams 305 Students had to present primary literature and lead a discussion on a particular topic. 312 Phytoplankton Survey
SLO #8 Question and formulate new ideas through the synthesis of scientific information.	302 research project 357 research project 303 research project 364 small group projects involve original thought and development based on previous studies 370 the synthetic term paper requires bringing together different ideas and placing them in a novel context 425 small group projects involve original thought and development based on previous studies capstone (CS) mock grant proposal 312 Phytoplankton Survey
SLO #9 Appreciate the importance of science in shaping our past, present, and future societies.	302 plants and the news 370 term paper is focused on conservation issues 420 assignment on evolution of human behavior

Appendix 4: Grading Rubric for Capstone

Name _____

Topic _____

Date _____

Time start: _____ Time finish: _____

(Scoring rubric: 5 = excellent, 1 = poor)

Topic/article choice:

- Appropriate topic/article of sufficient complexity, submitted on time _____

Comments:

Knowledge of paper and its content:

- Sufficient background knowledge _____
- Explained technical terms & methods _____
- Clear explanation of results _____
- Critically analyzed the paper, addressed shortcomings, etc. _____

Comments:

Presentation style:

- Organization _____
- Quality of teaching aids _____
- Pace _____
- Eye contact/engaging audience _____

Comments:

Discussion:

- Ability to stimulate thoughtful discussion _____
- Encouraged all students to participate _____

Comments:

Overall comments and suggestions for improvement:

Appendix 5: Capstone Synthesis

As a student in a Biology Senior Capstone Seminar, you have undoubtedly examined a topic or area within the field of biology in some detail. The purpose of this exercise is to give you an opportunity to summarize your understanding of a specific topic which you investigated this semester and to demonstrate your ability to synthesize this information in a scientific manner. Please answer the questions below about a specific topic of your choice. It is recommended that you address the topic that was the focus of your capstone paper but this is not required. Please limit your answers to questions 1 – 3 to one typed page total.

1. Provide a one paragraph summary of the topic of your choice.

2. Generate a testable research question that follows from your knowledge of the topic discussed in question 1. Also, state your question as a testable hypothesis if possible.

3. In one paragraph, comment on the significance of your question/hypothesis to the advancement of knowledge in the field.

Grading Rubric for Capstone Synthesis Exercise

Question 1:

0 – Topic of interest not clear from written paragraph.
1 – Topic clear but written paragraph lacks logical structure, coverage of the topic, or expansion/refinement of information.
2 – Topic clear and written paragraph includes moderate coverage of the topic and some expansion/refinement of information.
3 – Topic clear and written paragraph includes a comprehensive coverage of the topic and sufficient expansion/refinement of information.

Question 2:

0 – No clear testable question or hypothesis is presented.
1 – A question is posed but it is not clearly related to the topic in question 1 and/or it is not clearly stated as a testable hypothesis.
2 – A question is posed that relates to the topic in question 1 but it is not clearly testable and/or it is not clearly stated as a testable hypothesis.
3 – A question is posted that relates to the topic in question 1 and it is clearly testable and/or is clearly stated as a testable hypothesis.

Question 3:

0 – No clear connection made between question proposed and its significance to the field.
1 – Some connection made between question proposed and its significance but no supporting arguments or information is presented.
2 – A clear connection is made between the question proposed and its significance and some logical supporting arguments and/or information are presented.
3 – A clear connection is made between the question proposed and its significance and the connection is logically and extensively supported.

Appendix 6: The results of the Major Field Test (MFT) in Biology.

Results:

The Department of Biological Sciences has all graduating seniors take the MFT, a commercially available standardized exam, during their Senior Capstone course. Students take the Capstone course either in the fall or the spring semester. The results of the exam fall into three categories: institutional mean total score, institutional mean subscore distribution, and institutional assessment indicator mean score distributions. The scores below are the results for the four years that we have administered the exam.

Major Field Test Results - Butler University
(% represents those at or below score reported)

Institutional mean total score:

	2006-07		2007-08		2008-09		2009-10	
National mean	152.5		152.6		152.2		152	
National SD	7.6		8.1		8.1		8	
National n=	184		345		381		425	
Butler mean	160	80%	160	80%	159	80%	163	90%
Butler SD	10		9		8		10	
Butler n=	42		39		45		45	

Institutional mean subscore distribution:

Subscore 1 (cell biology)

	2006-07		2007-08		2008-09		2009-10	
National mean	53.1		52.9		52.8		52.7	
National SD	7		7.2		7.3		7.1	
Butler mean	59	75%	59	80%	58	75%	59	80%
Butler SD	12		11		9		10	

Subscore 2 (Molecular Biology and genetics)

	2006-07		2007-08		2008-09		2009-10	
National mean	52.8		52.7		52.7		52.6	
National SD	6.4		6.8		6.7		6.6	
Butler mean	57	75%	60	80%	59	80%	65	95%
Butler SD	12		12		11		13	

Subscore 3 (Organismal Biology)

	2006-07		2007-08		2008-09		2009-10	
National mean	52.7		52.6		52.5		52.2	
National SD	7.1		7.6		7.6		7.6	
Butler mean	60	85%	57	75%	59	80%	60	85%
Butler SD	11		10		10		10	

Subscore 4 (Population Biology, Evolution and Ecology)

	2006-07		2007-08		2008-09		2009-10	
National mean	52.4		52		51.9		51.8	
National SD	7.7		7.9		8		7.9	
Butler mean	59	80%	61	85%	58	75%	62	90%
Butler SD	9		8		10		10	

Institutional assessment indicator (AI) mean score distributions:

AI1: Biochemistry and cell energetics.

	2006-07		2007-08		2008-09		2009-10	
National mean	43.4		43.2		43.1		43	
National SD	8.6		8.5		8.5		8.1	
Butler mean	50	75%	51	80%	49	75%	50	75%
Butler SD	NA							

AI2: Cell structure, organization, and function

	2006-07		2007-08		2008-09		2009-10	
National mean	55.2		55.3		55		55	
National SD	8.5		8.8		9		8.9	
Butler mean	61	75%	62	75%	62	75%	63	80%
Butler SD	NA							

AI3: Molecular biology and molecular genetics

	2006-07		2007-08		2008-09		2009-10	
National mean	45.8		45.8		45.8		45.7	
National SD	8.6		9.2		9		8.8	
Butler mean	50	65%	56	80%	54	80%	60	90%
Butler SD	NA							

AI4: Diversity of Organisms

	2006-07		2007-08		2008-09		2009-10	
National mean	50		49		48.8		48.4	
National SD	10		9.9		9.7		9.6	
Butler mean	53	60%	58	80%	59	85%	55	70%
Butler SD	NA							

AI5: Organismal-animals

	2006-07		2007-08		2008-09		2009-10	
National mean	58.9		58.8		58.6		58.5	
National SD	7.7		8		8.1		8	
Butler mean	67	85%	59	45%	60	50%	65	75%
Butler SD	NA							

AI6: Organismal-plants

	2006-07		2007-08		2008-09		2009-10	
National mean	44.9		45		44.8		44.4	
National SD	8.1		8.7		8.6		8.5	
Butler mean	55	85%	52	75%	54	80%	55	85%
Butler SD	NA							

AI7: Population genetics and evolution

	2006-07		2007-08		2008-09		2009-10	
National mean	54.2		53.6		53.5		53.2	
National SD	9.3		9.3		9.4		9.3	
Butler mean	65	90%	65	90%	61	80%	66	90%
Butler SD	NA							

AI8: Ecology

	2006-07		2007-08		2008-09		2009-10	
National mean	56.3		56.1		56		55.9	
National SD	9		9.2		9.2		9.1	
Butler mean	62	70%	66	85%	62	70%	67	90%
Butler SD	NA							

AI9: Analytical skills

	2006-07		2007-08		2008-09		2009-10	
National mean	52.9		52.6		52.5		52.4	
National SD	8.1		8.3		8.4		8.3	
Butler mean	60	80%	61	80%	57	65%	63	90%
Butler SD	NA							