Learning Pathways: Undergraduate Research Program

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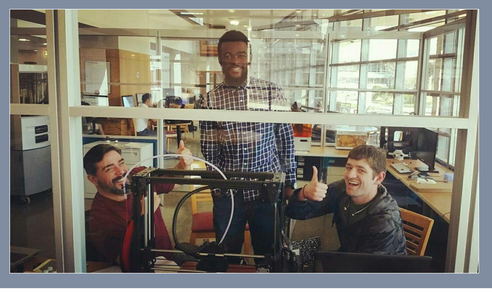
HOWARD COMMUNITY COLLEGE
You Can Get There From Here.



OVERVIEW

Howard Community College has developed a rigorous program of undergraduate research in which small teams of students work with a faculty mentor to pursue original, collaborative research. The program includes:

- A series of four, one credit research courses (URSC 101, 201, 202 and 203) in which students learn about research methods, protocols, data analysis, and research ethics
- Monthly seminars
- Student presentations at academic conferences
- An external program advisory board
- Publication in the college's new undergraduate research journal, The Journal of Research in Progress

Participating students have majored in such disciplines as life science, environmental science, computer science, engineering, mathematics, and technology. Representative projects have been in areas including biology, environmental science, geology, physics, chemistry, engineering, and astronomy.

To date, the top three impacts have been increases in retention rate, faculty engagement, and inter-institutional collaboration.

BACKGROUND

The undergraduate research program originally launched as two research-focused courses combined with two existing STEM seminars. Since that time the program has grown to consist of four courses designed specifically for the research program to help students learn to plan, execute, and communicate original research. The full four course sequence was officially launched in Fall 2018. The new courses offer excellent opportunities to assess how students' skills and beliefs about research evolve over the course of the four semester sequence.

EVALUATION

In Fall 2018, a rigorous plan to assess the URSC program and course sequence was developed and presented to the college's Institutional Review Board. The assessment plan was approved in Fall 2018. Data collection will begin in Spring 2019 and continue for multiple years. The project will utilize a variety of assessment tools.

Classroom Undergraduate Research Survey (CURE) – A survey tool developed by researchers at Grinnell College in collaboration with Harvey Mudd College, Hope College, and Wellesley College to measure students' beliefs about the importance of different skills for conducting research and their experience with those skills. The survey, administered by Grinnell College, was used as a pre-test/post-test or post-test only survey to measure student experience in research courses. In addition to collecting demographic data, the pre-test survey asks questions about students' reasons for taking a course, their level of experience with course elements, science attitude, and learning style. The post-test survey

EVALUATION (CONT'D)

assesses learning gains, learning benefits, overall experience, and science attitude. The CURE survey was administered to HCC undergraduate research students in Fall 2016.

Test of Scientific Literacy Skills (TOSLS) – An assessment developed by researchers at Georgia Tech to measure students' ability to "organize, analyze, and interpret quantitative data and scientific information".

Colorado Learning Attitudes About Science Survey for Experimental Physics (E-CLASS) – A survey tool developed by researchers at the University of Colorado to measure students' views about their strategies and attitudes when performing experiments. While the survey was developed with physics labs in mind, the questions are applicable to a variety of lab courses.

Focus Group Interviews – A faculty member who is not one of the research mentors will conduct small focus group interviews with URSC students. These interviews will explore student opinions regarding strengths and weaknesses of the program as well as more deeply probe some of the ideas expressed in the surveys.

In addition to the above instruments, surveys are also administered annually to the faculty involved with the research program.

OUTCOMES

Post test results for HCC undergraduate research students on selected post-test questions:

	HCC (%)	All Students (%)
1. I now plan to pursue a Master's degree in science field	41.6	19.6
2. I now plan to pursue a Doctoral degree in science field	25.0	21.4

HCC students reported **higher gains** than average on the following items:

1. A project where students have input into process or topic
2. Present results orally
3. Maintain lab notebook
4. Computer modeling
5. I can do well in science courses
6. I get personal satisfaction when I solve a scientific problem by figuring it out myself

	2015-201	2016-2017	2017-2018
Fall to Fall Retention	81.8%	85%	83.3%
Grade Point Average	3.45	3.34	3.37

Fall to fall retention rate for HCC in the same time period averaged 53.1%. Grade point average for HCC in the same time period averaged 2.45.

OUTCOMES (CONT'D)

Post Course Survey: Overall Assessment

These four questions serve as an overall assessment of the course. Note that the scale is 1 (strongly disagree) to 5 (strongly agree). The questions are on the post-course survey only. Means are used to represent the data.

	HCC	All Students
1. This course was a good way of learning about the subject	4.23	4.14
2. This course was a good way of learning about the process of scientific research	4.31	4.24
3. This course had a positive effect on my interest in science	4.15	3.98
4. I was able to ask questions in this class and get helpful responses	4.23	4.19

CONCLUSIONS & FUTURE DIRECTIONS

- Doing original research with freshman and sophomore undergraduate students is different than doing research as a graduate student but is very rewarding; adjust your expectations accordingly.
- Engage both transfer students and career students and create interdisciplinary student teams.
- Match students to projects based on their interest but also their skill sets.
- Consider a co-mentoring model to reduce faculty workload and to train new faculty mentors.
- Don't exclude students who have average academic performance as engaging in a research project with a mentor may benefit them academically.
- Work with senior leadership to fairly compensate faculty research mentors.
- Take advantage of any opportunity to highlight research student achievements.
- Help students learn how to highlight their experience and skills in resumes, essays, and job interviews.

ACKNOWLEDGEMENTS

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