The Cambridge Handbook of Undergraduate Research

Undergraduate Research can be defined as an investigation into a specific topic within a discipline by an undergraduate student that makes an original contribution to the field. It has become a major consideration among research universities around the world, in order to advance both academic teaching and research productivity. Edited by an international team of world authorities in undergraduate research, this handbook is the first truly comprehensive and systematic account of undergraduate research, which brings together different international approaches, with attention to both theory and practice. It is split into parts covering different countries, disciplines, and methodologies. It also provides an overview of current research and theoretical perspectives on undergraduate research as well as future developmental prospects of undergraduate research. Written in an engaging style, yet wide-ranging in its scope, it is essential reading for anyone wishing to broaden their understanding of how undergraduate research is implemented worldwide.


Elizabeth L. Ambos served as Council on Undergraduate Research’s (CUR’s) fourth Executive Officer from 2012 to 2019. She was the founding Assistant Vice Chancellor for Research Initiatives and Partnerships for the twenty-three-campus California State University (CSU) system.

Angela Brew is the chair of the Australasian Council for Undergraduate Research (ACUR). She has published seven books including *The Nature of Research* (2001) and *Research and Teaching* (2006). In 2009, she was awarded a prestigious Australian National Teaching Fellowship to enhance undergraduate research engagement.

Dominique M. Galli launched a successful biomedical research career at Indiana University–Purdue University Indianapolis, Indiana, and was later appointed Assistant Vice Chancellor for Research and Executive Director of the Center for Research and Learning.

Judith Lehmann heads the international scholarship division at the Heinrich Böll Foundation, Berlin. She previously taught literature, cultural studies, and philosophy of science, steered cross-faculty projects at various universities, and directed the Argentinian office of the German Academic Exchange Service (DAAD).
Contents

List of Figures xi
List of Tables xii
List of Contributors xiii
Foreword xviii

Lindsay Currie

Mick Healey and Alan Jenkins xx

1 Introduction
Harald A. Mieg and Susanne Haberstroh 1

Part I Theory and Research on Undergraduate Research
2 Theory and Research on Undergraduate Research: An Introduction
Harald A. Mieg and Wolfgang Deicke 23
3 Undergraduate Research: A View from Higher Education
Malcolm Tight 33
4 Undergraduate Research: The Psychological View
Johannes Reitinger and Herbert Altrichter 46
5 Undergraduate Research: Sociocultural Perspectives
Ines Langemeyer and Monika B. Nerland 59
6 Undergraduate Research: A Philosophical View
Angela Brew 72

Part II Implementation, Approaches, Methods
7 Introduction
Dominique M. Galli 87

Part II.1 Implementation Models in Undergraduate Research
8 The Zurich Framework
Peter Tremp and Thomas Hildbrand 93
CONTENTS

9 Four-Component Instructional Design Model, Maastricht
Ellen Bastiaens and Jeroen J. G. van Merriënboer | 101

10 Connected Curriculum, UCL
Nicholas Grindle and Vincent C. H. Tong | 108

11 Humboldt Reloaded, Hohenheim
Natascha Selje-Aßmann, Evelyn Reinmuth, and Martin Blum | 115

12 The US Model at IUPUI
Dominique M. Galli | 121

Part II.2 Key Measures for the Implementation of Undergraduate Research

13 Mentoring in Undergraduate Research: The Teacher’s Role
Helen Walkington, Eric E. Hall, and Caroline J. Ketcham | 133

14 Inquiry Approach and Phases of Learning in Undergraduate Research
Margus Pedaste | 149

15 Assessment in Undergraduate Research: The EvaluateUR Method
Jill Singer, Daniel Weller, Bridget Zimmerman, Sean Fox, and Elizabeth L. Ambos | 158

16 Dissemination in Undergraduate Research: Challenges and Opportunities
Emma Barker and Caroline Gibson | 172

Part III Disciplines

17 Introduction
Harald A. Mieg | 185

Part III.1 STEM

18 Undergraduate Research in Physics
Neal Broadus Abraham, Janice Hudgings, Michael Jackson, and Warren F. Rogers | 191

19 Undergraduate Research in Chemistry
Nicole L. Snyder | 199

20 Undergraduate Research in Biology
Evelyn Reinmuth, Martin Blum, and Joanna Fietz | 207

21 Undergraduate Research in Mathematics
Michael Dorff | 215

22 Undergraduate Research in Engineering
Caitlin D. Wylie | 222

23 Undergraduate Research in Data Science
Anthony Suen and Stefanie Ebeling | 230

Part III.2 Health

24 Undergraduate Research in Medicine
Niharika Nath and Sara A. Myers | 241
25 Undergraduate Research in Health Sciences

Leann L. Laubach

26 Undergraduate Research in Nursing

Ellen Buckner, Jennifer E. Wilson, and Larry Z. Slater

27 Undergraduate Research in the Exercise Science Discipline

Sarah Hunt Sellhorst and Elizabeth A. Easley

Part III.3 Social Sciences

28 Undergraduate Research in Sociology

Jeanne Mekolitchick

29 Undergraduate Research in Psychology

Sabrina L. Thurman and Maureen Vandermaas-Peeler

30 Undergraduate Research in Economics

Carlos Cortinhas and Pascal Stiefenhofer

31 Undergraduate Research in Political Science

Carol Strong

Part III.4 Humanities

32 Undergraduate Research in History

Kevin Ostoyich and Rebecca Ostoyich

33 Undergraduate Research in English

Billy Clark, Marcello Giovanelli, and Andrea Macrae

34 Undergraduate Research in Philosophy

John Rudisill

35 Undergraduate Research in Theology and Religious Studies

Marinus C. Iwuchukwu

Part III.5 Arts & Design

36 Undergraduate Research in Design

Marion Godau and Tom Bieling

37 Undergraduate Research in Architecture

Carola Ebert, Tatjana Schneider, and Carolin Stapenhorst

38 Undergraduate Research in Music

Gregory Young

39 Arts-Based Research for Undergraduate Students

Lynnette Young Overby

Part III.6 Disciplines A–Z

40 Undergraduate Research in Business Schools

William S. Harvey

41 Undergraduate Research in Early Childhood Education

Simone DeVore

42 Undergraduate Research in Geography

Péter Bagoly-Simó

43 Undergraduate Research in Legal Studies

Roland Broemel and Olaf Muthorst
44 Undergraduate Research in Social Work Education
   Angelique Jenney, Lauren K. Birks, and Christine Ann Walsh 414
45 Approaches to Undergraduate Research in Sustainability
   Michael A. Reiter and Kimberly D. S. Reiter 423
46 Undergraduate Research in Teacher Education
   Udo Gerheim 431

Part IV International Perspective
47 Introduction
   Judith Lehmann 441

Part IV.1 Americas
48 Undergraduate Research in the USA
   Maria T. Iacullo-Bird 445
49 Undergraduate Research in Canada
   Kara Lynne Loy 456
50 Undergraduate Research in Argentina
   Martín Aiello and Lucas Krotsch 464
51 Undergraduate Research in Brazil
   Paul Voerkel, Mônica Santos de Freitas, and Marcos Verissimo Alves 472
52 Undergraduate Research in Colombia
   Catalina Lopez-Otalvaro, Paola Andrea Quintero, Susana Torres-Cadavid, Simón Montoya-Rodas, and Blanca Nelly Gallardo-Gerón 480
53 Undergraduate Research in Mexico
   María Soledad Ramirez Montoya 489

Part IV.2 Africa & Middle East
54 Undergraduate Research in South Africa
   Anisa Vahed 499
55 Undergraduate Research in Nigeria
   Jonathan Adedayo Odukoya 508
56 Undergraduate Research in Israel
   Yehudit Judy Dori and Miri Barak 516
57 Undergraduate Research in the United Arab Emirates
   John D. Matthews, Shurooq Al Hashimi, Fatme Al Anouti, and J. Michael Allen 524

Part IV.3 Asia & Oceania
58 Undergraduate Research in China
   Hongbiao Yin and Lian Shi 535
<table>
<thead>
<tr>
<th>Undergraduate Research in India</th>
<th>Shivaji D. Sargar</th>
<th>543</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Research in Indonesia</td>
<td>Shuri Mariasih Gietty Tambunan and Manneke Budiman</td>
<td>549</td>
</tr>
<tr>
<td>Undergraduate Research in Japan</td>
<td>Joseph Haldane, Grant Black, Reiko Yamada, and Joseph McClanahan</td>
<td>557</td>
</tr>
<tr>
<td>Undergraduate Research in Australia</td>
<td>Lilia Mantai and Angela Brew</td>
<td>565</td>
</tr>
<tr>
<td>Undergraduate Research in New Zealand</td>
<td>Eric Pawson and Rachel Spronken-Smith</td>
<td>573</td>
</tr>
</tbody>
</table>

### Part IV.4  Europe

<table>
<thead>
<tr>
<th>Undergraduate Research in Austria</th>
<th>Günter Wageneder, Gudrun Salmhofer, Oliver Vettori, Elisabeth Westphal, Charlotte Zviauer, and Harald A. Mieg</th>
<th>583</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Research in France</td>
<td>Margarida Romero, Isabelle Mirbel, and Ariel B. Lindner</td>
<td>591</td>
</tr>
<tr>
<td>Undergraduate Research in Germany</td>
<td>Kerrin Riewerts and Susanne Wimmelmann</td>
<td>599</td>
</tr>
<tr>
<td>Undergraduate Research in Italy</td>
<td>Daniela Frison and Giovanna Del Gobbo</td>
<td>607</td>
</tr>
<tr>
<td>Undergraduate Research in the Netherlands</td>
<td>Michael Burke</td>
<td>616</td>
</tr>
<tr>
<td>Undergraduate Research in Portugal</td>
<td>Isabel Huet, Cecília Guerra, and Betina da Silva-Lopes</td>
<td>623</td>
</tr>
<tr>
<td>Undergraduate Research in Russia</td>
<td>Natalia Coleman, Nadezhda Vinogradova, Natalia Zhukova, and Igor Nikitin</td>
<td>632</td>
</tr>
<tr>
<td>Undergraduate Research in Scandinavia</td>
<td>Mari Elken and Sabine Wollscheid</td>
<td>638</td>
</tr>
<tr>
<td>Undergraduate Research in the UK</td>
<td>Pauline Kneale</td>
<td>649</td>
</tr>
</tbody>
</table>

### Part V  Avenues for Developing Undergraduate Research

| Synopsis and Introduction: Toward a Democratization of Knowledge | Angela Brew, Elizabeth L. Ambos, Dominique M. Galli, Judith Lehmann, and Harald A. Mieg | 661 |
| Community-Based Undergraduate Research | Eric Pawson, Mark Poskitt, and Annika Weiser | 670 |
| Interdisciplinary Undergraduate Research | Enakshi Sengupta, Patrick Blessinger, and Manfred Hampe | 683 |
76 Undergraduate Research in Digital Learning Environments
   Michael Kerres and Daniel Otto  
77 Crosscultural Undergraduate Research
   Nancy Hensel and Monika Sonntag, with contributions by Charles I. Abramson, Amelia Ahern-Rindell, John F. Barthell, Kevin Clancy, Victor H. Gonzalez, John M. Hranitz, Nichole Matuska, Marcus Müller, Theodora Petanidou, Charlotte K. Simmons, and Thomas Tscheulin  

Index
Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>A “wholistic” model for research-based learning decision-making</td>
</tr>
<tr>
<td>2.1</td>
<td>The nexus between research and teaching according to Healey and Jenkins</td>
</tr>
<tr>
<td>8.1</td>
<td>Models of academic teaching</td>
</tr>
<tr>
<td>8.2</td>
<td>The Zurich Framework</td>
</tr>
<tr>
<td>14.1</td>
<td>Inquiry-based learning framework: General phases, sub-phases, and their interrelations</td>
</tr>
<tr>
<td>24.1</td>
<td>Medical education in various countries and research-opportunity window</td>
</tr>
<tr>
<td>30.1</td>
<td>The Healey (2005) model</td>
</tr>
<tr>
<td>40.1</td>
<td>Dynamic relationship between research, teaching, and impact</td>
</tr>
<tr>
<td>42.1</td>
<td>Blueprint for the integration of research in a geography program</td>
</tr>
<tr>
<td>52.1</td>
<td>Current organization of the Colombian education system</td>
</tr>
<tr>
<td>53.1</td>
<td>Annual number of publications on UR among Mexican universities</td>
</tr>
<tr>
<td>54.1</td>
<td>The newly reformed higher education institutions in South Africa</td>
</tr>
<tr>
<td>76.1</td>
<td>Research-based learning process (RBLP) in UR with support of digital tools</td>
</tr>
<tr>
<td>76.2</td>
<td>Example of how to design a flipped classroom</td>
</tr>
</tbody>
</table>
# Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>Dimensions for framing the context of undergraduate research</td>
<td>xxvi</td>
</tr>
<tr>
<td>2.1</td>
<td>Forms of research</td>
<td>29</td>
</tr>
<tr>
<td>4.1</td>
<td>Model of social-scientific research competency</td>
<td>49</td>
</tr>
<tr>
<td>9.1</td>
<td>Organizational and learning principles</td>
<td>105</td>
</tr>
<tr>
<td>9.2</td>
<td>Ten key elements of the MaRBLe program</td>
<td>106</td>
</tr>
<tr>
<td>11.1</td>
<td>Lessons learned from the implementation of URE according to Humboldt reloaded</td>
<td>119</td>
</tr>
<tr>
<td>12.1</td>
<td>List of programs specifically targeting URM, disadvantaged, and underserved students at IUPUI, 2019–20</td>
<td>123</td>
</tr>
<tr>
<td>13.1</td>
<td>Ten salient practices for undergraduate research mentoring</td>
<td>134</td>
</tr>
<tr>
<td>13.2</td>
<td>Award-winning mentor interviewees: Country, institution, and discipline (n = 32)</td>
<td>138</td>
</tr>
<tr>
<td>13.3</td>
<td>Exemplar undergraduate research mentor training programs at various scales</td>
<td>144</td>
</tr>
<tr>
<td>15.1</td>
<td>EvaluateUR: Outcome categories and outcome components</td>
<td>162</td>
</tr>
<tr>
<td>15.2</td>
<td>EvaluateUR benefits</td>
<td>166</td>
</tr>
<tr>
<td>16.1</td>
<td>National/international conferences of undergraduate research</td>
<td>175</td>
</tr>
<tr>
<td>29.1</td>
<td>Salient practices of undergraduate research mentors</td>
<td>287</td>
</tr>
<tr>
<td>30.1</td>
<td>Summary of main benefits and costs of undergraduate research</td>
<td>296</td>
</tr>
<tr>
<td>40.1</td>
<td>Summary of relationships between research, teaching, and impact</td>
<td>382</td>
</tr>
<tr>
<td>40.2</td>
<td>Undergraduate research in business schools: Innovative practice worldwide</td>
<td>385</td>
</tr>
<tr>
<td>53.1</td>
<td>Types and numbers of higher education institutions (HEI) in Mexico, as recognized by SEP (2020)</td>
<td>490</td>
</tr>
<tr>
<td>69.1</td>
<td>Organization chart of the current Portuguese HE system</td>
<td>624</td>
</tr>
<tr>
<td>69.2</td>
<td>Organization chart of the selected cases</td>
<td>626</td>
</tr>
<tr>
<td>70.1</td>
<td>Number of students involved in the research pipeline, MSUTM</td>
<td>635</td>
</tr>
</tbody>
</table>
Contributors

Neal Broadus Abraham, Mount Holyoke College, USA
Charles I. Abramson, Oklahoma State University, USA
Amelia Ahern-Rindell, University of Portland, USA
Martin Aiello, Universidad Nacional de Tres de Febrero, Argentina
Edwin Akins II, Kennesaw State University, USA
Fatme Al Anouti, Zayed University, UAE
Shurooq Al Hashimi, Zayed University, UAE
J. Michael Allen, Zayed University, UAE
Herbert Altrichter, Johannes Kepler University Linz, Austria
Marcos Verissimo Alves, Universidade Federal Fluminense, Brazil
Elizabeth L. Ambos, Council on Undergraduate Research (former CEO), USA
Péter Bagoly-Simó, Humboldt-Universität zu Berlin, Germany
Miri Barak, Technion – Israel Institute of Technology, Israel
Emma Barker, University of Warwick, UK
John F. Barthell, University of Central Oklahoma, USA
Ellen Bastiaens, Maastricht University, The Netherlands
Tom Bieling, HAW Hamburg, Germany
Lauren K. Birks, University of Calgary, Canada
Grant Black, Chuo University, Japan
Patrick Blessinger, International HETL Association, USA
Martin Blum, University of Hohenheim, Germany
Angela Brew, Australasian Council for Undergraduate Research and Macquarie University, Australia
Roland Broemel, Goethe-Universität Frankfurt, Germany
Ellen Buckner, Moffett & Sanders School of Nursing, Samford University, USA
Manneke Budiman, Universitas Indonesia, Indonesia
Michael Burke, University College Roosevelt, Utrecht University, The Netherlands
Kevin Clancy, College of Saint Benedict | Saint John’s University, USA
LIST OF CONTRIBUTORS

Billy Clark, Northumbria University Newcastle, UK
Natalia Coleman, New Jersey City University, USA
Carlos Cortinhas, University of Exeter Business School, UK
Lindsay Currie, Council on Undergraduate Research, USA
Betina da Silva-Lopes, University of Aveiro, Research Centre CIDTFF, Portugal
Mônica Santos de Freitas, Universidade Federal do Rio de Janeiro, Brazil
Wolfgang Deicke, Humboldt-Universität zu Berlin, Germany
Giovanna Del Gobbo, University of Florence, Italy
Simone DeVore, University of Wisconsin-Whitewater, USA
Michael Dorff, Brigham Young University, USA
Yehudit Judy Dori, Technion – Israel Institute of Technology & Samuel Neaman Institute for National Policy Research, Israel
Elizabeth A. Easley, University of South Carolina Lancaster, USA
Stefanie Ebeling, UC Berkeley, USA
Carola Ebert, Berlin International University of Applied Sciences, Germany
Mari Elken, Nordic Institute for Studies in Innovation, Research and Education, Norway
Joanna Fietz, University of Hohenheim, Germany
Sean Fox, SERC at Carleton College, USA
Daniela Frisoni, University of Florence, Italy
Blanca Nelly Gallardo-Cerón, Universidad Católica de Oriente, Colombia
Dominique M. Galli, Indiana University-Purdue University Indianapolis, USA
Udo Gerheim, Carl von Ossietzky Universität Oldenburg, Germany
Caroline Gibson, University of Warwick, UK
Marcello Giovanelli, Aston University Birmingham, UK
Marion Godau, Fachhochschule Potsdam, Germany
Victor H. Gonzalez, University of Kansas, USA
Nicholas Grindle, University College London, UK
Cecília Guerra, University of Aveiro, Research Centre CIDTFF, Portugal
Susanne Haberstroh, Carl von Ossietzky Universität Oldenburg, Germany
Joseph Haldane, The International Academic Forum (IAFOR), Japan
Eric E. Hall, Elon University, USA
Manfred Hampe, Technische Universität Darmstadt, Germany
William S. Harvey, University of Bristol, UK
Mick Healey, Healey HE Consultants and University of Gloucestershire, UK
Nancy Hensel, Council on Undergraduate Research (former Executive Officer), USA
Thomas Hildbrand, ZHE Zürich - Zentrum für Hochschulentwicklung, Switzerland
John M. Hranitz, Bloomsburg University, USA
Janice Hudgings, Pomona College, USA
Isabel Huet, Universidade Aberta, Research Centers CIDTFF & LE@D, Portugal
List of Contributors

Maria T. Iacullo-Bird, Pace University, USA
Marinus C. Iwuchukwu, Duquesne University, USA
Michael Jackson, Millersville University of Pennsylvania, USA
Alan Jenkins, Oxford Brookes University, UK
Angelique Jenney, University of Calgary, Canada
Michael Kerres, University of Duisburg-Essen, Germany
Caroline J. Ketcham, Elon University, USA
Pauline Kneale, University of Plymouth, UK
Lucas Krotsch, Universidad Nacional de Lanús, Argentina
Ines Langemeyer, Karlsruher Institut für Technologie, Germany
Leann L. Laubach, University of Central Oklahoma, USA
Judith Lehmann, Heinrich Böll Foundation, Germany
Ariel B. Lindner, Université de Paris, France
Catalina Lopez-Otalvaro, Universidad EAFIT, Colombia
Kara Lynne Loy, University of Calgary, Canada
Andrea Macrae, Oxford Brookes University, UK
Lilia Mantai, The University of Sydney Business School, Australia
John D. Matthews, Zayed University, UAE
Nichole Matuska, College of Saint Benedict | Saint John’s University, USA
Joseph McClanahan, Creighton University, USA
Jeanne Mekolichick, Radford University, USA
Jeroen J. G. van Merriënboer, Maastricht University, The Netherlands
Harald A. Mieg, Humboldt-Universität zu Berlin, Germany
Isabelle Mirbel, Université Côte d’Azur, France
María Soledad Ramírez Montoya, Tecnológico de Monterrey, Mexico
Simón Montoya-Rodas, Akará – Corporación Alma Arte y Acción, Colombia
Marcus Müller, Technische Universität Darmstadt, Germany
Olaf Muthorst, Freie Universität Berlin, Germany
Sara A. Myers, University of Nebraska at Omaha, USA
Niharika Nath, New York Institute of Technology, USA
Monika B. Nerland, The University of Oslo, Norway
Igor Nikitin, K. G. Razumovsky Moscow State University of Technologies and Management, Russia
Jonathan Adedayo Odukoya, Covenant University, Nigeria
Kevin Ostoyich, Valparaiso University, USA
Rebecca Ostoyich, Valparaiso University, USA
Daniel Otto, University of Duisburg-Essen, Germany
Lynnette Young Overby, University of Delaware, USA
Eric Pawson, University of Canterbury, New Zealand
Margus Pedaste, University of Tartu, Estonia
Theodora Petanidou, University of the Aegean, Greece
Mark Poskitt, The University of British Columbia, Canada
Paola Andrea Quintero, Universidad EAFIT, Colombia
Evelyn Reinmuth, University of Hohenheim, Germany
Kimberly D. S. Reiter, Stetson University, USA
LIST OF CONTRIBUTORS

Michael A. Reiter, Bethune-Cookman University, USA
Johannes Reitinger, University of Vienna, Austria
Kerrin Riewerts, Universität Bielefeld, Germany
Warren F. Rogers, Indiana Wesleyan University, USA
Margarida Romero, Université Côte d’Azur, France
John Rudisill, The College of Wooster, USA
Gudrun Salmhofer, University of Graz, Austria
Shivaji D. Sargar, University of Mumbai, India
Tatjana Schneider, TU Braunschweig, Germany
Natascha Selje-Allmann, University of Hohenheim, Germany
Sarah Hunt Sellhorst, University of South Carolina Lancaster, USA
Enalshi Sengupta, American University of Afghanistan, Kabul, Afghanistan
Lian Shi, The Chinese University of Hong Kong, China
Charlotte K. Simmons, University of Central Oklahoma, USA
Jill Singer, SUNY Buffalo State, USA
Larry Z. Slater, University of Memphis Loewenberg College of Nursing, USA
Nicole L. Snyder, Davidson College, USA
Monika Sonntag, Humboldt-Universität zu Berlin, Germany
Rachel Spronken-Smith, University of Otago, New Zealand
Carolin Stapenhorst, Fachhochschule Aachen, Germany
Pascal Stiefenhofer, Newcastle University, UK
Carol Strong, University of Arkansas – Monticello, USA
Anthony Suen, UC Berkeley, USA
Shuri Mariasih Gietty Tambunan, Universitas Indonesia, Indonesia
Sabrina L. Thurman, Elon University, USA
Malcolm Tight, Lancaster University, UK
Vincent C. H. Tong, University College London, UK
Susana Torres-Cadavid, Universidad EAFIT, Colombia
Peter Tremp, Pädagogische Hochschule Luzern, Switzerland
Thomas Tscheulin, University of the Aegean, Greece
Anisa Vahed, Durban University of Technology, South Africa
Maureen Vandermaas-Peeler, Elon University, USA
Oliver Vettori, Vienna University of Economics and Business, Austria
Nadezhdia Vinogradova, K. G. Razumovsky Moscow State University of Technologies and Management, Russia
Paul Voerkel, Friedrich-Schiller-Universität Jena, Germany
Günter Wageneder, Universität Salzburg, Austria
Helen Walkington, Oxford Brookes University, UK
Christine Ann Walsh, University of Calgary, Canada
Daniel Weiler, Kensington, USA
Annika Weiser, Leuphana University Lüneburg, Germany
Elisabeth Westphal, Österreichische Universitätenkonferenz, Austria
Jennifer E. Wilson, Texas Woman’s University College of Nursing, USA
Susanne Wimmelmann, Georg-August-Universität Göttingen, Germany
List of Contributors

Sabine Wollscheid, Nordic Institute for Studies in Innovation, Research and Education, Norway
Caitlin D. Wylie, University of Virginia, USA
Reiko Yamada, Doshisha University, Japan
Hongbiao Yin, The Chinese University of Hong Kong, China
Gregory Young, Montana State University, USA
Natalia Zhukova, K. G. Razumovsky Moscow State University of Technologies and Management, Russia
Bridget Zimmerman, Nautilus Evaluation Services, Rushville, USA
Charlotte Zwiauer, Universität Wien, Austria
Foreword

Lindsay Currie

The undergraduate research community has long benefited from the sharing of ideas and experiences that foster the greater good. So, when I heard that Harald A. Mieg was spearheading a book toward this end, I was excited. His work here is important, bringing multidimensional perspectives together to assist all those involved in undergraduate research. His hard work to assemble such a diverse group of authors and researchers with unique perspectives makes this international handbook an invaluable resource for understanding different approaches and practices within the undergraduate research experience.

The Council on Undergraduate Research (CUR) works to unite the undergraduate research community, seeking to communicate the impact of undergraduate research; equip students, faculty, staff, and administrators with the tools for success; and provide undergraduate research to more students – particularly those from underserved populations. CUR began in 1978 as a small group of chemistry faculty at US private, liberal arts institutions, but it has evolved over time into an organization with more than 13,000 members on 900 campuses worldwide. CUR’s growth largely occurred because of its dedication to including a wide range of voices, different perspectives, and the challenges of changing circumstances. The work presented here reflects those values. By assembling lessons learned from students and faculty mentors in multifaceted academic environments, we can improve our knowledge of successful initiatives, adapt them to different settings, and appreciate the richness of diverse experiences in the undergraduate research community.

I would like to thank the immediate past executive officer of CUR, Elizabeth L. Ambos, for her contributions to this work. Beth encouraged Harald to share a previous book on inquiry-based learning through an English-language translation, thereby benefiting a wider audience. She was a staunch supporter of reaching beyond national boundaries to expand CUR’s role. During her tenure, the first World Congress on Undergraduate
Foreword

Research was held in 2016 in Doha, Qatar, bringing together a global community to celebrate, collaborate, and discuss mutual challenges facing undergraduate research. In this publication, which further develops the international conversation, Beth and the CUR community provided their support and insight.

The work here of Harald A. Mieg and colleagues provides inspiration in advancing undergraduate research programs around the world. Take these collective experiences, continue to share these voices as well as your own, and embrace the abundant strengths of this community.

Lindsay Currie, CAE, is Executive Officer of the Council on Undergraduate Research (CUR, www.cur.org). Currie is an association executive focused on enriching and advancing society through associations. She serves on the Council of Experts for the Center for Advancing Research Impact in Society and the American Society of Association Executives’ Foresight Advisory Committee.
Foreword

Mick Healey and Alan Jenkins

Undergraduate research is now an international movement.
(Jenkins & Healey, 2010, p. 41)

1 What Is Undergraduate Research?

Over the last fifty years undergraduate research (UR) has transformed from a focus on selected students predominantly engaged in STEM (science, technology, engineering, and mathematics) disciplines at private US universities to one that challenges and transforms undergraduate curricula internationally for all, or many, students (Jenkins & Healey, 2010; Karukstis, 2019). The language used to describe UR varies between institutions and includes terms such as “research-based education” (Humboldt, Germany), “student as producer” (Lincoln, UK), “problem-based and inquiry-based learning” (McMaster, Canada), and “student as scholar” (Miami, US) (Healey & Jenkins, 2018).

However it is described, UR reflects attempts by some national systems, individual universities, and disciplinary communities to bring together more effectively the teaching and research roles of the university to benefit students, faculty, and the wider society (Jenkins & Healey, 2010). However, the forms and specific purposes of UR programs vary widely – see, for example, the variety of international initiatives published by the US Council on Undergraduate Research (CUR) (www.cur.org/documents/?CategoryId=7). The range of dimensions of UR has usefully been mapped by Beckman and Hensel (2009), and it has been developed further by Walkington (2016) (see Table I).
Why Is Undergraduate Research Important?

Clearly, the form of UR shapes why it is seen as important. For many, UR provides a means to revitalize Wilhelm von Humboldt’s vision, when founding the University of Berlin in 1810, that “universities should treat learning as not yet wholly solved problems and hence always in research mode” (Elton, 2005, p. 110). Many educational developers see UR as a fulcrum to shift university teaching from a dominant lecture-based form to build on the visions of active, inquiry-based learning as promulgated by educational philosophers such as John Dewey (Healey, 2005; Healey & Jenkins, 2009; Jenkins & Healey, 2012). Others are drawn to UR as a vision through which to challenge the trends observed in many national systems (such as the UK) that have separate funding, and separate institutional and departmental strategies, for teaching and research. This division then threatens the values of many academics who wish to combine the roles of “teacher” and “researcher.” That perspective has shaped much of our work (Healey & Jenkins, 2018). More recently we have seen the engagement of students in research and inquiry as part of a wider debate about student–staff partnerships (Healey et al., 2014, 2015; Healey & Healey, 2019). The partnership perspective also reminds us that it is important to examine not only the student experience of research (e.g., Turner et al., 2008; Zamorski, 2002), but also the experience of their staff partners and mentors (e.g., Durning & Jenkins, 2005; Shanahan et al., 2015).

The last decade has seen significant growth in our understanding of the positive effects of UR (Crowe & Brakke, 2019). However, despite research findings (such as those from the US, based on the National Survey on Student Engagement) that demonstrate how programs that incorporate UR have positive impacts on student engagement and performance, “at too many institutions, only small numbers of students are involved. The time has come for universities to make participating in high impact activities a reality for every student” (Kuh, 2008, p. 22). Recognizing that the
dissemination of UR may take a wide range of forms is a step in this direction (Spronken-Smith et al., 2013).

3 What Contribution Does This Handbook Make?

This handbook presents a wealth of evidence that UR has come of age as an international movement (Jenkins & Healey, 2010). It is a sign of the extent to which UR is transforming university curricula internationally that many innovative programs and scholarly perspectives can be brought together in this volume. The book has a very wide international focus, revealing how in many national systems and institutions UR is enhancing the student and faculty experience. It is also very comprehensive in the range of disciplines and interdisciplines that feature. It is immensely important that the form of UR should reflect disciplinary perspective and values – and thus bring more faculty and students into UR (Healey & Jenkins, 2003; Robertson & Blacker, 2006).

4 What Challenges Does the Undergraduate Research Movement Face?

One of the strengths of the UR movement is that, in seeking to reshape Humboldt’s vision of what is a university, it challenges ideas of what constitutes research, what forms it can take, and whom it is for. However, it can take time to challenge some of the national and institutional firewalls between policies and funding for teaching and research, and the competition for attention from other higher education agendas.

There are some positive national initiatives, such as the US National Science Foundation, which in the 1990s significantly revised its research funding to include strong criteria for research dissemination and both undergraduate and graduate involvement in funded research projects (National Science Foundation, 1995). For many years we attempted to promote such an approach in the UK through the work of the Research and Teaching Forum, under Roger Brown’s leadership. When in 2006 it was announced that research ratings and funding would “now” include research dissemination, the group argued unsuccessfully that the impact on student learning should be a major criterion in future assessments (Brown, 2010; Jenkins & Healey, 2015). Nevertheless, the seeds were sown, and eventually in 2019 the guidance for the Research Excellence Framework (REF) for 2021 announced that: “Impacts on teaching within, as well as beyond, the submitting institution will be eligible for submission” (REF, 2019, p. 13).

A further perceived bottleneck for the institutional embedding of UR is that other initiatives within higher education also demand attention
(e.g. employability, widening participation, internationalization, community development, sustainability). However, advocates of UR point out that these are complementary rather than competing initiatives, and that engaging students in research and inquiry can help deliver these other agendas (Healey & Jenkins, 2009). This is well illustrated by the development of the connected curriculum at UCL (University College London), UK, where learning through research and inquiry is connected to staff research, through lines of research activity built into each program, links across subjects and out to the world, workplace learning, research outputs directed at an audience, and links with other students and alumni (Fung, 2017).

This volume reveals the great strides made in developing understanding, practices, and policies for embedding UR internationally. It provides a strong compendium of understanding and practices to take this agenda forward and sets out issues for further development.

References


Mick Healey is a higher education researcher and consultant; emeritus professor at the University of Gloucestershire, UK; The Humboldt Distinguished Scholar in Research-Based Learning at McMaster University, Canada; and International Teaching Fellow at University College Cork, Republic of Ireland.

Alan Jenkins is emeritus professor in higher education at Oxford Brookes University, UK, and co-founding editor of the *Journal of Geography in Higher Education*. 