

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

Evaluation Questions for OUTCOMES	Possible Indicators/Measures	Possible Data Collection Methods and Information Sources	Rank/Priority (include brief rationale)
<p>1. How effective was the curriculum development activities in</p> <ul style="list-style-type: none"> (a) Developing/identifying an appropriate laboratory exercise? (b) Enhancing the student's learning and understanding of the research process? <p>2. How does the curriculum development improve the course compared with the original one?</p> <ul style="list-style-type: none"> (a) Improve student interest in labs? (b) Increase student interest in bioinformatics? 	<p>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.</p> <p>Longer term (Bio 101 curriculum):</p> <ol style="list-style-type: none"> 1. Students positive about new curriculum 2. Students increased interest in bioinformatics 	<p>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)</p> <p>Longer term (Bio 101 curriculum): Course evaluations from Academic Affairs for Bio 101. Enrollment in bioinformatics course in 2011-2012 (taught by new hire)</p>	<p>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.</p>