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 : CELLULAR BIOPHYSICS AND MODELING

| Inputs | Strategies | Outputs | Outcomes | | Impacts |
|---|---|---|---|---|---|
| | | | (Short Term-Learning) | (Medium Term-Action) | (Long Term-Conditions) |
| Undergraduate Students<br><br>Curriculum Development Teams (Faculty, Instructors, Postdoctoral fellows, and Graduate and Undergraduate Students)<br><br>Applied Science Faculty<br><br>Neuroscience Faculty<br><br>New Scientific/Pedagogical Discoveries<br><br>Teaching and Research Laboratories<br><br>Equipment and Supplies (software)<br><br>Institutional Commitment<br><br>Supportive Teaching and Research Environment and Infrastructure: Teaching Seminars/Workshops/Lunch Meetings<br><br>Charles Center Teaching Mentoring<br><br>Faculty Release Time<br><br>Graduate Teaching Assistants<br><br>Department Curriculum Review Opportunities/External Review<br><br>HHMI – Staff, Leadership and Funding<br><br>Other Funding Sources | Neuroscience faculty subcommittee review of strategies and resources: ongoing as labs are developed<br><br>Continued interaction with Neuroscience faculty as lab is developed : for faculty buy-in and input<br><br>Develop new systems-based cellular biophysics course required for ALL neuroscience majors--to reflect new scientific discoveries and teaching approaches in modern neuroscience<br><br>Use examples from ongoing faculty research programs<br><br>Provide training opportunities and resources for faculty, lab coordinators, and graduate and undergraduate teaching assistants<br><br>Provide for faculty release time<br><br>Provide teaching assistants<br><br>Provide training and support for others such as undergraduates, graduate students, and postdocs engaged in curriculum development efforts<br><br>Update software packages | A system-based cellular biophysics and modeling course offered each year to 70-80 sophomores<br><br>Development of course materials for the new courses, including powerpoints, problem sets, tutorials<br><br>Faculty and instructors (lab coordinator and grad students) develop new skills in modeling<br><br>Other Neuroscience faculty develop demonstrable new skills in modeling and application of quantitative applications | Students have better understanding of neural systems and systems-biology<br><br>Students have better understanding of the content covered in the lab<br><br>Students have ability to apply modeling and quantitative approaches to scientific questions in neuroscience<br><br>Faculty lab development activities have positive impact on curriculum developers and those who implement it<br><br>Students demonstrate more interest and engagement in science, particularly neuroscience<br><br>Students develop improved attitude toward quantitative approaches and mathematical modeling<br><br>Implementation leads to new collaborations among involved faculty<br><br>Systems approach leads to better attendance, attention, and engagement<br><br>New collaborations are formed | Students remain engaged in (neuro-) science activities; they remain in some science major<br><br>More students enter neuroscience research labs as undergraduates<br><br>Students demonstrate better understanding in upper level courses<br><br>Stronger performance in related neuroscience courses and labs<br><br>Faculty receive recognition for input of new course into curriculum and teaching new course with reduced workload in other areas<br><br>Faculty continue to be involved in modifying or developing courses with less or no HHMI support<br><br>Institutionalization of the new course<br><br>Additional faculty become involved in course development for introductory labs<br><br>Faculty use this course as paradigm for introducing system-based courses in other fields | Students enter neuroscience graduate programs or professions<br><br>Students employ system-based approaches in future science endeavors<br><br>Faculty and instructors continue to modify what and how they teach science, in particular introducing many more new courses that involve systems-based approaches and modeling<br><br>Faculty develop a freshmen-through-senior systems-based curriculum, expanding opportunities at all levels of the curriculum<br><br>Faculty members disseminate this approach outside of W&M for other neuroscience programs<br><br>Faculty receive recognition, awards, tenure, promotion for their efforts; Institutions reward faculty for novel teaching and curriculum development activities<br><br>Institutions commit funds and other similar support for curriculum revision |

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# DRAFT: CELLULAR BIOPHYSICS EVALUATION FRAMEWORK

| Evaluation Questions for OUTCOMES | | Possible Data Collection Methods and Information Sources | Rank/Priority (include brief rationale) |
|---|---|---|---|
| 1. How effective was the course in teaching contemporary neuroscience from a systems-based and modeling approach?<br><br>2. Did the students' attitudes towards systems-based approach and modeling change for the positive?<br><br>3. How effectively did the students employ these approaches beyond the course?<br><br>4. What was the effect of this approach in a sophomore level course on the neuroscience program and on the curricula of other departments involved in the neuroscience program?<br><br>5. What impacts were there beyond the Neuroscience program and beyond the college on curriculum development activities? | 1. a. Students show increased interest in systems & mathematical approaches in neuroscience<br>b. Students learn basic neuroscience material better and retain material long term<br>c. Students value quantitative approaches<br>d. Students less wary of math and modeling applications<br>e. Students continue in neuroscience (majors and careers) and continue taking quantitative courses students succeed in these courses<br><br>2. a. Students value math, modeling, and quantitative approaches<br>b. Students less math-phobic<br>c. Students seek out quantitative courses in neuroscience<br>d. Students recommend modeling and quantitative courses to friends<br><br>3. a. Students take additional courses with quantitative modeling component<br>b. Students pursue research opportunities with quantitative approaches<br>c. Students employ modeling and systems-based approaches<br><br>4. a. Course integrated into curriculum<br>b. Course enrollment increases<br>c. Number of neuroscience majors increases<br>d. Neuroscience creates additional courses modeled on this course<br>e. Neuroscience program creates upper level courses that are extensions of this course and builds upon it<br><br>5. a. Courses in other departments employ similar strategy for introductory/sophomore courses<br>b. Impacts science pedagogy at College<br>c. Additional curriculum development grants and awards that stress quantitative and modeling approaches<br>d. Other departments and interdisciplinary programs create upper level courses that are extensions of this course and build upon it; new multidisciplinary courses created | 1,2. a. Pre-Post Tests<br>b. Entrance and Exit Questionnaire<br>c. Interview<br>d. Focus Group<br>e. CURE<br>f. Course/Classroom Observations<br>g. Course Surveys<br><br>3. a. Data collection on course/curriculum changes (e.g., Enrollment for students)<br>b. Student data for independent research activities<br><br>4. a. Data on offerings in curriculum and departmental major<br>b. Interviews/reports from faculty and other curriculum developers<br>c. Focus Group of faculty and other curriculum developers<br>d. Faculty CVs and portfolios<br><br>5. a. Review of course offerings, syllabi, and catalogs for research based courses<br>b. Review of teaching workshop topics and teaching seminars<br>c. Assessment of teaching on P&T<br>d. Faculty CVs and portfolios<br>e. Annual report of HHMI-funded activities and their impact<br>f. Grant funding information<br>g. Institutional funding reports | 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. That is, we except to see increasing impact over time. |