

ISSN: 2301-251X

EUROPEAN JOURNAL OF SCIENCE AND MATHEMATICS EDUCATION



April 2023
Volume 11
Issue 2

This page is intentionally left blank



Bastas

**EUROPEAN JOURNAL OF SCIENCE AND
MATHEMATICS EDUCATION**

Volume 11

Issue 2

April 2023

European Journal of Science and Mathematics Education

ISSN: 2301-251X (Online)

Web: <https://www.scimath.net/>

Publisher: Bastas

Copyright and Licensing: Authors retain the copyright of their articles and have full control over their own published scholarly work. Authors are not asked to transfer copyrights to Bastas. This allows the scientific community to have free and immediate access to the content as soon as the work is published online.

Authors grant Bastas the right of first publication and dissemination of the articles. As the original publisher, Bastas publishes articles under a permissive [Creative Commons Attribution License \(CC BY 4.0\)](#), which allows third parties to distribute, remix or build upon the work, even commercially, as long as they credit the authors for original article.

EUROPEAN JOURNAL OF SCIENCE AND MATHEMATICS EDUCATION

The **European Journal of Science and Mathematics Education** aims to stimulate discussions on contemporary topics in science and mathematics education and to foster the application of the results in primary, secondary, and higher education in the countries of Europe and other countries. The journal is open-access, peer-reviewed and published quarterly.

AIMS AND SCOPE

The **European Journal of Science and Mathematics Education** is founded to stimulate discussions on contemporary topics in Science and Mathematics Education and to foster the application of the results in primary, secondary, and higher education. The Journal is a platform for exchange of original ideas with particular emphasis on application. We welcome empirical and theoretical research papers, as well as papers on innovation of teaching techniques and technologies, and position papers.

ABSTRACTING AND INDEXING

European Journal of Science and Mathematics Education (EJSME) is listed by the following indexes, databases, directories, or libraries.

ERIC

ERIH

EBSCO

Google Scholar

SCOPUS

Sherpa Romeo

EDITORIAL BOARD

Editors

Kamisah Osman, The National University of Malaysia, Malaysia

SCOPUS ID: 26656915400

Milan Kubiato; J. E. Purkyne University, Faculty of Education

Department of Preschool and Primary Education

Pasteurova 1, 400 96 Usti nad Labem, Czech Republic

SCOPUS ID: 18037477400

Editorial Board

Dominique Persano Adorno, University of Palermo, Italy

Maija Aksela, University of Helsinki, Finland

Patricia Bagget, New Mexico State University, USA

George Bodner, Purdue University, USA

Roberto Capone, University of Bari, Italy

Ubiratan D'Ambrosio, UNICAMP, São Paulo, Brazil

Bruno D'Amore, University of Bologna, Italy

Philipp Bitzenbauer, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Jean-Luc Dorier, University of Geneva, Switzerland

Sibel Erduran, University of Oxford, UK

Lianghuo Fan, University of Southampton, UK

Markus Sebastian Feser, Universität Hamburg, Germany

Gabriele Kaiser, University of Hamburg, Germany

Berinderjeet Kaur, National Institute of Education, Singapore

Jari Lavonen, University of Helsinki, Finland

Cedric Linder, Uppsala University, Sweden

Yu-Ling Lu, National Taipei University of Education, Taiwan

Nicolina A. Malara, Università degli Studi di Modena e Reggio Emilia, Italy

Cheryl Mason, San Diego State University, USA

João Filipe de Matos, University of Lisbon, Portugal
Immaculate Kizito Namukasa, University of Western Ontario, Canada
Edward Redish, University of Maryland, USA
Rohaida Mohd. Saat, University of Malaya, Malaysia
Ali Simsek, Anadolu University, Turkey
Josip Slisko, Autonomous University of Puebla, Mexico
Verena Spatz, Technische Universität Darmstadt, Germany
Heinz Steinbring, University of Duisburg-Essen, Germany
Behiye Ubuz, Middle East Technical University, Turkey
Muhammet Usak, Kazan Federal University, Russia
Anne Watson, University of Oxford, UK
Dean Zollman, Kansas State University, USA

Executive Editor

Muhammet Usak, PhD in Science Education

SCOPUS ID: 23010777700

Past Editors and Editorial Board Members

Ayhan Bilsel, Founding Editor-in Chief (2013-2020)

Fahme Dabaj, Co-Editor (2013-2020)

Mehmet Garip, Co-Editor (2013-2020)

David Hestenes (2013-2020)

Norman Lederman (2013-2020)

Lillian McDermott (2013-2020)

Keith Taber (2013-2020)

Carl Winslow (2013-2020)

Kewen Zhao (2013-2020)

Jean-Philippe Drouhard (2013-2015)

CONTENTS

Volume 11 – Issue 2 – April 2023

- Research Article
Subject-language perspectives on multilingual students learning in science 197-214
Anders Jakobsson, Maria Kouns
<https://doi.org/10.30935/scimath/12568>
- Research Article
Investigating the status of highly able students through the lens of the Lebanese national policy and the mathematics and science centralized curricula and textbooks 215-233
Maya Antoun, Rayya Younes, Sara Salloum
<https://doi.org/10.30935/scimath/12569>
- Research Article
Plant awareness disparity among students of different educational levels in Spain 234-248
Javier Marcos-Walias, Javier Bobo-Pinilla, Jaime Delgado Iglesias, Roberto Reinoso Tapia
<https://doi.org/10.30935/scimath/12570>
- Research Article
Solving word problems involving triangles by transitional engineering students: Learning outcomes and implications 249-258
William Guo
<https://doi.org/10.30935/scimath/12582>
- Research Article
The difficulties in geometry: A quantitative analysis based on results of mathematics competitions in Italy 259-270
Lorenzo Facciaroni, Alessandro Gambini, Lorenzo Mazza
<https://doi.org/10.30935/scimath/12590>
- Research Article
Assessing Greek pre-service primary teachers' scientific literacy 271-282
Georgios Stylos, Olga Siarka, Konstantinos T. Kotsis
<https://doi.org/10.30935/scimath/12637>
- Research Article
Drawing on a computer algorithm to advance future teachers' knowledge of real numbers: A case study of task design 283-296
Rongrong Huo
<https://doi.org/10.30935/scimath/12640>

Research Article		
The role of metaphors in interpreting students' difficulties in operating with percentages: A mixed method study based on large scale assessment		297-321
<i>Chiara Giberti, George Santi, Camilla Spagnolo</i>		
https://doi.org/10.30935/scimath/12642		
Research Article		
Conditions and constraints of implementing a mathematics lesson study-based PD program for Japanese pre-service teachers		322-343
<i>Yusuke Shinno, Tomoko Yanagimoto</i>		
https://doi.org/10.30935/scimath/12643		
Research Article		
Rasch analysis and validity of the construct understanding of the nature of models in Spanish-speaking students		344-359
<i>Jose M. Oliva, Ángel Blanco</i>		
https://doi.org/10.30935/scimath/12651		
Research Article		
Establishing a physics concept inventory using computer marked free-response questions		360-375
<i>Mark A. J. Parker, Holly Hedgeland, Sally E. Jordan, Nicholas St. J. Braithwaite</i>		
https://doi.org/10.30935/scimath/12680		