Life Sciences Group of the Center for School Reform

The TERC Life Sciences Group, a research and development program, is founded on the conviction that students can and should experience the life sciences as dynamic fields of inquiry whose diversity reflects the immense diversity of living systems.

We believe that life science education in primary and secondary schools should take a systems biology approach across different scales, explore a range of biological phenomena and methods of investigation, and acquaint students with both qualitative and quantitative understanding.

Moreover, in an era of accelerating biodiversity loss and climate change, our work is informed by biocomplexity studies. Students should learn to understand how ecological systems involve both human and nonhuman factors, and their own roles as participants in such systems. Students are young citizens of a society facing many critical ethical, political, and economic challenges. These can only be engaged effectively by those who understand something of the nature and dynamics of the complex, human-natural systems in which we live.

Projects

The list below includes Life Science Group projects organized by three areas of research and development: *Biocomplexity and Ecology*, *Climate Change*; and *Curriculum and Laboratory Design*.

Biocomplexity and Ecology

Principal Investigator: Gilly Puttick and Brian Drayton
Funders: National Science Foundation
Website: http://biocomplexity.terc.edu

TERC and the Institute for Ecosystem Studies are developing an innovative high school curriculum designed around the dynamics of complex and evolving coupled natural and human (CNH) systems. Materials are drawn from research at the Long-Term Ecological Research sites. More »

Principal Investigator: Brian Drayton and Gilly Puttick
Funders: National Science Foundation
Website: http://biocomplexityUDL.terc.edu

This project has developed a multimedia-enhanced version of the TERC-developed Biocomplexity and the Habitable Planet (DRL-0628171) curriculum, a high school capstone science course. The Biocomplexity developers designed. More »

Principal Investigators: Gilly Puttick, Eli Tucker-Raymond
Funder: The National Science Foundation

The *Building Systems from Scratch* project will develop and study a education program that integrates computing into middle school Earth systems science by interweaving game design and science learning. More »

Principal Investigators: Jeff Lockwood and Gilly Puttick
Funders: TERC

TERC's 1997 *Ecology: A systems approach* broke new ground in high school curriculum, taking a "molecules to systems" approach ... More »

Climate Change

Principal Investigator: Brian Drayton and Gilly Puttick
Funder: TERC
Website: https://external-wiki.terc.edu/display/BAC/About

This project and its website emphasize biological evidence of climate change and links natural phenomena to social and cultural changes in our region. More »

Principal Investigator: Gilly Puttick and Brian Drayton
Funders: National Science Foundation
Website: http://terc.360kid.com/

This innovative, new media-based after-school project engages girls ages 8-11 in energy conservation activities. More »

Principal Investigators: Gilly Puttick and Brian Drayton
Funder: National Science Foundation

This project is designing and conducting a crowd-sourced open innovation challenge to young people of ages 13-18 to mitigate levels of greenhouse gases. The goal of the project is to explore the extent to which the challenge will successfully attract, engage and motivate teen participants to conduct sustained and meaningful scientific inquiry across science, technology and engineering disciplines. More »

Principal Investigator: Gilly Puttick
Funder: TERC

The project explores the affordances of game design to teach young people about climate change. More »

Principal Investigators: Brian Drayton and Gilly Puttick
Funder: National Science Foundation

TERC and the Manomet Center for Conservation Sciences are developing and testing an education partnership model for climate change education that features inquiry-oriented and place-based learning. More »

Research on Laboratory Design in Biology

Principal Investigator: Brian Drayton, Gilly Puttick, and Joni Falk
Funder: TERC

This 18-month study examines key research literature from 1987-2006 on laboratory experiences in life science in order to propose a new model for increased engagement in lab-based activities among students in grades 1-13. More »

Publications and Products

A Study of the Literature of Lab-Based Instruction in Biology
Gilly Puttick, Brian Drayton, and E. Cohen
—(2015). American Biology Teacher 77 (1).

Book Review: Green Equilibrium
Brian Drayton
—Biological Conservation, Volume 182, February 2015, Pages 281-283.

Interactive Whiteboard Use in High-Tech Science Classrooms: Patterns of Integration
Rena Stroud, Brian Drayton, Kathryn Hobbs, and Joni Falk
—International Journal of Emerging Technologies in Learning, Vol 9, No 9 (2014)

Reply to Angelo: Declines in species in Thoreau's Concord and the Middlesex Fells, Massachusetts, USA
Primack, R.B., A.J. Miller-Rushing, and Brian Drayton
—Phytoneuron 2014-61: 1–5. Published 16 June 2014. ISSN 2153 733X

Seeding Social Norms About Energy Conservation Among Girl Scouts
Debra Bernstein and Gilly Puttick
—(2014) Applied Environmental Education and Communication 13(3), 171-182.

Under the Microscope: Review of the Research on Biological Lab Experiences 1987-2007: A Research White Paper
Brian Drayton, Gilly Puttick, and Meaghan Donovan
Cambridge, MA: (2013) TERC, Inc.

Digital design of "smart images": A design story — A Working Paper from the TERC Life Sciences Group
Brian Drayton, Gillian Puttick, TERC, Cambridge, MA

Discourse Analysis of Comments on a Climate Change Op-Ed, Part 1 — Working Paper #1
Brian Drayton, TERC, Cambridge, MA

Discourse Analysis of Comments on a Climate Change Op-Ed, Part 2 — Working Paper #2
Brian Drayton, TERC, Cambridge, MA, 8/13/14

What, where, who? Learning in an Innovate to Mitigate pilot team
Brian Drayton and Gilly Puttick, TERC, Cambridge, MA.

Biocomplexity UDL

Biocomplexity

Ecology: A Systems Approach

Life Sciences Initiative Team

Core Staff: Brian Drayton and Gillian Puttick, investigators; Abe Drayton, researcher

Collaborators: Trevor Lloyd-Evans (Manomet), Prof Lisa Delissio (Salem State U), Eli Tucker-Raymond, Karen Mutch-Jones, Joni Falk, TERC

Advisors: Tina Grotzer, Harvard Graduate School of Education; Richard Primack, Boston University; Amy Seidl; Abraham Miller-Rushing, National Park Service; Leona Schauble, Vanderbilt University.

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