Washington and Jefferson College

HHMI CURRICULUM DEVELOPMENT: BIO 292 Tutorial: Evaluating/Developing a Bioinformatics Laboratory Exercise for BIO 101

Inputs	Strategies	Outputs	Outcomes		Impacts (Long Term-Conditions)
			(Short Term-Learning)	(Medium Term-Action)	
Faculty member responsible for initial selection/development of bioinformatics laboratory exercise: J. Caldwell (J.E.C.) Undergraduate Student to carry out and evaluate exercises through Bio 292 tutorial: L. Correia (L.C.) Potential laboratory exercises selected and modified from publications by the Association for Biology Laboratory Education (ABLE) and commercially available kits. Learning goals and existing curriculum in BIO 101 lecture and laboratory. (The new laboratory exercise will complement these.) Existing BIO 101 laboratory equipment, including computers, glassware, plant growth lights, and gel electrophoresis equipment. Existing departmental laboratory equipment, including thermocycler and protein gel electrophoresis equipment. HHMI funding for laboratory supplies to be used in piloting/developing exercises HHMI stipend to J. Caldwell for course development Other Biology faculty who teach BIO 101 (expert evaluators, who will help us select the final exercise(s) to be used in BIO 101): A. McGrain, J. Kilgore, A. Lee CURE survey to evaluate effect of Bio 292 tutorial on student (L.C.) learning	Develop a rubric for evaluating potential laboratory exercises, including student learning outcomes, student understanding of the nature/process of science, and exposure of students to new techniques Pilot various published exercises/kits and evaluate using the rubric. Alter and/or combine various exercises to better fit rubric and learning outcomes. Weekly meetings between student (L. C.) and faculty mentor (J.E.C.) to review progress and plan next steps.	**From Student (L.C.):** Rubric for use in evaluating lab exercises. Completed rubric comparing set of five exercises. Modified instructions for laboratory exercises, as needed. Poster presenting the rubric and overview of selected exercises. One or two “best” exercises recommended for rewriting for laboratory manual. Pre- and post-survey responses to CURE survey. Particular attention will be paid to significant changes in student’s responses to “opinions about yourself and science” **From Faculty (Bio 101 instructors):** Evaluation and comments regarding student’s poster presentation and laboratory exercises. **From Faculty (J.E.C.):** Final writeup of exercise for Bio 101 manual.	Student (L.C.) gains understanding of research process (evaluated by comparing CURE pre-/post-survey responses). Student gains confidence in ability to work independently and do research. Faculty member (J.E.C.) gains experience in mentoring student research.	**Specific** New laboratory exercise(s) written for Biology 101. Student (L.C.) continues in research activities through internships and/or work with W&J faculty. Rubric available for evaluating other laboratory exercises. **Broad** Bio 101 students gain understanding of bioinformatics, biotechnology, and the nature of the scientific process. Bio 101 students gain basic competence with computational bioinformatics tools. Increased student interest in biology lab courses.	Students who complete Bio 101 are able to apply basic techniques in bioinformatics and biotechnology to upper level coursework and research projects. Increased level of student interest and enrollment in advanced courses on bioinformatics and molecular biology. Student (L.C.) may pursue further research experience through graduate study.

Evaluation Questions for OUTCOMES	Possible Indicators/Measures	Possible Data Collection Methods and Information Sources	Rank/Priority (include brief rationale)
1. How effective was the curriculum development activities in (a) Developing/identifying an appropriate laboratory exercise? (b) Enhancing the student's learning and understanding of the research process? 2. How does the curriculum development improve the course compared with the original one? (a) Improve student interest in labs? (b) Increase student interest in bioinformatics?	**Short term (Bio 292 tutorial):** One exercise stands out as clearly superior and is implemented in Bio 101. From CURE pre-/post-surveys: Student (L.C.) becomes more confident in her abilities as a researcher. Student expresses gains in her level of understanding of the research process. Faculty comment favorably about student's poster presentation. Faculty express interest in new laboratory exercise. **Longer term (Bio 101 curriculum):** 1. Students positive about new curriculum 2. Students increased interest in bioinformatics	**Short term (Bio 292 tutorial):** Completed rubric for 5 lab exercises Biology faculty comments regarding student's poster CURE pre-/post-survey responses from student (L.C.) Student's future research experiences (further Bio 292, independent study, internships) **Longer term (Bio 101 curriculum):** Course evaluations from Academic Affairs for Bio 101. Enrollment in bioinformatics course in 2011-2012 (taught by new hire)	Items are ranked based on how soon they can be captured during and after program activities (strategies) have occurred. Near-term assessment for assessing effectiveness in course and curricular changes can be performed primarily through feedback from students and faculty. Longer-term effects can be assessed by changes adopted by department and institution. Overall impact can be determined by long-term effect within and outside the institution.