Introduction to the Special Issue on Perspectives and Experiences on Mentoring Undergraduate Students in Research: Part I

Thomas Hagedorn, Aihua Li, Jan Rychtář & Dewey T. Taylor

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Introduction to the Special Issue on Perspectives and Experiences on Mentoring Undergraduate Students in Research: Part I

Thomas Hagedorn, Aihua Li, Jan Rychtář, and Dewey T. Taylor

Abstract: This issue is the first of a special PRIMUS two-part issue collecting articles from experienced faculty mentors. We offer it as a valuable resource for faculty leading undergraduate research programs. It is inspired by the “Regional Faculty Workshop on REU Issues” in 2013 and the Joint Mathematics Meeting 2015 Mathematical Association of America’s “Themed Session on Perspectives and Experiences on Mentoring Undergraduate Students in Research.” This issue consists of seven papers focusing on the larger issues involved in creating, running, and sustaining an undergraduate research program in mathematics.

Keywords: Undergraduate research, REU, mentoring, mathematics

There has been no larger change in the undergraduate program in mathematics over the past 30 years than the increased prevalence of undergraduate research. Today, it is common to find undergraduates doing mathematics research at colleges and universities. The source of this growth can be traced back to 1987, when the National Science Foundation (NSF) re-established the funding of undergraduate research, abolished five years earlier due to budget cuts, with the creation of the Research Experiences for Undergraduates (REU) program. A major goal of the program was to address the decline in the number of mathematical doctorates by involving more undergraduate students in research, especially students from institutions with limited research programs [6]. Eight mathematics sites were initially funded in 1987. It quickly grew to 18 sites in 1991, and in 2016, there were 59 NSF-funded REU sites in the mathematical sciences.

Address correspondence to Aihua Li, Department of Mathematical Sciences, 1 Normal Avenue, Montclair State University, Montclair, NJ 07043, USA. E-mail: lia@mail.montclair.edu
The mathematics community enthusiastically supported this development. In 1987, Pi Mu Epsilon, the mathematics honor society, sponsored a contributed paper session for undergraduates with 30 speakers at the Mathematics Association of America (MAA)’s summer meeting. The next year, the MAA created a subcommittee on Research by Undergraduates. In 1989, the Council on Undergraduate Research formed the Mathematical and Computer Sciences Council.

In 1994, the first MAA Undergraduate Poster Session was held with 12 student papers at the Joint Mathematics Meeting [6]. By 2012, over 300 papers were presented at the poster session, and over 15% of all attendees at the Joint Mathematics Meetings were undergraduates. Behind such growth has been the expansion of undergraduate research over the past three decades from the summer REU programs to becoming institutionalized in mathematics departments as part of their curriculum. Recently, the benefits of undergraduate research for students, whether math majors or not, for attracting and retaining beginning college students has become recognized.

In light of this growth, this special two-part issue of PRIMUS presents 17 papers describing the variety of undergraduate mathematics research currently being conducted. These papers, many originally presented as part of the MAA Contributed Paper Session Perspectives and Experiences on Mentoring Undergraduate Students in Research at the 2015 Joint Mathematics Meetings, guides readers through various stages of research with students. Topics appearing in this issue range from an introduction to starting an undergraduate research program for faculty new to undergraduate research to learning how to use media to disseminate project results for veteran faculty. This issue nicely complements previous publications [1, 2, 3, 4, 5, 7, 8, 9, 10] focused on initiating and sustaining undergraduate research programs in mathematics.

In Part 1 of this two-part special issue, we present papers focusing on the details involved in creating, running, and sustaining an undergraduate research program in mathematics. In Part 2, we present papers offering advice on more specific topics, such as finding and designing appropriate and accessible research projects for undergraduates.

This first issue begins with “Successfully Mentoring Undergraduates in Research: A How To Guide for Mathematicians,” a “how to” guide for mathematicians interested in successfully mentoring undergraduates in research. In this comprehensive paper, a six-step process is outlined to guide a faculty member through the undergraduate mentoring process from beginning to end. “Cultivating a Culture of Undergraduate Research at a Public Comprehensive University” describes how to establish a culture of undergraduate research throughout a department at a primarily undergraduate university. An important aspect of creating this culture is through the involvement of junior faculty early in their careers. The paper “Mentoring
Undergraduate Interdisciplinary Mathematics Research Students: Junior Faculty Experiences” presents advice on conducting undergraduate research for these faculty.

One current critical issue is how to bring the benefits of undergraduate research to a greater number of students. Four papers address different aspects of this issue. The authors of “Developing Collaboration Skills in Team Undergraduate Research Experiences,” address how to successfully work with groups of students with very diverse backgrounds by having students learn collaboration skills during team-based research experiences. The paper “Team-based Introductory Research Experiences in Mathematics” details efforts to use undergraduate research projects to recruit and retain at-risk students early in their academic careers. Similarly, the authors of “Starting and Sustaining an Undergraduate Research Program: The SURIEM Experience at Michigan State University” share their experience of establishing a summer REU mathematics program aimed at an early stage college students. This issue concludes with the paper “Coordinating a Large, Amalgamated REU Program with Multiple Funding Sources,” which describes how to coordinate multiple research programs in a department where undergraduate research is already well established.

The 2015 MAA Curriculum Guide calls for every undergraduate math major to work independently on “a substantial mathematical project that involves techniques and concepts beyond the typical content of a single course” [4]. In this collection of seven papers, we hope readers will find advice and inspiration for creating and running an undergraduate research program, or improving an existing one, to provide more students this opportunity.

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REFERENCES


**BIOGRAPHICAL SKETCHES**

Thomas Hagedorn is Chair and Professor in the Department of Mathematics and Statistics at The College of New Jersey. He is a past Chair of the New Jersey section of the Mathematics Association of America and currently chairs the MAA’s Deborah and Franklin Tepper Haimo Award committee for distinguished college and university teaching. He also serves on the Board of Education for the Princeton Public Schools. He enjoys popularizing mathematics and is proud to have introduced his family to the pleasures of SET and the puzzles of Martin Gardner and Raymond Smullyan. Email: hagedorn@tcnj.edu

Aihua Li is a professor of mathematics at Montclair State University. In the past decade she has mentored more than 30 undergraduate students on research in mathematics. She had directed REU programs for minority students (NREUP) and CURM teams sponsored by NSF through BYU. She had served as co-director for the Garden State Undergraduate
Conference in Mathematics from 2009 to 2013 and was a past vice chair for student affairs of the MAA New Jersey Section. Dr. Li has been a council member in the Council on Undergraduate Research since 2013 and she is a current member of the MAA Committee on Undergraduate Student Activities and Chapters. Email: lia@mail.montclair.edu

Jan Rychtář is a professor at the Department of Mathematics and Statistics at the University of North Carolina at Greensboro. He has been involved in undergraduate research since 2004 and has directly supervised research of over 66 undergraduate students and his work with students resulted in over 35 manuscripts published in professional journals. He is the founder and main organizer of the student centered conference held at UNCG and he has received REU, NREUP, CURM and PIC math grants. He is a CUR councilor in the division of Mathematics and Computer Sciences. Email: rychtar@uncg.edu

Dewey T. Taylor is an associate professor in the Department of Mathematics and Applied Mathematics at Virginia Commonwealth University. She holds a Ph.D. in mathematics from NC State University. Her research focuses on graph theory, in particular, product graphs and domination in graphs. She has been a graduate Program Director at VCU and is very active in research with undergraduate students as well as with in-service and pre-service teachers. Since 2015, she is a co-organizer of the student research conference at UNCG, received CURM and NREUP grants and is a CUR councilor in the division of Mathematics and Computer Sciences. Email: dttaylor2@vcu.edu