1. Record Nr. UNINA9910574063703321

Titolo	Fostering Understanding of Complex Systems in Biology Education : Pedagogies, Guidelines and Insights from Classroom-based Research / / edited by Orit Ben Zvi Assaraf, Marie-Christine P. J. Knippels
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2022
ISBN	9783030981440 3030981444
Edizione	[1st ed. 2022.]
Descrizione fisica	1 online resource (283 pages)
Collana	Contributions from Biology Education Research, , 2662-2327
Disciplina	570.71 571.071
Soggetti	Science - Study and teaching Education - Research Teaching Biology - Social aspects Science Education Research Methods in Education Pedagogy Societal Outreach of Biology Biologia de sistemes Ensenyament de les ciències naturals Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	1. Theoretical Perspectives on Complex Systems in Biology Education -- 2. Long Term Ecological Research as a Learning Environment: Evaluating Its Impact in Developing the Understanding of Ecological Systems Thinking – A Case Study -- 3. Involving teachers in the design process of a teaching and learning trajectory to foster students' systems thinking -- 4. Supporting university student learning of complex systems: an example of teaching the interactive processes that constitute photosynthesis -- 5. High school students' causal reasoning

and molecular mechanistic reasoning about gene-environment interplay after a semester-long course in genetics -- 6. Systems Thinking in Ecological and Physiological Systems and the Role of Representations -- 7. The Zoom-Map—Explaining Complex Biological Phenomena by Drawing Connections between and in Levels of Organization -- 8. Pre-service teachers' coual schemata and system reasoning about the carbon cycle and climate change: an exploratory study of a learning framework for understanding complex systems -- 9. Teaching Students to Grasp Complexity in Biology Education using a "Body of Evidence" Approach -- 10. Science teachers' construction of knowledge about simulations and population size via performing inquiry with simulations of growing vs. descending levels of complexity -- 11. Designing Complex Systems Curricula for High School Biology: A Decade of work with the BioGraph Project -- 12. Lessons learned: Synthesizing approaches that foster understanding of complex biological phenomena.

Sommario/riassunto

This book synthesizes a wealth of international research on the critical topic of 'fostering understanding of complex systems in biology education'. Complex systems are prevalent in many scientific fields, and at all scales, from the micro scale of a single cell or molecule to complex systems at the macro scale such as ecosystems. Understanding the complexity of natural systems can be extremely challenging, though crucial for an adequate understanding of what they are and how they work. The term "systems thinking" has become synonymous with developing a coherent understanding of complex biological processes and phenomena. For researchers and educators alike, understanding how students' systems thinking develops is an essential prerequisite to develop and maintain pedagogical scaffolding that facilitates students' ability to fully understand the system's complexity. To that end, this book provides researchers and teachers with key insights from the current research community onhow to support learners systems thinking in secondary and higher education. Each chapter in the book elaborates on different theoretical and methodological frameworks pertaining to complexity in biology education and a variety of biological topics are included from genetics, photosynthesis, and the carbon cycle to ecology and climate change. Specific attention is paid to design elements of computer-based learning environments to understand complexity in biology education.