# Washington & Jefferson College On-campus Summer Student Research—Bioinformatics

## Inputs
- **HHMI Funding:** Support up to 2 research teams/summer
- **Institutional funding:** Support housing costs for 2 research teams

## Strategies
- Provide various opportunities for a wide variety of students to engage in significant mentored and interdisciplinary summer research experiences in bioinformatics and mathematical applications to biological problems at Washington & Jefferson College (current departments and programs involved: BIO, ITL, MTH, BCH, and NSC)
- Summer on-campus research by undergraduate interns will reach more students through the contribution of information (and the development of research protocols/experiences) to existing BIO, BCH, ITL, MTH, and NSC courses (through the use of a dedicated server and website)
- Offer administrative, academic, financial, and general program support for students (and in some cases the mentors) to fully maximize their research experiences
- Efforts will be made to recruit students for internships 1) from different classes (Freshmen, Sophomores, Juniors, Seniors), 2) from a variety of academic departments, 3) with different levels of research experience, and 4) from underrepresented minority groups
- Recruit and match students with appropriate faculty mentors and train potential student mentors

## Outputs
- Number and demographics of all HHMI-supported on-campus summer bioinformatics research students
- Number and demographics of HHMI-supported on-campus summer bioinformatics research students graduating in natural sciences and mathematics and ITL
- Number and demographics of non-HHMI supported on-campus summer bioinformatics research students who were affected by HHMI research support (e.g., attended science seminars, or decided to engage in research without HHMI support)
- Number and demographics of mentors (undergraduate peers and postdocs)

## (Short Term-Learning) Outcomes
- Students value their summer experience (primarily through student, peer, and mentor perceptions and attitudes)—SURE survey
- Students are more interested in and value research in science/mathematics or other related disciplines
- Students have enhanced knowledge and test scores in science and related disciplines
- Students have enhanced knowledge regarding graduate and professional school in the sciences and related disciplines

## (Medium Term-Action) Outcomes
- Students earn science graduate degrees (M.S., Ph.D., M.D.-Ph.D., M.D., etc.) and are practicing in science and/or research
- Students are in fellowships (postdoc and medical) positions and plan to continue in science or academia
- Students are more interested in and value research in science/mathematics or other related disciplines
- Students have enhanced knowledge regarding graduate and professional school in the sciences and related disciplines

## (Long Term-Conditions) Impacts
- Students who value scientific research and understand how science and the research enterprise works
- Graduates who are engaged in science-related professions
- Increasing the number of faculty who mentor undergraduate students who contribute to the research enterprise
- Institutions place a high value on providing significant undergraduate research as part of the institution’s culture
### Evaluation Questions for OUTCOMES

<table>
<thead>
<tr>
<th>Evaluation Questions for OUTCOMES</th>
<th>Possible Indicators/Measures</th>
<th>Possible Data Collection Methods and Information Sources</th>
<th>Rank/Priority (include brief rationale)</th>
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| 1. Was the research experience valuable or not valuable for the students both short term and long term? What are the perspectives of the students, mentors, and supervisors on the students’ experiences? | 1. a) Continue to major in science  
   b) Graduate with science degree  
   c) Pursue additional research experiences before graduation  
   d) Expect to continue in research post-research experience  
   e) Value summer research experience—satisfaction surveys (SURE)  
   f) Express student-specified gains | 1. a) Student Exit Questionnaire  
   b) Interview  
   c) Supervisor, Mentor, Summer Program Director, and Selector Feedback  
   e) Focus Group  
   f) SURE  
   g) GCAT pre- and post-project questionnaires | The first question is the most pressing, not only because we can get the answer sooner, but also because the response to the question can inform us how to improve the overall program and possibly help us take action to impact the students and programs quickly (formative assessment). The second question takes time to answer, but the answers are relatively easier to obtain. The third and fourth questions are more difficult to answer given that students, faculty, and the institutional outcomes will need to be obtained in the long-term and the results would likely be more qualitative. |
| 2. What do students do after they graduate from their colleges/universities? How do students continue to be involved in science after they graduate from their colleges/universities? | 2. a) Pursue science and research-related activities after graduation, particularly through their job/education (post-graduation surveys—1, 5, and 10 years)  
   b) Pursue science and research-related activities five years after graduation, particularly through their job/education (post-graduation surveys—5 years)  
   c) Pursue science and research-related activities ten years after graduation, particularly through their job/education (post-graduation survey—10 years) | 2. a) Tracking Questionnaire  
   b) Contacting Undergraduate Institution and Selector  
   c) Alumni search  
   d) National Surveys (NSF, AAMC, etc.)  
   e) Grants, honors, and awards  
   f) Publication searches  
   f) Citation Impact | |
| 3. How are students contributing to science and/or research after the experience? | 3. a) Applied, received, and accepted academic faculty positions, including type of faculty positions (e.g. tenure-track)  
   b) Employed in research or science jobs (e.g. academic research, industry, government, NGO’s, associations, and societies)  
   d) Mentoring undergraduate students  
   e) Earned honors and awards in research and education | 3. a) Tracking Questionnaire  
   b) Alumni search  
   c) Interview  
   d) Focus Group  
   e) Peer review through panels, awards, etc. gauging research and mentoring contributions | |
| 4. How are mentors (at all levels) affected by their mentorship experiences? | 4. a) Success in desired career track  
   b) Better mentoring provided to other mentees | 4. a) Student, faculty, and administration surveys and interviews  
   b) Increase in support for undergraduate student research activities | |
| 5. How are the faculty and the grantee institution affected by HHMI support for student research? | 5. a) Students and faculty who are engaged in research without HHMI support  
   b) Institutional changes as a result of HHMI support for undergraduate student research | 5. a) Tracking of number and quality of undergraduate student research experiences at a given institution  
   b) External awards/funding for undergraduate student  
   c) Institutional funding for undergraduate research  
   d) Faculty research grants | |