

**Assessment of Student Learning Plan**  
Kansas State University

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- Check the box if your program's student learning outcomes have been modified since November 2003. If so, please email ([apr@ksu.edu](mailto:apr@ksu.edu)) or attach a hard copy to this document.

**A. College, Department, and Date**

College:        A&S  
Department:    *Division of Biology*  
Date:            10/11/2004

**B. Contact Person(s) for the Assessment Plans**

*David A. Rintoul*

**C. Degree Program**

*Bachelors degree in Microbiology (CIP 260502)*

**D. Assessment of Student Learning Three-Year Plan**

**1. Student Learning Outcome(s)**

Recipients of degrees in this program will have demonstrated:

- 1) Awareness of the diversity of life, the evolutionary processes which result in that diversity, as well as the evolutionary relationships and ecological linkages of living organisms.
- 2) Ability to think critically and to integrate factual and conceptual information into an understanding of scientific data.

Special rationale for selecting these learning outcomes (optional):

*These two were selected because they are common to all (3) undergraduate degree programs in the Division of Biology. In addition, the methods of assessment for both of these objectives can be direct measures. Finally, they are relevant to four of the University-level outcomes, and thus are important outcomes which are desired for any university graduate, regardless of degree program.*

Relationship to K-State Student Learning Outcomes (insert the program SLOs and check all that apply):

Program SLOs	University-wide SLOs (Undergraduate Programs)					Program SLO is conceptually different from university SLOs
	Knowledge	Critical Thinking	Communication	Diversity	Academic / Professional Integrity	
Awareness of the diversity of life, the evolutionary processes which result in that diversity, as well as the evolutionary relationships and ecological linkages of living organisms.	X			X		N/A
Ability to think critically and to integrate factual and conceptual information into an understanding of scientific data.	X	X	X			N/A

**2. How will the learning outcomes be assessed? What groups will be included in the assessment?**

*SLO #1 – All microbiology majors are required to take General Microbiology (BIOL 455). The focus of this course is to provide our majors with an understanding of the structures and functions of microorganisms, and to introduce them to the phylogenetic taxonomy that biologists use to classify these life forms. Evolutionary biology forms the basis for this phylogenetic taxonomy. Therefore we propose to assess learning of this outcome in the core Microbiology course that is most focused on the outcome. All students in BIOL 455 will be given a short test (5-10 questions) during the first class period of the semester; these questions will serve to test their knowledge of the diversity of microbial life forms, evolution, and phylogeny. At the end of the semester the students remaining in BIOL 201 will be given that same test. These results will be used to calculate (g), or Gain in Learning (see Roy, H., Bioscience: The Journal of College Biology Teaching, 27:3-7, 2001). Test results from students who are not microbiology majors will be excluded from this calculation. Test results from students who did not take the test at the beginning of the semester will also be excluded from this calculation. This direct assessment method obviously evaluates student knowledge, thus addressing university SLO #1. Additionally, it evaluates their awareness of diversity, although at a slightly more advanced level than is embraced in university SLO #4 (“Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse world.”). Our “diverse world” includes many organisms besides human beings. It is certainly beneficial for our students to shed that anthropocentric world-view, and to*

*understand that bacteria and many other organisms make it possible for them to live and work in this diverse world.*

*SLO #2 – All microbiology majors are required to take Modern Genetics (BIOL 450). The focus of this course is to provide our majors with an understanding of the principles of genetic analysis, and to acquaint them with the modern molecular biology tools and techniques which are used in biology today. The ability to think critically and to integrate factual and conceptual information is required for an understanding of genetics. All students in BIOL 450 will be given a problem to solve (see example below) during the first class period of the semester. The identical or a similar problem will be given to the class at the end of the semester. These will be graded by instructors in the course. The percentage of the class with a correct answer will be calculated. Test results from students who are not microbiology majors will be excluded from this calculation. Test results from students who did not take the test at the beginning of the semester will also be excluded from this calculation. This direct assessment method obviously evaluates student knowledge, thus addressing university SLO #1. Additionally, it evaluates critical thinking, which is university SLO #2. Finally, it evaluates university SLO #3 (“Students will demonstrate the ability to communicate clearly and effectively.”), by evaluating their ability to communicate their understanding in logical and cogent ways.*

**Sample problem for SLO #2** – *Investigators want to order two steps in a yeast synthetic pathway, one catalyzed by enzyme A and one by enzyme B. A<sup>-</sup> cells accumulate product a, B<sup>-</sup> cells accumulate product b. Both A<sup>+</sup> and B<sup>+</sup> cells exhibit normal function. The genes encoding A and B are not linked. Haploid A<sup>-</sup>B<sup>+</sup> are mated with haploid A<sup>+</sup>B<sup>-</sup> cells to produce diploid cells, which then are allowed to undergo meiosis, producing 4 types of haploid progeny cells.*

- a) The haploid progeny exhibiting mutant phenotypes then are mated with each of the two original haploids (A<sup>-</sup>B<sup>+</sup> and A<sup>+</sup>B<sup>-</sup>). One of the mutant haploids produced in the first mating yields a set of haploid progeny that show the same phenotypes as the parents in the second mating. What is the genotype of this haploid?*
- b) If the haploid identified in part (a) accumulates product b, which step occurs first in the pathway – the one catalyzed by enzyme A or the one catalyzed by enzyme B?*

**3. When will these outcomes be assessed? When and in what format will the results of the assessment be discussed?**

*SLO #1 – General Microbiology is offered in both the fall and spring semester. Two faculty members are charged with delivery of this course; one is responsible for teaching this course in the fall semester and the other is responsible for teaching this course in the spring semester. Course content and grading rules are the same for both semesters. We hope to initiate this assessment tool in the fall of 2005. Results of the assessment will be collected for a minimum of 4 semesters (two times for each instructor) before any analysis will be attempted. This should minimize any effects due to differences in instructional styles of the two faculty members involved, and should also ameliorate any effects due to variations in the preparation of students in any given semester. Thus analysis of the results will not occur until after the spring semester of 2007. Results will be analyzed on a semester basis, but will also be pooled in order to gain insight into the teaching of this important student learning outcome. These results will be shared with the instructors and with the Curriculum and Undergraduate Affairs Committee within the Division of Biology. If appropriate, modifications to the curriculum will be made in order to address any problems revealed by this analysis (see below).*

*SLO #2 – Modern Genetics is offered in both the fall and spring semester. Two faculty members are charged with delivery of this course; one is responsible for teaching this course in the fall semester and the other is responsible for teaching this course in the spring semester. Course content and grading rules are the same for both semesters. We hope to initiate this assessment tool in the fall of 2005. Results of the*

*assessment will be collected for a minimum of 4 semesters (two times for each team of instructors) before any analysis will be attempted. This should minimize any effects due to differences in instructional styles of the two teams, and should also ameliorate any effects due to variations in the preparation of students in any given semester. Thus analysis of the results will not occur until after the spring semester of 2007. Results will be analyzed on a semester basis, but will also be pooled in order to gain insight into the teaching of this important student learning outcome. These results will be shared with the instructor teams and with the Curriculum and Undergraduate Affairs Committee within the Division of Biology. If appropriate, modifications to the curriculum will be made in order to address any problems revealed by this analysis (see below).*

**4. What is the unit's process for using assessment results to improve student learning?**

*Assessment results will be shared with instructors in these courses as mentioned above. If they deem it useful, they can make appropriate changes in their approach, their syllabus, etc. Content changes might also be made, but this would require involvement of additional parties. Curricular matters are the purview of the Curriculum and Undergraduate Affairs Committee. Members of this committee represent all the subdisciplines of Biology. Curricular changes that involve core courses are initiated by this committee; the faculty as a whole must vote on curricular changes proposed by this committee.*