# Electronic Journal of Science Education

ISSN 1087-3430

Published by Southwestern University

Georgetown, Texas

www.ejse.southwestern.edu

# **Electronic Journal of Science Education**

### **Co-Editors**

Michael Kamen, Southwestern University, Georgetown, Texas, United States

Molly Weinburgh, Texas Christian University, Fort Worth, Texas, United States

### Associate Editors

Karen E. Bledsoe, Western Oregon University, United States

Sarah J. Carrier, North Carolina State University, United States

Mary U. Hanrahan, RMIT University, Australia

William J.F. Hunter, Illinois State University, Normal, Illinois, United States

Murat Kahveci, Canakkale Onsekiz Mart University, Turkey

Paul Kelter, Northern Illinois University, United States

Nina A. Leonhardt, Suffolk County Community College, United States

David M. Majerich, Temple University, United States

Lisa Martin-Hansen, Georgia State University, United States

Laura McCord, Southwestern University, Georgetown, Texas United States

Colette Murphy, Queen's University Belfast, Belfast, United Kingdom

Martina Nieswandt, University of Massachusetts, Amherst, United States

Rose Pringle, University of Florida, United States

Mike U. Smith, Mercer University School of Medicine, United States

Gail Tooker, State University of New York – Cortland, Courtland, NY, United States

Geeta Verma, University of Colorado Denver, United States

Julie Westerlund, Texas State University, San Marcos, Texas, United States

BaoHui Zhang

### Administrative Assistant

Murielle Wright, Texas Christian University, Fort Worth, Texas

## Editorial Review Board

Shehadeh Mustafa Abdo, An-Najah National University, Jordan Jamal Hasan Abu Al-Ruz, Hashemite University, Zarka-Jordan Bayram Akarsu, Erciyes University, Turkey Hilal Aktamıs

Tamer G. Amin, Lebanese American University, Beirut, Lebanon

Yael M. Bamberger, Weizmann Institute of Science, Israel

# **Electronic Journal of Science Education**

Craig Berg, University of Wisconsin-Milwaukee, United States

Sumita Bhattacharyya, Nicholls State University, United States

Kimberly Bilica

Gulnur Birol

Patrick Brown, DuBray Middle School, Fort Zumwalt School District, United States

Vivien Mweene Chablengula, Southern Illinois University, Carbondale

Meng-Fei Cheng, Unversity of Illinois at Urbana-Champaign, United States

Marissa Tamar Cohen, St Francis College, United States

Michelle Cook, Clemson University, United States

Kent J. Crippen, University of Nevada Las Vegas

Jeanelle Day, Eastern Connecticut State University, United States

Hasan Deniz, University of Nevada, Las Vegas, United States

Susan Edwards, Monash University, Australia

Mark Enfield, Elon University, United States

Maria Evagorou, University of Nicosia, Cyprus, Cyprus

Barry Farris, Columbia University, United States

Wilson J. Gonzalez-Espada, Morehead State University, United States

Leigh Ann Haefner, Penn State Altoona, United States

Sumi Hagiwara, Montclair State University, United States

Sarah Anne Haines, Towson University, United States

Vincente Handa, West Visayas State University, Philippines

Paul C. Jablon, Lesley University, United States

Leslie Jones, Valdosta State University, United States

Debra Junk, University of Texas Austin, United States

Ajda Kahveci, Canakkale Onsekiz Mart University, Turkey

Grant Kessler, United States

Kenneth P. King, Roosevelt University, United States

Minkee Kim, Bilkent University, Turkey

Ravinder Koul, Pennsylvania State University, United States

Mustafa Serdar Köksal, Inonu University, Faculty of Education, Turkey

Barbara Ladewski, Educational Innovations Consulting LLC, United States

Kimberly H. Lott, Utah State University, United States

Stephen Marble, Southwestern University, Georgetown, Texas, United States

Madelon McCall, Baylor, United States

Robin McCartney, University of Louisiana at Lafayette, United States

John McCullagh, Stranmillis University College, Belfast

Thomas John McCloughlin, St. Patrick's College, Ireland

Cherie McCollough, Texas A&M University - Corpus Christi, United States

Laura McCord, Southwestern University, United States

Andrea Sabatini McLoughlin, Long Island University, United States

# **Electronic Journal of Science Education**

James Minogue, North Carolina State University

Francis Molina, AAAS - Project 2061, United States

Suzanne Nesmith, Baylor, United States

Prasart Nuangchalerm, Mahasarakham University, Thailand

George E. O'Brien, Florida International University, United States

Feral Ogan-Bekiroglu, Marmara University, Turkey

MaryKay Orgill, University of Nevada- Las Vegas, United States

John Parks, Baylor, United, States

Deniz Peker, Columbus State University, United States

**Dave Pinkerton** 

Kate Popejoy, University of North Carolina at Charlotte, United States

Sharon Price Schleigh, East Carolina University, United States

Ahmad Qablan, The Hashemite University, Jordan

Peter Rillero, Arizona State University

Yavuz Saka, Zonguldak Karaelmas University

Dennis Showers, State University of New York - Geneseo, United State

Cindi Smith-Walters, Middle Tennessee State University, United States

Jose Soto-Sonera,

Mustafa Sözbilir, Ataturk University, Turkey

M. E. Spencer, University of Montevallo, United States

Michael Svec, Furman University, United States

M. O. Thirunarayanan, Florida International University

Mustafa S. Topçu, Yüzüncü Yıl University, Van, Turkey

Eva Erdosne Toth, West Virginia University, United States

Peter Veronesi, The College at Brockport, United States

Bruce Waldrip, Monash University, Australia

Anita Welch, North Dakota State University, United States

Yalcin Yalaki, Hacettepe University, Ankara, Turkey

Joseph Zawicki, Buffalo State College, United States

Uri Zoller, Haifa University, Israel