

Volume 19 | Number 1 | 2015

# Electronic Journal of Science Education

ISSN 1087-3430

Published by

Texas Christian University  
Fort Worth, Texas

Southwestern University  
Georgetown, Texas

[www.ejse.southwestern.edu](http://www.ejse.southwestern.edu)

# Electronic Journal of Science Education

---

## ***Editor of Regular Issues***

Molly Weinburgh, Texas Christian University, United States

## ***Editor of Special Issues***

Michael Kamen, Southwestern University, United States

## ***Associate Editors***

Karen E. Bledsoe, Western Oregon University, United States

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

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

Colette Murphy, Queen's University Belfast, United Kingdom

Martina Nieswandt, University of Massachusetts, 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, United States

Geeta Verma, University of Colorado- Denver, United States

Julie Westerlund, Texas State University, United States

BaoHui Zhang, Lingnan University, Hong Kong

## ***Editorial Review Board***

Shehadeh Mustafa Abdo, An-Najah National University, Jordan

Emmanuel Edoja Achor, Benue State University, Nigeria

Kenneth Adu-Gyamfi, Mampong Technical College of Education, Ghana

Mohammed Ahmed, Oriental Institute of Science and Technology, India

Bayram Akarsu, Erciyes University, Turkey

Hilal Aktamış, Adnan Menderes University, Turkey

Sulaiman Al-Balushi, Sultan Qaboos University, Oman

Abdulwali H. Aldahmash, King Saud University, Saudi Arabia

Tamer G. Amin, Lebanese American University, Lebanon

# Electronic Journal of Science Education

---

Vincent Amodeo, University of Albany, United States  
Sumreen Asim, University of North Texas, United States  
Yael M. Bamberger, Weizmann Institute of Science, Israel  
Emmanuel Folorunso Bamidele, Obafemi Awolowo University, Nigeria  
Lloyd H. Barrow, University of Missouri, United States  
Stephen Bartos, Middle Tennessee State University, United States  
Craig Berg, University of Wisconsin-Milwaukee, United States  
Sumita Bhattacharyya, Nicholls State University, United States  
Kimberly Bilica, University of Texas at San Antonio, United States  
Ian Binns, University of North Carolina- Charlotte, United States  
SueAnn Bottoms, Oregon State University, United States  
Sherri L. Brown, University of Louisville, United States  
Patrick Brown, DuBray Middle School- Fort Zumwalt School District, United States  
Erica Brownstein, Oklahoma State University, United States  
Dan Carpenter, Texas Tech University, United States  
Marissa Tamar Cohen, St Francis College, United States  
Michelle Cook, Clemson University, United States  
Casey Creghan, Sam Houston State University, United States  
Kent J. Crippen, University of Nevada- Las Vegas, United States  
Jeanelle Day, Eastern Connecticut State University, United States  
Hasan Deniz, University of Nevada, United States  
Michael Dias, Kennesaw State University, United States  
Vanessa Dodo Seriki, University of Houston-Clear Lake, United States  
Susan Edwards, Monash University, Australia  
Mark Enfield, Elon University, United States  
Eva Erdosne Toth, West Virginia University, United States  
Maria Evagorou, University of Nicosia, Cyprus  
Barry Farris, Columbia University, United States  
Marilyn Fler, Monash University, Australia  
Andrea Foster, Sam Houston State University, United States  
Wendy Frazier, George Mason University, United States  
Wilson J. Gonzalez-Espada, Morehead State University, United States  
Sumi Hagiwara, Montclair State University, United States  
Sarah Anne Haines, Towson University, United States  
Marie Hammer, Monash University, Australia  
Vincente Handa, West Visayas State University, Philippines  
Pamela Esprivalo Harrell, University of North Texas, United States  
Susan Hawkins, Indiana University, United States  
Mary Hobbs, University of Texas, United States  
Paul C. Jablon, Lesley University, United States

# Electronic Journal of Science Education

---

Leslie Jones, Valdosta State University, United States  
Debra Junk, University of Texas Austin, United States  
Ajda Kahveci, Canakkale Onsekiz Mart University, Turkey  
Grant Kessler, Southwestern University, United States  
Kenneth P. King, Roosevelt University, United States  
Catherine M. Koehler, Southern Connecticut State University, United States  
Mustafa Serdar Köksal, Inonu University, Turkey  
Ravinder Koul, Pennsylvania State University, United States  
Barbara G. Ladewski, Educational Innovations Consulting LLC, United States  
Elina Lampert-Shepel, Mercy College, United States  
Zane Laws, Cisco College, United States  
Kimberly H. Lott, Utah State University, United States  
Stephen Marble, Southwestern University, United States  
Sue March, Monash University, Australia  
Catherine Martin-Dunlop, Morgan State University, United States  
Johanna Mazlo, University of North Carolina, United States  
Madelon McCall, Baylor University, United States  
Robin McCartney, University of Louisiana- Lafayette, United States  
Thomas John McCloughlin, St. Patrick's College, Ireland  
Cherie McCollough, Texas A&M University- Corpus Christi, United States  
John McCullagh, Stranmillis University College, Belfast  
Deb McGregor, University of Wolverhampton, United Kingdom  
Suely A. Mello, Universidade Estadual Paulista/Marilia, Brazil  
Scott Miller, Sam Houston State University, United States  
James Minogue, North Carolina State University, United States  
Suzanne Nesmith, Baylor University, United States  
Prasart Nuangchalem, Maharakham University, Thailand  
George E. O'Brien, Florida International University, United States  
Feral Ogan-Bekiroglu, Marmara University, Turkey  
John C. Park, Baylor University, United States  
Rod Parker-Rees, Plymouth University, United Kingdom  
John Pecore, University of West Florida, United States  
Deniz Peker, Columbus State University, United States  
Gustavo Perez, University of North Texas, United States  
Dave Pinkerton, Western Colorado State University, United States  
Kate Popejoy, University of North Carolina- Charlotte, United States  
Sharon Price Schleigh, East Carolina University, United States  
Ahmad Qablan, The Hashemite University, Jordan  
Peter Rillero, Arizona State University, United States  
Soleil Roper, Texas Tech University, United States

# Electronic Journal of Science Education

---

Melody Russell, Auburn University, United States  
Andrea Sabatini-McLoughlin, Long Island University, United States  
Shannon Sahabi, Texas Tech University, United States  
Emine Sahin, Indiana University, United States  
Yavuz Saka, Zonguldak Karaelmas University, Turkey  
Dennis Showers, State University of New York – Geneseo, United States  
Becky Sinclair, Texas A&M University – Commerce, United States  
Cindi Smith-Walters, Middle Tennessee State University, United States  
Jose Soto-Sonera, Universidad del Este, Puerto Rico  
Mustafa Sözbilir, Ataturk University, Turkey  
Karthigeyan Subramaniam, University of North Texas, United States  
Michael Svec, Furman University, United States  
M. O. Thirunarayanan, Florida International University, United States  
Julie Thomas, Oklahoma State University, United States  
Mustafa S. Topçu, Yüzüncü Yıl University, Turkey  
Irina Verenikina, University of Wollongong, Australia  
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, Turkey

## ***Administrative Assistant***

Murielle Wright, Texas Christian University, Texas