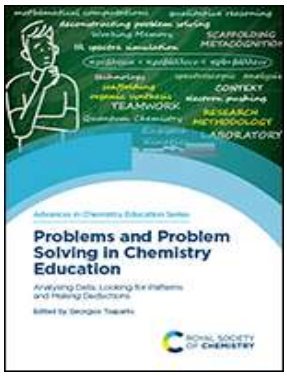
GEORGIOS TSAPARLIS

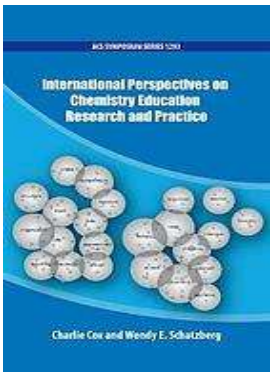
Professor Emeritus of Science Education

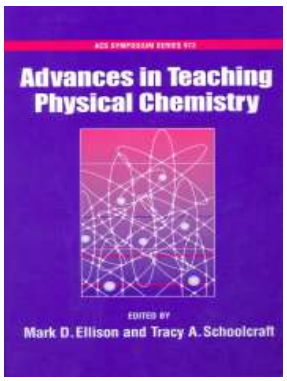
Department of Chemistry, University of Ioannina, Greece

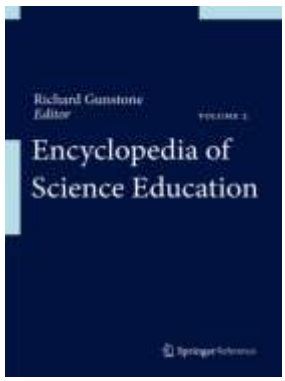
A2. SCIENTIFIC WORKS

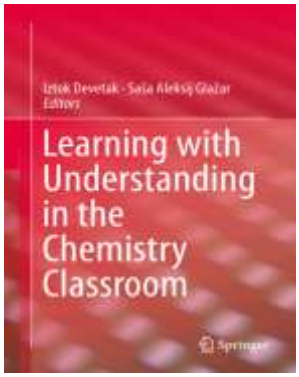
PART 2: PUBLICATIONS IN INTERNATIONAL BOOKS

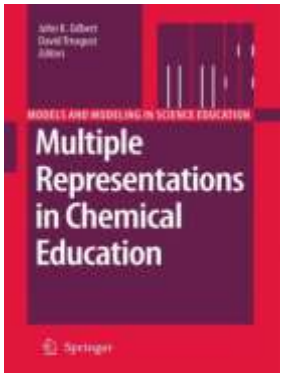


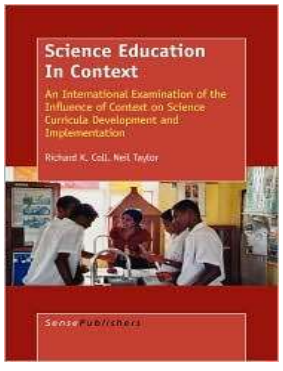








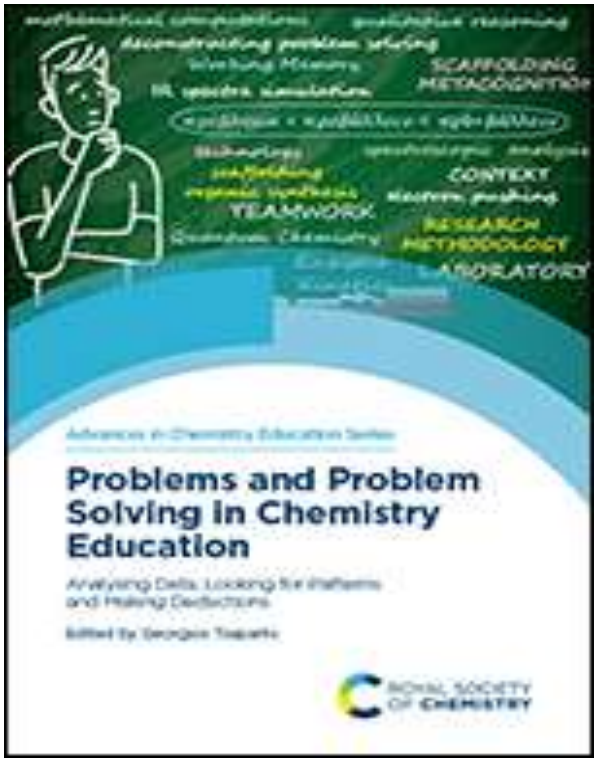




MAY 2021

NEW BOOK:
Problems and Problem Solving in Chemistry Education

Editor: Georgios Tsaparlis



Royal Society of Chemistry: Advances in Chemistry Education Series

Published: 19 May 2021

https://pubs.rsc.org/en/content/ebook/978-1-83916-218-3
http://pubs.rsc.org/bookshop/collections/series?issn=2056-9335

About this book

Problem solving is central to the teaching and learning of chemistry at secondary, tertiary and post-tertiary levels of education, opening to students and professional chemists alike a whole new world for analysing data, looking for patterns and making deductions. As an important higher-order thinking skill, problem solving also constitutes a major research field in science education. Relevant education research is an ongoing process, with recent developments occurring not only in the area of quantitative/computational problems, but also in qualitative problem solving.

The following situations are considered, some general, others with a focus on specific areas of chemistry: quantitative problems, qualitative reasoning, metacognition and resource activation, deconstructing the problem-solving process, an overview of the working memory hypothesis, reasoning with the electron-pushing formalism, scaffolding organic synthesis skills, spectroscopy for structural characterization in organic chemistry, enzyme kinetics, problem solving in the academic chemistry laboratory, chemistry problem-solving in context, team-based/active learning, technology for molecular representations, IR spectra simulation, and computational quantum chemistry tools. The book concludes with methodological and epistemological issues in problem solving research and other perspectives in problem solving in chemistry.

Contents

ARTICLE IN INTERNATIONAL ENCYCLOPEDIA OF SCIENCE EDUCATION

Ba.1. Tsaparlis G. (2015). Cognitive demand. In Gunstone R (Ed.) Encyclopedia of Science Education, pp 164-167. Springer Dordrecht, Heidelberg, New York, London
ISBN: 978-94-007-2149-4 (Print) 978-94-007-2150-0 (Online)
http://link.springer.com/referencework/10.1007/978-94-007-2150-0

ARTICLE IN AMERICAN ENCYCLOPEDIA OF CHEMISTRY

Ba.2. Tsaparlis, G. (2004). Atomic structure. In L.J. Lagoswski (Ed.), Chemistry: Foundations and Applications (four-volume illustrated encyclopedia, Vol. 1, pp. 78-87. MacMillan.

PUBLICATIONS IN INTERNATIONAL BOOKS

Bb.1. Tsaparlis, G. (1994). Blocking mechanisms in problem solving from the Pascual-Leone's M-space perspective. In H.-J. Schmidt (Ed)., Proceedings of the 1994 International Symposium *Problem Solving and Misconceptions in Chemistry and Physics*, pp. 211-226. The International Council of Association for Science Education (ICASE).
Bb.2. Tsaparlis. G. (2000). Problem solving in chemistry in science education. In M. Ahtee et al. (eds.), *Research on mathematics and science education*, pp. 67-87. University of Jyvaskyla, Finland: Institute for Educational Research.
Bb.3. Stamovlasis, D. & Tsaparlis, G. (2003). Nonlinear analysis of the effect of working memory capacity on student performance in problem solving. In D. Psillos et al. (Eds.), *Science education in the knowledge-based society,* pp. 183-190. Kluwer Academic Publishers.

Bb.4. G. Tsaparlis (2007). **Teaching and learning physical chemistry – Review of educational research**. In M.D. Ellison & T.A. Schoolcraft (Eds.), ***Advances in Teaching Physical Chemistry,*** Ch. 7. Washington DC: American Chemical Society (Distributed by Oxford University Press). ISBN: 978-0-8412-3998-2 (paperback) / 0841239983 hardback

Bb.5. G. Tsaparlis (2007). **The rivalry among the separate science subjects for dominance in secondary education: The case of Greece and beyond**. In R.K. Coll and N. Taylor (Eds.), ***Education in context - An international perspective of the influence of context on science curricula development, and implementation***. Sense Publishers. ISBN: 978-90-8790-247-6 (paperback) / 978-90-8790-248-3 (hardback) / 978-90-8790-249-0 (e-book)

Bb.6. G. Tsaparlis (2009). **Learning at the macro level: the role of practical work.** In J.K. Gilbert and D.F. Treagust (Eds.), ***Multiple representations in chemical education***, Chapter 5. Springer. ISBN: 978-1-4020-8871-1 (hardcover)

Bb.7. G. Tsaparlis (2012). **Electrolysis, electrolytes, and galvanic cells**. In K. S. Taber (Ed.) ***Teaching secondary chemistry***, 2nd edn, Ch. 8. London: Association for Science Education / Hodder Education. ISBN: 978-1444-124323

Bb.8. Tsaparlis G. (2014**). Linking the macro with the submicro levels of chemistry: demonstrations and experiments that can contribute to active/meaningful/conceptual learning**. In Devetak, I. & Glažar, S. A. (eds.) ***Learning with understanding in the chemistry classroom***., pp. 41-61. ISBN 978-94-007-4365-6 (Springer).

Tsaparlis G. & Sevian H. (eds.) (2013). ***Concepts of Matter in Science Education***. Vol. 19 in Series: Innovations in Science Education and Technology. ISBN 978-94-007-5913-8 Hardcover, ISBN 978-94-007-5914-5 (eBook) (Springer)

Bb9. G. Tsaparlis & H. Sevian (2013). H. ***Concepts of matter – complex to teach and difficult to learn*** (Introductory chapter in Bb9). (pp. 1-8)

Bb.10. G. Tsaparlis (2013). ***Learning and teaching the basic quantum chemical concepts*** (in ***Concepts of Matter in Science Education***) (pp. 437-460).

Bb.11. G. Tsaparlis & H. Sevian (2013). ***Toward a scientifically sound understanding of concepts of matter*** (Concluding chapter in ***Concepts of Matter in Science Education***) (pp. 485-520)

Bb.12. Tsaparlis G. (2018). **Challenges, Barriers, and Achievements in Chemistry Education: The Case of Greece**. In C. Cox and W. E. Schatzberg (eds.), ***International Perspectives on Chemistry Education Research and Practice***, Ch. 7, pp. 93-110. Washington, DC, American Chemical Society. ISBN13: 9780841233461 (print); eISBN: 9780841233430 (electronic).

Tsaparlis, G. (ed.) (2021). **Problems and Problem Solving in Chemistry Education**, Royal Society of Chemistry (book 7 in series: Advances in Chemistry Education Series. *Published: 19 May 2021*)

Bb.13. Tsaparlis, G. (2021). **Introduction –The Many Types and Kinds of Chemistry Problems,** in G. Tsaparlis (ed.)**,** Ch. 1, in **Problems and problem solving in chemistry education** (pp. 1-14).

Bb.14. Tsaparlis, G. (2021). **It Depends on the Problem and on the Solver: An Overview of the Working Memory Overload Hypothesis, Its Applicability and Its Limitations,** Ch. 5, in **Problems and problem solving in chemistry education** (pp. 93-126).

BB.15. Tsaparlis, G. (2021). **Issues, Problems and Solutions: Summing It All Up**in G. Tsaparlis (ed.), Ch. 17, in **Problems and problem solving in chemistry education** (pp. 414-444).

BB.16. Tsaparlis, G. (2021). **Postscript – Two Issues for Provocative Thought: (a) The Potential Synergy Between HOTS and LOTS (b) When Problem Solving Might Descend to Chaos Dynamics.** Ch. 18, **Problems and problem solving in chemistry education** (pp. 445-456).

International Perspectives on Chemistry Education Research and Practice

ACS SYMPOSIUM SERIES **1293**

Editor(s): Charlie Cox[1], Wendy E. Schatzberg[2]
Publication Date (Web): July 2, 2018

[1] Stanford University, Stanford, California
[2] Dixie State University, Saint George, Utah
Sponsoring Divisions: ACS Division of Chemical Education

ISBN13: 9780841233461 (print)
eISBN: 9780841233430 (electronic)
DOI: 10.1021/bk-2018-1293

CHAPTER 7, pp. 93-110

Challenges, Barriers, and Achievements in Chemistry Education: The Case of Greece

Georgios Tsaparlis

Encyclopedia of Science Education*

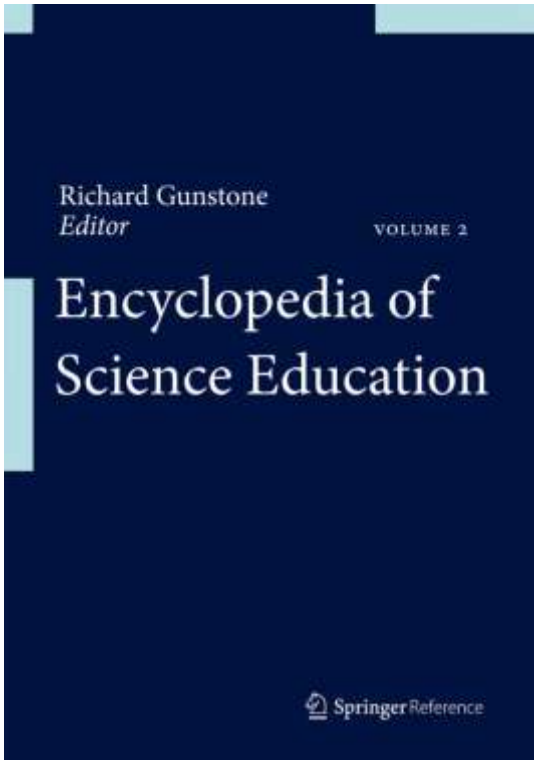
R. Gunstone (Editor)

Springer Dordrecht, Heidelberg, New York, London

ISBN: 978-94-007-2149-4 (Print) 978-94-007-2150-0 (Online)

* Το πρώτο πλήρες έργο αναφοράς στη διδακτική των φυσικών επιστημών. Άρθρα γραμμένα από τους κορυφαίους ερευνητές παγκοσμίως. Με σύστημα κριτών (peer review).

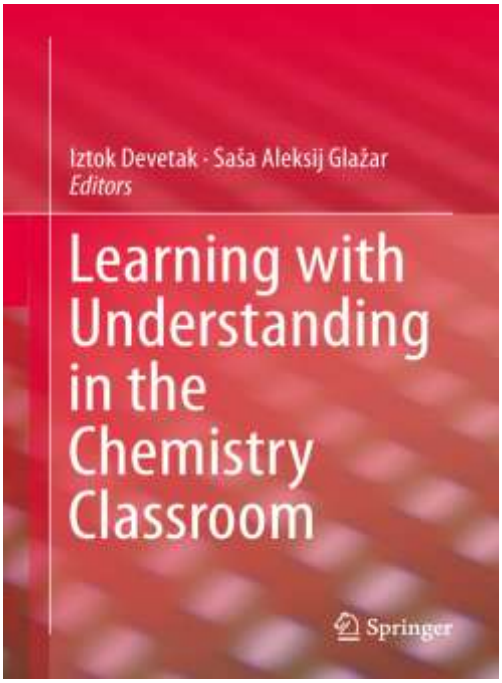
http://link.springer.com/referencework/10.1007/978-94-007-2150-0



Georgios Tsaparlis (2015). Cognitive demand, pp 164-167.

Learning with understanding in the chemistry classroom

I. Devetak & S. A. Glažar (editors.)



ISBN 978-94-007-4365-6 (Springer)

Georgios Tsaparlis, Linking the macro with the submicro levels of chemistry: demonstrations and experiments that can contribute to active/meaningful/conceptual learning.

pp. 41-61.

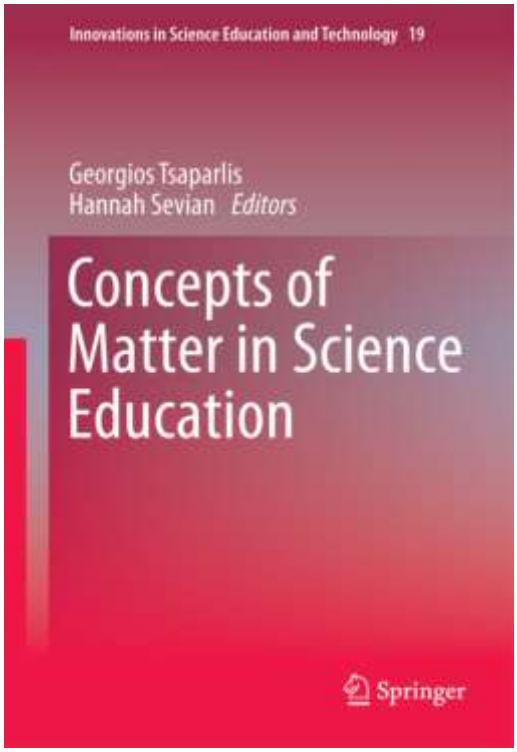
EDITED VOLUME[&] (PUBLISHED JULY 2013 BY SPRINGER)

Tsaparlis G. & Sevian H. (eds.) *Concepts of Matter in Science Education*. Vol. 19 in Series: Innovations in Science Education and Technology. ISBN 978-94-007-5913-8 Hardcover, ISBN 978-94-007-5914-5 (eBook) (Springer) For more information about the book, including the contents, see below or http://www.springer.com/education+%26+language/science+education/book/978-94-007-5913-8

[&] *This volume resulted from the International Symposium which Georgios Tsaparlis organized in Athens, Greece, in 2010 (with George Kalkanis). Authors include: George Bodner, Avi Hofstein, Philip Johnson, Loretta Jones, Joseph Krajcik, Keith Taber, Vicente Talanquer, David Treagust, Marianne Wiser.]*

In this book, G. Tsaparlis is author or co-author of the following three chapters:

- G. Tsaparlis & H. Sevian. H. *Concepts of matter – complex to teach and difficult to learn* (Introductory chapter) . (pp. 1-8)
- G. Tsaparlis, *Learning and teaching the basic quantum chemical concepts*. (pp. 437-460)
- G. Tsaparlis & H. Sevian, *Toward a scientifically sound understanding of concepts of matter* (Concluding chapter) (pp. 485-520)



ABOUT THIS BOOK:

- Covers a central topic in science and chemistry education
- Examines teaching and learning concepts at every level from pre-school through post-graduate studies
- Coverage includes students' and teachers' mental models regarding the particulate nature of matter

Bringing together a wide collection of ideas, reviews, analyses and new research on particulate and structural concepts of matter, *Concepts of Matter in Science Education* informs practice from pre-school through graduate school learning and teaching and aims to inspire progress in science education. The expert contributors offer a range of reviews and critical analyses of related literature and in-depth analysis of specific issues, as well as new research. Among the themes covered are learning progressions for teaching a particle model of matter, the mental models of both students and teachers of the particulate nature of matter,educational technology, chemical reactions and chemical phenomena, chemical structure and bonding, quantum chemistry and the history and philosophy of science relating to the particulate nature of matter. The book will benefit a wide audience including classroom practitioners and student teachers at every educational level, teacher educators and researchers in science education.

"If gaining the precise meaning in particulate terms of what is solid, what is liquid, and that air is a gas, were that simple, we would not be confronted with another book which, while suggesting new approaches to teaching these topics, confirms they are still very difficult for students to learn".

Peter Fensham,
Emeritus Professor Monash University, Adjunct Professor QUT
(from the foreword to this book)

Content Level » Research

Table of contents

Teaching Secondary Chemistry, 2nd NEW edition

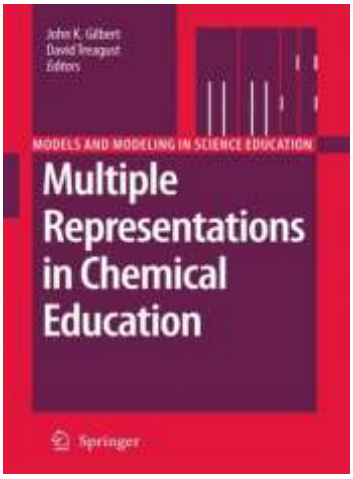
The OPEN UNIVERSITY SET BOOK
HODDER EDUCATION

ISBN: 9781444124323
Published: 29/06/2012
Extent: 400 pages

Keith Taber (editor)

Contents:

Written for: newly-qualified science teachers, experienced teachers of chemistry who want to extend the range of strategies and approaches used, biologists or physicists who have to teach chemistry, or students training to be teachers.



Multiple Representations in Chemical Education

Series: Models and Modeling in Science education, Vol. 4

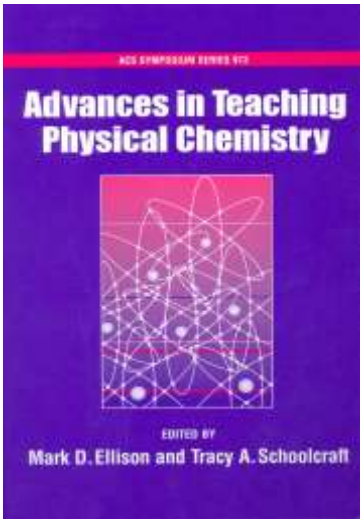
SPRINGER 2009, X, 370 p., Hardcover
ISBN: 978-1-4020-8871-1

John K. Gilbert & David Treagust (Eds.)

ABOUT THIS BOOK

Understanding the triplet (macro, sub-micro, and symbolic) relationship is a key aspect of chemical education, but there is considerable evidence that students find great difficulty in achieving mastery of the ideas involved. In bringing together the work of leading chemistry educators who are researching the triplet relationship at the secondary and university levels, the book discusses the learning involved, the problems that students encounter, and successful approaches to teaching.

Written for: Chemistry teacher educators, chemistry curriculum designers, chemical education researchers



Advances in Teaching Physical Chemistry

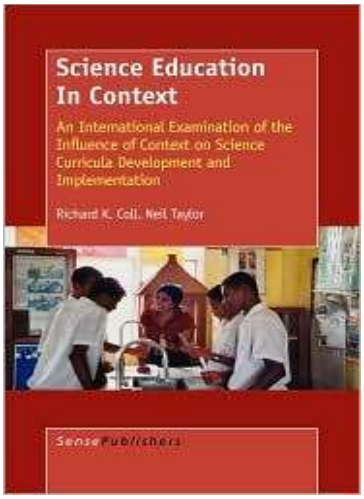
Mark D Ellison and Tracy A Schoolcraft (Editors)

Distributed by
Oxford University Press

ISBN: 9780841239982 (paperback)
ISBN: 0841239983 hardback,
342 pages

Description

This book brings together the latest perspectives and ideas on teaching modern physical chemistry. It includes perspectives from experienced and well-known physical chemists, a thorough review of the education literature pertaining to physical chemistry, a thorough review of advances in undergraduate laboratory experiments from the past decade, in-depth descriptions of using computers to aid student learning, and innovative ideas for teaching the fundamentals of physical chemistry. This book will provide valuable insight and information to all teachers of physical chemistry.



Science Education in Context

***An international perspective of the influence of context on science curricula* development, and implementation**

R.K. Coll and N. Taylor (Eds.)

ISBN: 9087902476
ISBN-13: 9789087902476
Format: Paperback, 384pp
Publisher: Sense Publishers
Pub. Date: December 2007

RESEARCH ON MATHEMATICS AND SCIENCE EDUCATION

From Beliefs to Cognition from Problem Solving to Understanding

***Maija Ahtee, Ole Björkvist, Erkki Pehkonen and Virpi Vatanen* (Eds.)**

2001. 134 p. EUR 14 inc VAT . Ordernumber D052.

THIS BOOK contains a selection of the papers presented at the seminars of the Finnish Association for Research in Mathematics and Science Education and the Finnish Graduate School of Mathematics, Physics and Chemistry Education. It thus gives a brief insight into some recent research interests in mathematics, physics and chemistry education in Finland. The volume also contains papers by professor Laurence Viennot, Universite Paris VII, France, and professor Georgios Tsaparlis, Univeristy of Ioannina, Greece, who gave lectures and workshops at the spring seminar of the Graduate School in Joensuu, and by professor Erkki Pehkonen, who gave a lecture at the summer seminar in Vaasa. The book is meant especially to stimulate international feedback on Finnish research in mathematics and science education. (Institute for Educational Research, University of Jyväskyla, Finland)

Problem solving in chemistry and science education, G. Tsaparlis, pp. 67-87.