Program (Major, Minor, Core): Undergraduate Majors (BA and BS)  
Department: Biology  
College/School: College of Arts and Sciences  
Person(s) Responsible for Implementing the Plan: the Learning Outcomes Committee of the Department of Biology (Drs. Bray Speth, Russell, Kennell, and Janowiak) and the Department Chair, Dr. Wood.  
Date Submitted: November 2015

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<th>Program Learning Outcomes</th>
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<td>What do you expect all students who complete the program to know, or be able to do?</td>
<td>Where is the outcome learned/assessed (courses, internships, student teaching, clinical, etc.)?</td>
<td>How do students demonstrate their performance of the program learning outcomes? How does the program measure student performance? Distinguish your direct measures from indirect measures.</td>
<td>How does the program use assessment results to recognize success and &quot;close the loop&quot; to inform additional program improvement? How/when is this data shared, and with whom?</td>
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**LO1.** Graduates will:
1a. Know and understand the core concepts of biology:
- evolution as the unifying principle of biological science;
- the relationship between structure and function;
- transfer of energy and matter within and among organisms and the environment;
- transmission, flow and processing of information;
- the interconnectedness of biological systems.
1b. Connect and integrate their knowledge and understanding across all scales of biological organization, from cells and molecules to organisms and ecosystems.
1c. Understand the process by which scientific knowledge is constructed, analyzed and interpreted.

Learning and assessment of the knowledge dimension (LO1) is currently performed at the course level. Our goal for the 2015-16 AY is to begin and complete mapping of existing courses to this outcome. We have used the most current conceptual framework of undergraduate biology education [1, 2] to guide conversation among faculty and reach consensus on what specific concepts and connections all our students should master when they graduate.

**Direct assessment** of the knowledge dimension (LO1) is currently performed at the course level. Evidence of student learning is collected as course exams and other artifacts such as term papers, reports and reflections.

**Indirect measures** of student achievement at the program level are available, such as the numbers of students going on to graduate programs and professional school, and graduate employment rates. Other indirect measures would be the number of students that present their work in local and international conferences.

We plan on adopting and/or developing assessment instruments that allow us to measure students’ knowledge and understanding of biology at multiple points along the normal course of curriculum progress. We are connected to a nationwide network of biologists and biology education researchers who are developing such tools. We expect these tools to be available to us within the next academic year. Our goal is to obtain both qualitative and quantitative data that can be used to make informed decisions on curriculum and general program improvement.

**LO2.** Graduates will use scientific reasoning and appropriate techniques to propose research questions, articulate hypotheses, design and conduct experiments, represent results, and interpret data to draw appropriate conclusions.

Learning Outcomes 2-4 refer to competencies that are broadly recognized by the Biology scientific community to be fundamental for every biology graduate (Vision and Change Report, AAAS, 2011). Because of the nature of these outcomes, for Learning outcomes 2-4, at this point in time, we only have indirect measures which include the number of biology undergraduates that enroll in independent research and produce and analyze data sets that lead to significant findings.

As we are only at the very beginning of our planned activities we will need to complete our mapping and begin data collection and analysis before we can close the feedback loop.
**LO3.** Graduates will be self-directed learners who seek information independently and use it to grow their knowledge base.

Outcomes, we expect them to be achieved in a broader context than that of any individual course. These outcomes will need to be mapped to the curriculum as a whole.

Presentations and co-authorship on scientific publications.

One potential avenue for collecting **direct assessment data** would be to develop a required end-of-term assignment for all independent study courses, complete with a rubric, to document each student’s (a) mastery of the scientific process; (b) independent reasoning; and, (c) written communication ability. This standardized report would be separate from, and in addition to, the specific products course instructors would normally require. The standardized independent study reports will be collected from all students in independent study courses, so that all reports would be available in an electronic format for long-term programmatic assessment purposes.

**LO4.** Graduates will be able to effectively communicate their understanding of biology and/or their research findings, to diverse audiences and in multiple formats.
| **LO5.** Graduates will be able to apply their understanding of science to current societal issues and to recognize the ethical issues related to scientific research. | This is a much broader outcome that may be learned/assessed at the level of individual courses, which remain to be determined. | All the department faculty agreed on the value and relevance of this outcome, which closely aligns with the SLU mission. We anticipate that this outcome will be more challenging to assess in a quantifiable manner. Potential avenues for assessment might include course level outcomes in interdisciplinary courses that include component of ethics, philosophy, social sciences, and by documenting students’ involvement in service initiatives. |

1. **It is not recommended** to try and assess (in depth) all of the program learning outcomes every semester. It is best practice to plan out when each outcome will be assessed and focus on 1 or 2 each semester/academic year. Describe the responsibilities, timeline, and the process for implementing this assessment plan.
   At this time we are still developing the plan. All members of the committee as well as the Department Chair are fully responsible for developing the plan, including all faculty in the planning process, and connecting to the broader scientific community outside of Saint Louis University to ensure that our plan is consistent and aligned with national recommendations for college biology education.

2. **Please explain how these assessment efforts are coordinated with Madrid (courses and/or program)?**
   We are in direct contact with Dr. Francisco Prieto (an Assistant Professor of Physics) who serves on the Madrid Campus Assessment Committee. We are keeping him fully apprised of our plans and our progress and he is reciprocating by sharing the details of their approaches.
3. The program assessment plan should be developed and approved by all faculty in the department. In addition, the program assessment plan should be developed to include student input and external sources (e.g., national standards, advisory boards, employers, alumni, etc.). Describe the process through which your academic unit created this assessment plan. Include the following:

a. **Timeline regarding when or how often this plan will be reviewed and revised. (This could be aligned with program review.)**

   Assessment has been an ongoing process in the Department of Biology. At this time, the Department is actively engaged in revision of student learning outcomes and curriculum mapping. A departmental Learning Outcomes Committee, established in 2014, was tasked with guiding development of a new set of Undergraduate Learning Outcomes for all Biology majors. We articulated five learning outcomes through an iterative process that began with a grassroots effort to gather consensus among all department faculty about their vision of what our graduates should know and be able to do. We referred extensively to national calls for reform of undergraduate biology education [1] and to department evaluation rubrics developed by PULSE (Partnership for Undergraduate Life Science Education) [3, 4]. The five broad Learning Outcomes listed in the table above emerged as a result of integrating the national recommendations with feedback from department faculty, which the committee solicited periodically during the 2014-2015 academic year.

b. **How students were included in the process and/or how student input was gathered and incorporated into the assessment plan.**

   Data derived from senior exit interviews, tri-beta surveys and other student developed and implemented surveys that are provided to the department are taken into consideration. Because of the mentoring system each faculty member regularly meets with his/her mentees and discusses curricular issues that are positive and negative. The distilled results of these are routinely shared at the departmental level as we strive to constantly improve our approach to our curriculum.

c. **What external sources were consulted in the development of this assessment plan?** We have joined the regional (Midwest-Great Plains) network of PULSE and a team of faculty attended two regional PULSE conferences (June 2014 and June 2015), where we
started drafting a plan for our assessment efforts with the help of colleagues and administrators from other institutions of higher education. In addition to the Vision and Change Report [1] and the PULSE resources [3], the committee has used a reference

d. Assessment of the manageability of the plan in relation to departmental resources and personnel. The faculty are fully charged with development, implementation and monitoring of the plan. Collected data will be housed on-line and will be maintained and evaluated by the Assessment Committee.

References: