NAME: Undergraduate Program

INSTITUTION: Howard Hughes Medical Institute

Howard Hughes Medical Institute
Office of Grants and Special Programs
Updated – 01/15/09

DRAFT: HHMI CURRICULUM DEVELOPMENT : RESEARCH-BASED INTRODUCTORY LABS

Inputs	Strategies	Outputs	Outcomes		Impacts
			(Short Term-Learning)	(Medium Term-Action)	(Long Term-Conditions)
Undergraduate Students Curriculum Development Teams (Faculty, Instructors, Postdoctoral fellows, and Graduate and Undergraduate Students) Biology Faculty Phage Lab as the Paradigm New Scientific/Pedagogical Discoveries Teaching and Research Laboratories Equipment and Supplies Institutional Commitment Collaborating Institutions Supportive Teaching and Research Environment and Infrastructure: Teaching Seminars/Workshops/Lunch Meetings Charles Center Teaching Mentoring Faculty Release Time Department Curriculum Review Opportunities/External Review Biology Departmental Staff, e.g. lab coordinator , graduate teaching assistants HHMI – Staff, Leadership and Funding Other Funding Sources	"Introductory Lab" committee review of strategies and resources: ongoing as labs are developed Continued interaction with faculty as lab is developed : for faculty buy-in and input Develop new introductory labs to reflect new scientific discoveries and teaching approaches Ensure that new labs are integrated with ongoing faculty research programs: discovery of new phage (continuation of phage lab); developmental ecotoxicology of mercury; metagenomic analysis of bacteria in College Woods Provide training opportunities and resources for faculty, lab coordinators, and graduate and undergraduate teaching assistants Provide for faculty release time Provide support for others such as undergraduates, graduate students, and postdocs engaged in curriculum development efforts Update laboratory equipment	Institutionalization of the "Phage Lab" Total of 24 students each year Two sections of mercury ecotoxicology Total of 24 students each year Two sections of bacterial metagenomics of College Woods ; total of 24 students each year Number and demographics of students using items purchased with HHMI funds Development of lab manual for the labs; development of other materials to share and disseminate (powerpoints, exercises, protocols) Faculty and other instructors (lab coordinator and grad students) develop new skills	Students have better understanding of process of science, i.e, how new knowledge is produced Students have better understanding of the content covered in the lab Lab development activities have positive impact on curriculum developers and those who implement it Students are more interested and engaged in science issues and continue in science Implementation of new labs lead to new collaborations among faculty developing labs Labs lead to better attendance and attention in labs; better understanding in lecture	Students have a long-term interest or engagement in science activities; they remain in science major More students enter research labs as undergraduates Students understand science concepts better Those who took lab perform better in related courses and labs Faculty receive recognition for input into curriculum and teaching new course with reduced workload in other areas Faculty continue to be involved in modifying or developing courses with less or no HHMI support Institutional or other sources of support expand for curriculum development Additional faculty become involved in course development for introductory labs Faculty use this lab as basis for upper level lab design—as a continuation of introductory labs	Students are engaged in science-related activities and professions Faculty and instructors continue to modify what and how they teach science, in particular introducing many more new courses that involve research Faculty develop a freshmen-through-senior research-based curriculum, expanding opportunities for research at all levels of the curriculum A cadre of faculty members lead a national movement to disseminate curriculum revision, especially incorporating research into courses/labs Curricular revision is spurred in all science departments Faculty receive recognition, awards, tenure, promotion for their efforts; Institutions reward faculty for better teaching and curriculum development activities Institutions commit funds and other support for curriculum revision

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DRAFT: RESEARCH-BASED INTRODUCTORY LABS EVALUATION FRAMEWORK

Evaluation Questions for OUTCOMES	Measures	Possible Data Collection Methods and Information Sources	Rank/Priority (include brief rationale)
1. How effective were the research-based labs in teaching contemporary science to students? 2. Did the students' attitudes towards research change for the positive? 3. How effectively did the students employ or engage in research beyond the course ? 4. What was the effect of the integration of research-based labs on the faculty and department/major? 5. What impacts were there beyond the department for the curriculum development activities?	1. a. Students show increased interest in research b. Students learn introductory material better and retain material long term c. Students value research d. Students less wary of "real" research experiences e. Students continue in science (majors and careers) and continue in research 2. a. Students value research b. Students less wary of "real" research experiences c. Students continue in science (majors and careers) and continue in research 3. a. Students take additional courses with research component b. Students pursue research opportunities outside of course experiences 4. a. Course(s) integrated into curriculum b. Course enrollment increases c. Department student majors increases d. Department creates additional courses modeled on this lab 5. a. Lab courses in other departments employ similar strategy for introductory lab courses b. Effect on science pedagogy c. Additional curriculum development grants and awards that stress research-based approaches	1,2. a. Pre-Post Tests b. Entrance and Exit Questionnaire c. Interview d. Focus Group e. CURE f. Course/Classroom Observations g. Course Surveys 3. a. Data collection on course/curriculum changes (e.g., Enrollment for students) b. Student data for independent research activities 4. a. Data on offerings in curriculum and departmental major b. Interviews/reports from faculty and other curriculum developers c. Focus Group of faculty and other curriculum developers d. Faculty CVs and portfolios 5. a. Review of course offerings, syllabi, and catalogs for research based courses b. Review of teaching workshop topics and teaching seminars c. Assessment of teaching on P&T d. Faculty CVs and portfolios e. Annual report of HHMI-funded activities and their impact f. Grant funding information g. Institutional funding reports h. Publications in science teaching journals	Items are ranked based on how soon they can be captured during and after program activities (strategies) have occurred. However all questions and measures will be evaluated during and after each activity in order to capture the ongoing, longer-term changes in impact.