

Visual Tools for Critical Thinking Across the Curriculum

Systems thinking offers a unique methodology for utilizing higher-order thinking skills to gain knowledge and communicate ideas.

What Are Systems Thinking and System Dynamics?

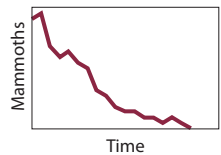
The tools of systems thinking can help us comprehend complex issues and ideas. Analyzing and understanding change helps students form successful strategies for learning and working with the challenges they meet in the world.

Why Use Systems Thinking?

- Enhances and develops habits of critical thinking
- Provides tools for expressing and communicating ideas effectively
- Supports the goals of the Common Core Standards and STEM initiatives
- Fosters learner-centered learning and collaborative problem-solving
- Creates a framework for an interdisciplinary viewpoint

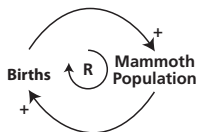
Tools of Systems Thinking

The tools of ST/SD range from graphic organizers to computer models.



• Behavior-over-Time Graphs

Show behavior of one or more elements of a system over a period of time, using line graphs.



• Feedback Diagrams

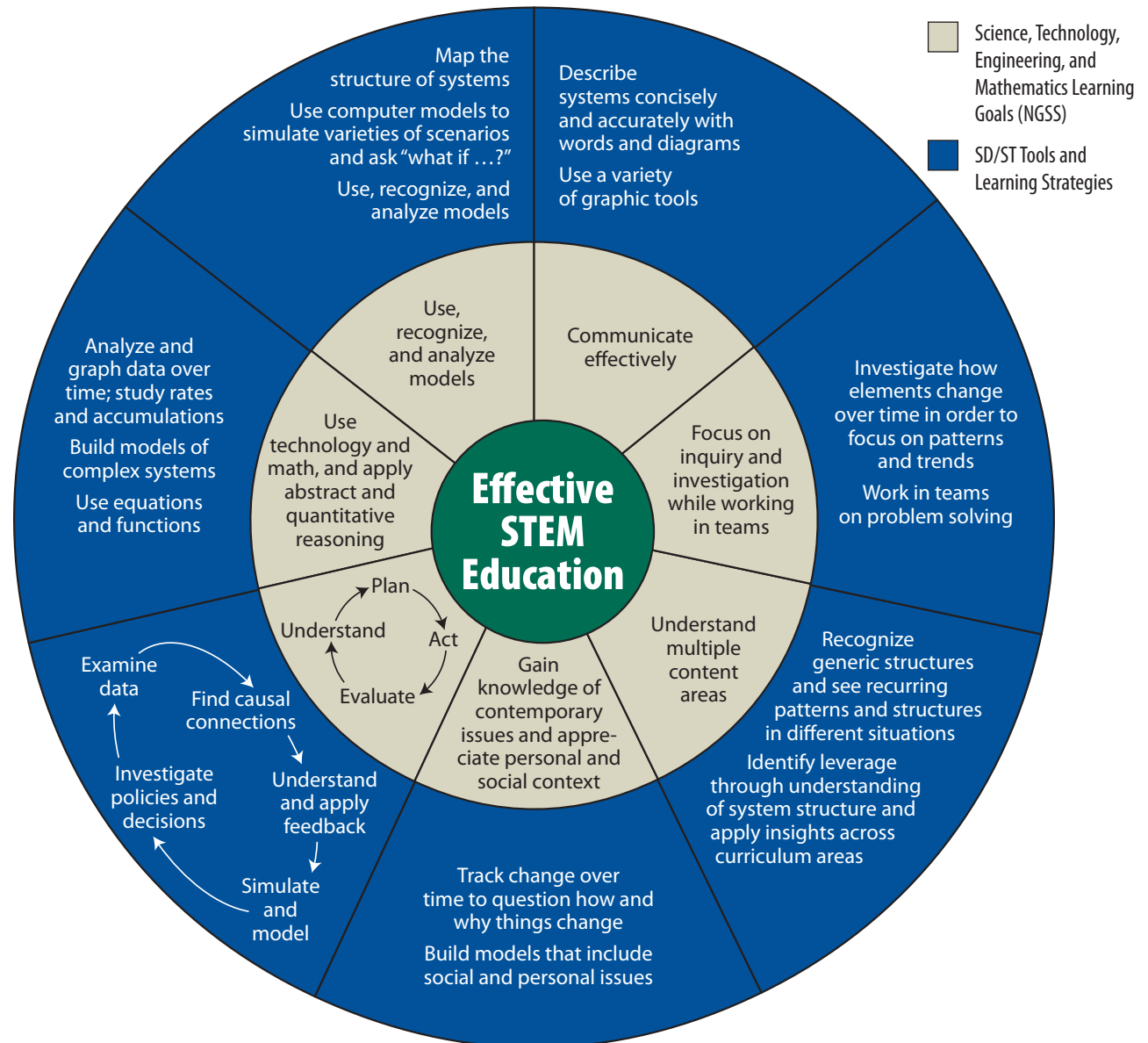
Use words and arrows to map how elements of a system interact and affect each other.

• Diagrams and Computer Models

Draw stocks (accumulations of quantities) and

flows (factors that change the stocks) to show the structure of a system. Use equations and functions to simulate or replicate behaviors in a system.

System Dynamics/Systems Thinking (SD/ST) Tools and Learning Strategies to Build Science, Technology, Engineering, and Math Excellence



What Are the Goals Of DynamiQueST?

- Give students the experience of being coached on their projects by experts in the systems field, teachers, and other students, in a helpful and supportive manner.
- Permit teachers from different schools to see evidence of student work communicating critical thinking using systems thinking and system dynamics (ST/SD).
- Provide a venue for teachers and kids to network and learn from each other.
- Showcase student work for the wider community.
- Have some fun and celebrate with kids!

Who Will Be There?

Students ages 8–18 will showcase their work using their ability to analyze and to clearly communicate critical thinking using the tools and methods of system thinking and system dynamics.

Do Students Need a Lot of Experience to Participate?

DynamiQueST creates a venue for celebrating what has been done, informing those who wish to start, and providing encouragement for all!

Sample Past Projects

Student projects can be presented through posters, videos or other media of student choice.

- What to Do About Avian Flu?
- Global Water Supplies
- Over-Fishing and the Decline of Cod Population
- Deforestation of the Mekong Watershed and the Impact on Rice Crops
- Nuclear Power Can Help to Reduce Air Pollution
- Urban Development of Williston, Vermont: Impact on Local Vermont Indicator Species
- ...and many more!

Who Are the Coaches?

1. Professionals well versed in analyzing complex systems using the tools and methods of ST/SD
2. Teachers who have used ST/SD in their classrooms for years
3. Other participating students

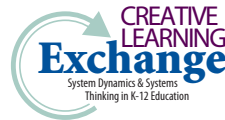
How Do I Know if DynamiQueST Will Fit My Students?

Do you and your students ask the following kinds of questions and want to delve deeper into the issues they study?

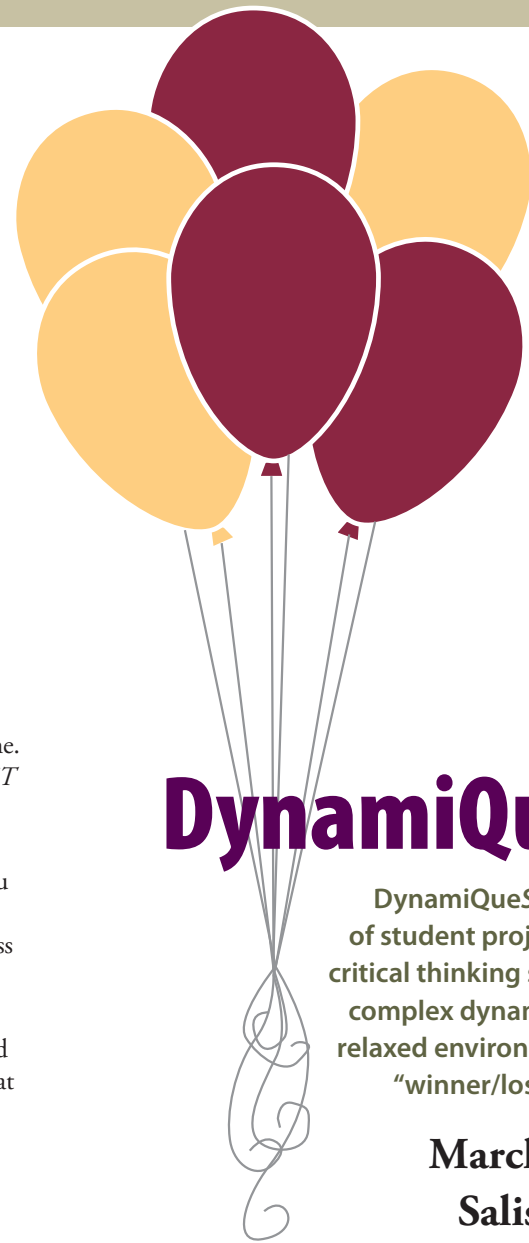
- What's changing?
- How is it changing?
- Why is it changing?
- So what? What should be done?

How Do I Sign Up?

1. Identify project(s) about topics that change over time. Look at the rubrics document on the DynamiQueST section of the CLE website.
2. Check on the Creative Learning Exchange website or email the director, Lees Stuntz, (see below). If you are new to systems thinking get in touch with the CLE. We have both the resources and the willingness to help you get ready for DynamiQueST.
3. If you are new to thinking critically about systems and don't have any projects this year, just come and join us to experience the day and mostly enjoy what students can do!



Creative Learning Exchange
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DynamiQueST*

DynamiQueST is a showcase of student projects that utilize critical thinking skills to analyze complex dynamic systems in a relaxed environment, free from "winner/loser" constraints.

March 11, 2016
Salisbury Labs
Worcester Polytechnic Institute
Worcester, Massachusetts

**This event was held from 2000–2008 and again in 2015, sponsored by the Boston Area Systems Thinking Educators. The WPI System Dynamics Program sponsored it at WPI from 2004–2008.*

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