Quantitative Center

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; Comp. Sci.; Applied Science Faculty Mathematics Faculty

New Scientific/Pedagogical Discoveries—from work on teaching biomath

Examples from Teaching and Research Laboratories

Equipment and Supplies

Institutional Commitment

W&M BioMath Initiative

Expertise/experience from other 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 | Quantitative Center will be developed to serve as a central source to forge an interdisciplinary college-wide community of quantitative-computational scholars; will be located next to writing center in Swem Library

Quant. & Comp. Center will provide extensive tutoring at all levels for courses involving quant. & computational themes

Quant. & Comp. Center will provide workshops for faculty and students on novel ways to incorporate quant/computational approaches into the classroom

Center will provide training opportunities and resources for faculty, lab coordinators, and graduate and undergraduate teaching assistants

Provide for faculty release time as workshops are being developed and implemented

Provide support for others such as undergraduates, graduate students, and postdocs engaged in curriculum development efforts

Upgrade computational facilities (Matlab and other software licenses)

Provide assistance on quant/ computational aspects of faculty-student research projects | The establishment of a quant/ computational center (none currently exists)

Services will be provided: tutoring, workshops on various topics, brown bag discussion groups; journal clubs; assistance with research projects; assistance with pedagogy

Faculty and other instructors (lab coordinator and grad students) develop new quantitative skills | Students and faculty develop better understanding of use of quantitative and computational techniques

Students develop stronger skills in mathematics and in the application of mathematical principles in all courses

Students have better understanding of the content covered in labs because they understand the basis for this knowledge

Students are more confident and less fearful of mathematics in biology in other courses

Students develop deeper understanding of math principles

Students and faculty willing to undertake projects involving math and computation

Labs lead to better attendance and attention in labs; better understanding in lecture | Students take more science courses in which they employ quantitative approaches

Students take additional math/statistics courses

Students have a long-term interest or engagement in science activities; they remain in science major

More students enter research labs as undergraduates involving math

Students willing to employ quantitative approaches in their own research

Students understand science concepts better because of understanding the underlying math

Faculty receive recognition for quantitative 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 introduction of quantitative approaches

Faculty use quantitative center to explore new fields and begin new collaborations | Students continue to be engaged in science-related activities and professions; in particular students will enter biomath programs

Students are more open to use bio-math approaches in their post-graduate careers

Faculty and instructors continue to modify what and how they teach science, in particular weaving quantitative approaches throughout the curriculum

Faculty and students make incorporation of biomath and computational approaches an integral part of their teaching and research

A cadre of faculty members begin to employ quant approaches in teaching and research

Similar approaches 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 ongoing curriculum revision related to biomath and computation |

NAME: HHMI Undergraduate Science Education Program

INSTITUTION: College of William and Mary

Evaluation Questions for OUTCOMES		Possible Data Collection Methods and Information Sources	Rank/Priority (include brief rationale)
1. How effective was the integration of mathematical approaches in teaching contemporary science to students? 2. Did the students' attitudes towards the use of quantitative approaches change for the positive? 3. How effectively did the students apply quantitative approaches beyond the course in future scientific work? 4. What was the effect of the integration of math into the introductory curriculum development changes to 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 mathematical approaches in science b. Students learn introductory material better and retain material long term c. Students value quantitative approaches d. Students less wary of math applications e. Students continue in science (majors and careers) and continue taking quantitative courses 2. a. Students value math and quantitative approaches b. Students less math-phobic c. Students seek out quantitative courses d. Students recommend quantitative courses to friends 3. a. Students take additional courses with quantitative component b. Students pursue research opportunities with quantitative 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 course e. Department creates upper level courses that are extensions of this course and build upon it 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 quantitative approaches d. Other department creates upper level courses that are extensions of this course and build upon it; new multidisciplinary courses created	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); quarterly and before/after surveys; courses taken 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 by department, institution d. Faculty CVs and portfolios e. Annual report of HHMI-funded activities and their impact f. Grant funding information 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.