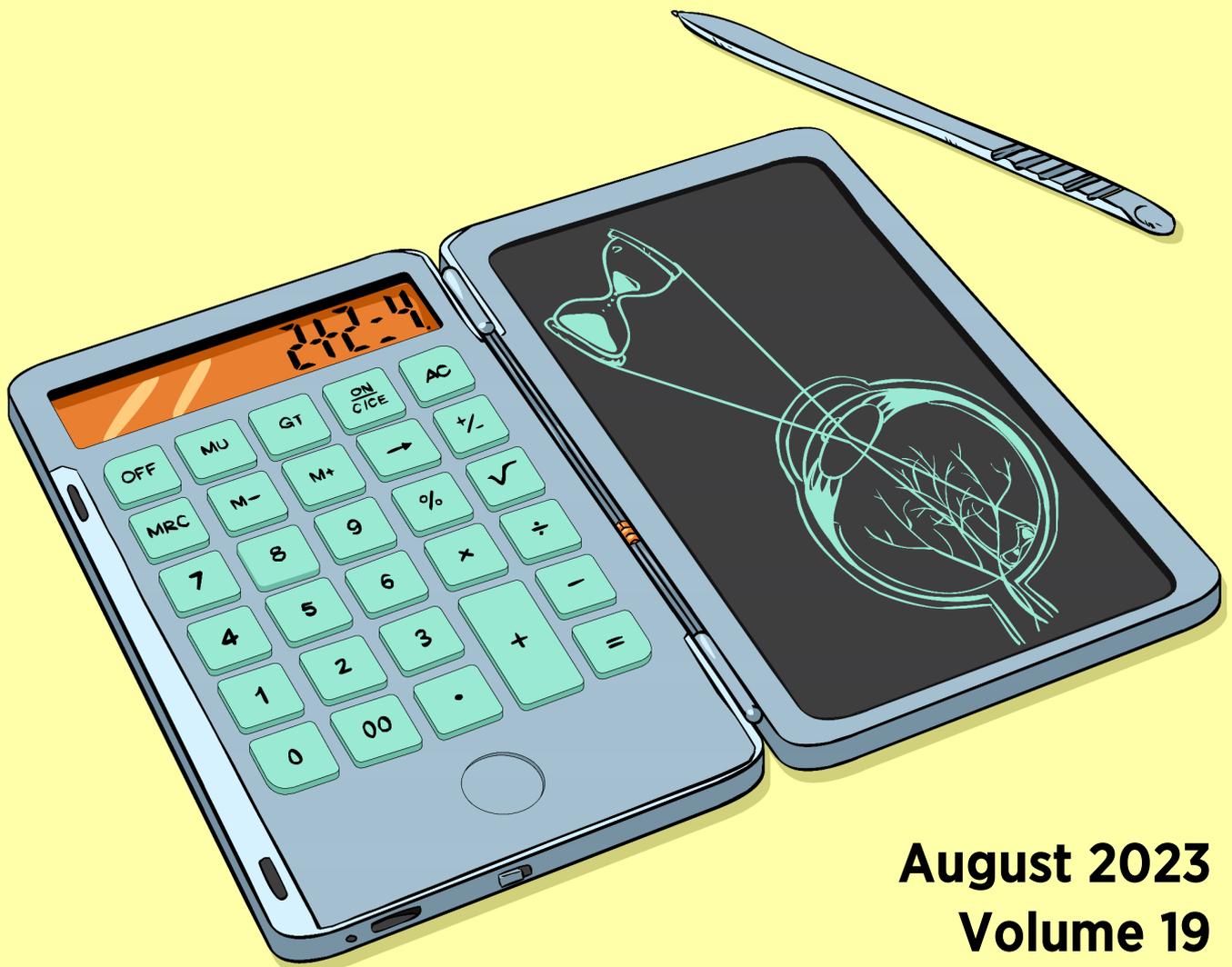


ISSN: 1305-8223

EURASIA JOURNAL OF MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION



August 2023
Volume 19
Issue 8

Published by: **Modestum**

Publication Office: Modestum LTD, 29 Gildredge Road, Eastbourne, East Sussex, BN21 4RU, United Kingdom

Serbia Office: Modestum DOO, Bulevar Mihajla Pupina 10i, 3. Sprat, Stan 133, Belgrade, SERBIA

Phone: +381 61 6600107

Email: publications@modestum.co.uk

Publisher: <https://modestum.co.uk>

Journal Web: <https://www.ejmste.com>

Twitter: <https://twitter.com/ejmste>

Facebook: <https://www.facebook.com/ejmste>

© 2005-2023. All rights reserved by Modestum. Copyright for Open Access Content is Retained by Authors. Also, authors continue to hold the copyrights of their own papers by acknowledging that their papers are originally published in the Eurasia Journal of Mathematics, Science and Technology Education. Hence, articles published are licensed under a "Creative Commons Attribution 4.0 International License."

ISSN: 1305-8223 (Online)

**EURASIA JOURNAL OF
MATHEMATICS, SCIENCE AND
TECHNOLOGY EDUCATION**

August 2023
Volume 19
Issue 8



This page is intentionally left blank

EURASIA JOURNAL OF MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION

The Eurasia Journal of Mathematics, Science and Technology Education (Abbrev. EURASIA J. Math., Sci Tech. Ed. or EJMSTE) is an English Open Access peer-reviewed journal publishing articles on all aspects of Mathematics, Science and Technology Education with ISSN: 1305-8223 (online). The journal is published 12 times in a year, and strictly adheres to the principles of the peer review process.

EURASIA Journal of Mathematics, Science and Technology Education encourages submissions from all authors throughout the world. Manuscripts are judged by two experts solely on the basis of their contribution of original data, ideas and their presentation. All manuscripts must comply with Manuscript Preparation Guidelines. Submitted manuscripts must not have been published, accepted for publication or be under consideration elsewhere.

Submissions: EJMSTE has a fully online review system. This system offers authors the convenience of submitting their manuscripts via [EditorialPark](#). Please send your manuscripts an MS Word attachment to the editors via the following address: <https://www.editorialpark.com/ejmste/>

Eurasia Journal of Mathematics, Science and Technology Education (EJMSTE) is a monthly journal published online 12 times annually in January, February, March, April, May, June, July, August, September, October, November, and December.

EJMSTE is indexed and/or abstracted in

- [EBSCO](#)
- [ERIH PLUS](#)
- [Google Scholar](#)
- [Genamics JournalSeek](#)
- [PsycINFO](#)
- [PSYINDEX](#)
- [ROAD](#)
- [SafetyLit](#)
- [SCOPUS](#)
- [Scimago](#)

Publication of any material submitted by authors does not necessarily mean that the journal, publisher, editors, or any of the editorial board members endorse or suggest the content. Publishing decisions are based and given only on scholarly evaluations. Apart from that, decisions and responsibility for adopting or using partly or in whole any of the methods, ideas or the like presented in EJMSTE pages solely depends on the readers' own judgment.

EDITORIAL BOARD

Editors-in-Chiefs

Chun-Yen CHANG, National Taiwan Normal University (NTNU), TAIWAN

Lianghuo FAN, University of Southampton, UNITED KINGDOM & East China Normal University, CHINA

Editors

Engineering Education

Teen-Hang MEEN, National Formosa University, TAIWAN

Xiangyun DU, Qatar University, QATAR & UNESCO PBL Center for Engineering and Science Education, Aalborg University, DENMARK

Mathematics Education

Chunxia QI, Beijing Normal University, CHINA

Der-Ching YANG, National Chiayi University, TAIWAN

Joohee LEE, University of Texas at Arlington, USA

Lianghuo FAN, University of Southampton, UNITED KINGDOM & East China Normal University, CHINA

Kwok Cheung CHEUNG, University of Macau, MACAU

Mei-Shiu CHIU, National Chengchi University, TAIWAN

Oh Nam KWON, Seoul National University, SOUTH KOREA

Sandra NITE, Texas A&M University, USA

Science Education

Hayat HOKAYEM, Texas Christian University, USA

Jan Alexis NIELSEN, University of Copenhagen, DENMARK

Jana FANCOVICOVA, University of Trnava, SLOVAKIA

Jing LIN, Beijing Normal University, CHINA

Mariusz PANCZYK, Medical University of Warsaw, POLAND

Milan KUBIATKO, Jan Evangelista Purkyně University, CZECH REPUBLIC

Onofrio Rosario BATTAGLIA, University of Palermo, ITALY

Ozcan GULACAR, University of California, Davis, USA

Sarantos PSYCHARIS, School of Pedagogical and Technological Education, GREECE

Silvija MARKIC, University of Education Ludwigsburg, GERMANY

Vanda JANSTOVA, Charles University, Prague, CZECH REPUBLIC

STEM Education

Eila JERONEN, University of Oulu, FINLAND

Federica VALLONE, University of Naples Federico II, Naples, ITALY

Technology Education

M. Shane TUTWITER, University of Rhode Island, USA

Tzu-Hua WANG, National Tsing Hua University, TAIWAN

Yi-Shun WANG, National Changhua University of Education, TAIWAN

Zacharia ZACHARIAS, University of Cyprus, CYPRUS

Editorial Board Members

Agustin ADÚRIZ-BRAVO, Universidad de Buenos Aires, ARGENTINA

Alipasa AYAS, Bilkent University, TURKEY

Anjum HALAI, Aga Khan University, PAKISTAN

Anna Maria GRUGNETTI, University of Pavia, ITALY

Charis VOUTSINA, University of Southampton, UNITED KINGDOM

Chin-Chung TSAI, National Chiao Tung University, TAIWAN

Colleen T. DOWNS, University of KwaZulu-Natal, SOUTH AFRICA

Do-Yong PARK, Illinois State University, USA

Fouad ABD-EL-KHALICK, University of Illinois at Urbana-Champaign, USA

Gert KADUNZ, University of Klagenfurt, AUSTRIA

Gregory J. KELLY, The Pennsylvania State University, USA

Gurol IRZIK, Sabanci University, TURKEY

Ingo EILKS, University of Bremen, GERMANY

Jan H. VAN DRIEL, University of Melbourne, AUSTRALIA

Jari LAVONEN, University of Helsinki, FINLAND

Kamisah OSMAN, Universiti Kebangsaan Malaysia, MALAYSIA

Kenneth TOBIN, The Graduate Center of CUNY, USA

Kyriacos ATHANASIOU, National and Kapodistrian University of Athens, GREECE

Lung Hsiang WONG, Nanyang Technological University, SINGAPORE

Lyn ENGLISH, Queensland University of Technology, AUSTRALIA

Lynn A. BRYAN, Purdue University, USA

Mailizar MAILIZAR, Syiah Kuala University, INDONESIA

Marika KAPANADZE, Ilia State University, GEORGIA

Martin RUSEK, Charles University, CZECH REPUBLIC

Michael ALLEN, Kingston University, UK

Monika Szczygieł, Pedagogical University of Krakow, POLAND

Nélio BIZZO, Universidade de São Paulo, BRAZIL

Pavol PROKOP, Trnava University, SLOVAKIA

Paul PACE, University of Malta, MALTA

Pernilla NILSSON, Halmstad University, SWEDEN

Peter C. CORMAS, California University of Pennsylvania, USA

Rachel MAMLOK-NAAMAN, Weizmann Institute of Science, ISRAEL

Rohaida Mohd. SAAT, University of Malaya, MALAYSIA

Rolf V. OLSEN, University of Oslo, NORWAY

Sarantos PSYCHARIS, School of Pedagogical and Technological Education - ASPETE, GREECE

Sarika KEWALRAMANI, Monash University, AUSTRALIA

Sonya N. MARTIN, Seoul National University, REPUBLIC OF KOREA

Uwe GELLERT, Freie Berlin University, GERMANY

Vanessa KIND, Durham University, UK

Vincentas LAMANAUSKAS, University of Siauliai, LITHUANIA

CONTENTS

Triple helix components supporting STEM education to increase future STEM careers in the United Arab Emirates <i>Fatima Yousif Husain, Sufian Forawi, Chun-Yen Chang</i> https://doi.org/10.29333/ejmste/13424	em2303
Using observation and measurement data in the constructing scientific explanations among elementary pre-service teachers <i>Myoung Joo Baek, Il Ho Yang</i> https://doi.org/10.29333/ejmste/13425	em2304
COVID-19 prevention intentions of pre-science science teachers from South African and Indonesian universities <i>R. Ahmad Zaky El Islami, Moleboheng Ramulumo, Indah Juwita Sari, Lindelani Mnguni</i> https://doi.org/10.29333/ejmste/13426	em2305
Examining the implementations related to teaching science to students with disabilities <i>Nina I. Kryukova, Natalia E. Rastorgueva, Elena O. Popova, Valeria L. Zakharova, Jhanna I. Aytuganova, Goliya I. Bikbulatova</i> https://doi.org/10.29333/ejmste/13427	em2306
Exploring the potential of artificial intelligence tools in educational measurement and assessment <i>Valentine Joseph Owan, Kingsley Bekom Abang, Delight Omoji Idika, Eugene Onor Etta, Bassey Asuquo Bassey</i> https://doi.org/10.29333/ejmste/13428	em2307
Investigating the relationship between students' interest in physics and environmental attitudes in Georgia <i>Marika Kapanadze, Nino Javakhishvili, Lia Dzagania</i> https://doi.org/10.29333/ejmste/13429	em2308
Unpacking mental models, strategies, and schemas pre-service mathematics teacher in solving maximum rectangular areas <i>Wayan Rumite, Purwanto Purwanto, I Nengah Parta, Swasono Rahardjo</i> https://doi.org/10.29333/ejmste/13430	em2309
Science and engineering students' difficulties in understanding vector concepts <i>Saed Sabah</i> https://doi.org/10.29333/ejmste/13431	em2310
Perceiving the usage of external representations in physics <i>Wiebke Leisen, Maria Opfermann, Hendrik Härtig</i> https://doi.org/10.29333/ejmste/13432	em2311

Learning to argue while arguing to learn: Students' emotional experiences during argumentation for graphing real-life functions em2312

Karina Wilkie, Michal Ayalon

<https://doi.org/10.29333/ejmste/13435>

Augmented reality learning media based on tetrahedral chemical representation: How effective in learning process? em2313

Sri Yamtinah, Elfi Susanti VH, Sulistyo Saputro, Sri Retno Dwi Ariani, Ari Syahidul Shidiq, Dwi Retno Sari, Deiya Gama Ilyasa

<https://doi.org/10.29333/ejmste/13436>

Education of students from Greek schools regarding natural disasters through STEAM em2314

Akylina Mereli, Evelpidou Niki, Sarantos Psycharis, Hara Drinia, Assimina Antonarakou, Maria Mereli, Tzouxanioti Maria

<https://doi.org/10.29333/ejmste/13437>

Examining preservice science teachers' perspectives on the social responsibility of scientists and engineers em2315

Izida I. Ishmuradova, Tatyana V. Sazonova, Svetlana A. Panova, Irina S. Andryushchenko, Nikolay A. Mashkin, Valeria L. Zakharova

<https://doi.org/10.29333/ejmste/13457>

The interactive classroom: Integration of SMART notebook software in chemistry education em2316

Abdou L. J. Jammeh, Claude Karegeya, Savita Ladage

<https://doi.org/10.29333/ejmste/13458>