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

- **Biocomplexity and the Habitable Planet**
  - Principal Investigator: Gilly Puttick and Brian Drayton
  - Funders: National Science Foundation
  - Website: [http://biocomplexity.terc.edu](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 »](#)

- **Biocomplexity-Transforming Innovative High School Curriculum**
  - Principal Investigator: Brian Drayton and Gilly Puttick
  - Funders: National Science Foundation
  - Website: [http://biocomplexityUDL.terc.edu](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 »](#)

- **Building Systems from Scratch**
  - 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 »](#)

- **Digital Content Enhancements for the Ecology Curriculum**
  - 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

- **Biosphere and Climate: Understanding Climate Change in New England**
  - Principal Investigator: Brian Drayton and Gilly Puttick
  - Funder: TERC
  - Website: [https://external-wiki.terc.edu/display/BAC/About](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 »](#)

- **Girls' Energy Conservation Corps (GECCo)**
  - Principal Investigator: Gilly Puttick and Brian Drayton
  - Funders: National Science Foundation
  - Website: [http://terc.360kid.com/](http://terc.360kid.com/)

  This innovative, new media-based after-school project engages girls ages 8-11 in energy conservation activities. [More »](#)
Innovate to Mitigate

**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.  

Scratch Girls

**Principal Investigator:** Gilly Puttick  
**Funder:** TERC

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

The Climate Lab

**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.

Research on Laboratory Design in Biology

**Under the Microscope: Examining the Research Base on Biological Lab Experiences**

**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.

Publications and Products

**A Study of the Literature of Lab-Based Instruction in Biology**  
Gilly Puttick, Brian Drayton, and E. Cohen  

**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  

**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  

Brian Drayton, Gilly Puttick, and Meaghan Donovan  

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

Brian Drayton, TERC, Cambridge, MA

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**
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.

For questions or comments, please contact Brian Drayton (brian_drayton@terc.edu) or Gilly Puttick (gilly_puttick@terc.edu).