



## Creative Learning Exchange: Resources for Systems Education

<http://www.clexchange.org>

The Creative Learning Exchange (CLE) was founded to serve as a curricular clearinghouse as well as a networking hub for K-12 educators interested in using systems education in schools. Lees Stuntz, Director, can be reached at [stuntzln@clexchange.org](mailto:stuntzln@clexchange.org). All of the links listed here, and more, can be accessed through the CLE Website. [Register for our free newsletter.](#)

### Featured Curricula:

[Splash!](#)

[Model Mysteries](#)

[System Dynamics Apps](#)

[Shape of Change Lessons](#)

[Dollars and Sense Lessons](#)

[Characteristics of Complex Systems Project, Oscillation Curriculum](#)

[Population Dynamics](#)

[Healthy Chickens, Healthy Pastures Lessons](#)

[The Lorax Lessons](#)

## Getting Started With Systems Thinking and Dynamic Modeling:

<http://www.clexchange.org/gettingstarted/>

### CLE Introductory Packet

<http://clexchange.org/gettingstarted/intropacket.asp>

Six articles which give an overview of systems thinking and dynamic modeling and put them in the context of systems education.

### System Dynamics Apps (created by BTN and the CLE)

**Splash! – NEW!**

<http://www.clexchange.org/splash/> The CLE and **BTN** are excited to launch something totally new.

Over the years we have found that the gap between the kinesthetic and pencil and paper tools (games, behavior-over-time graphs, causal loop diagrams and connection circles) and stock/flow mapping and modeling has been hard to cross for many students and teachers. We think **Splash!** will help bridge the gap. It is fun, intuitive and engaging! For phones, tablets and newer Chromebooks.

**Population Planner, Retire Rich, Bacteria Sandwich, 'I' in Inflation.**

<http://www.clexchange.org/curriculum/apps/>

Four simple, fun and engaging apps for phone, tablet and Chromebooks to help all ages gain insights using system dynamics models. Explore today!

### Demo Dozen

[http://static.clexchange.org/ftp/documents/x-curricular/CC2010\\_DemoDozen.zip](http://static.clexchange.org/ftp/documents/x-curricular/CC2010_DemoDozen.zip)

A twelve-lesson sequence of models that illustrates the beginning structures common to system dynamics modeling.

### Road Maps

<http://clexchange.org/curriculum/roadmaps.asp>

A downloadable self-study system dynamics course. It was originally created by the System Dynamics in Education Project at MIT under the tutelage of Dr. Jay Forrester.

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## Systems Education Books from the Creative Learning Exchange

<http://www.clexchange.org/cleproducts/default.asp>

### ***Model Mysteries: An Exploration of Vampires, Zombies, and Other Fantastic Scenarios to Make the World a Better Place***

**by Anne LaVigne and Lees Stuntz**

If you're interested in thinking about how to solve mysteries and like the idea of creating computer models and applying them to real-world problems, this book is for you. You can use it independently as a student, work with a group of students, or if you're a teacher, share it with interested students to complete a guided or independent study.

### ***Communicating Critical Thinking: Visual Tools for Student Projects***

This booklet is designed to help teachers and students create projects in all areas of the curriculum. The use of Systems Tools make explicit and visible the thinking behind student work, helping students create their projects at a new level of communication and understanding.

### ***The Shape of Change and The Shape of Change: Stocks and Flows***

**by Rob Quaden, Alan Ticotsky and Debra Lyneis**

A key selection of introductory and intermediate lessons that focus on using systems thinking to teach critical thinking, written by a team of master teacher mentors. Now including the sequel, *The Shape of Change: Stocks and Flows*, lessons from *The Shape of Change* are re-visited using Stock and Flow diagrams to enhance the systems learning and critical thinking.

### ***Dollars and Sense: Stay in the Black: Saving and Spending***

**by Jeff Potash and John Heinbokel**

Seven lessons with engaging computer simulations teach the basics of personal finance to students in late elementary and early middle school. Learner-directed learning and systems thinking combine to make the concepts of saving and spending come alive for students.

### ***Dollars and Sense II: Our Interest in Interest***

**by Jeff Potash**

Eight lessons with engaging computer simulations advance the teaching of managing personal finances to students in middle school and high school. Learner-directed learning and systems thinking combine to make the concepts of saving, interest, and spending come alive for secondary students.

### ***Critical Thinking Using Systems Thinking and Dynamic Modeling***

The first chapter of this book is a reprint of the first chapter of *Tracing Connections: Voices of Systems Thinkers*, describing the critical thinking skills that Barry Richmond delineated as the ones which systems thinking (and system dynamics) address so effectively. The second chapter is based on the accompanying booklet for the video *...that School in Tucson, a Longitudinal Study of Systems Thinking in K-12 Education*, and is a direct correlation of Richmond's critical thinking skills with the tools of systems thinking and system dynamics used in K-12 education.

### ***Healthy Chickens, Healthy Pastures: Making Connections at Drumlin Farm and Beyond***

**by Linda Booth Sweeney and Renata Pomponi**

This *Making Connections Playkit* has been created to help students think deliberately about living systems in a farm setting and to give students an organizing framework of systems thinking skills to take home and apply in other contexts. (Curriculum guide available.)

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### ***...that School in Tucson***

**A DVD and booklet published by the Creative Learning Exchange, produced by James Morrison.**

A longitudinal study that reunited students from Orange Grove Middle School after thirteen years to talk about the impact that studying systems thinking had on their learning and thinking. Footage from 13 years ago of the same students is juxtaposed with current footage.

## **Systems Education Books available from other resources**

### ***Lessons in Mathematics: A Dynamic Approach***

**by Diana Fisher**

Mathematics is tough sledding for many. The difficulty is that most students fail to appreciate that mathematics is "just a language," a rigorous and abstract one. This book focuses on making the abstractness more concrete with interesting and fun lessons. It uses STELLA software's icon-based, non-abstract language to structure problems in ways that students can easily visualize. Students use the software's simulation capabilities to explore solutions to the problems. Available from [iseesystems.com](http://iseesystems.com)

### ***Modeling Dynamic Systems: Lessons for a First Course***

**by Diana Fisher**

This book provides a set of tools that enable educators at the secondary and college levels to teach a one-semester or one-year course in System Dynamics. Developed for beginning modelers, the lessons contained in this book can be used for a core curriculum or for independent study. Available from [iseesystems.com/](http://iseesystems.com/)

### ***The Systems Thinking Playbook***

**Expanded by Linda Booth Sweeney and Dennis Meadows**

*The Systems Thinking Playbook* enables teachers to brief, facilitate, and debrief 30 exercises for groups of 5-500 students. It is accompanied by a two-hour DVD to illustrate good practice in introducing and facilitating each of the games. The exercises are brief, 5-20 minutes for each.

Each chapter contains easy-to-follow directions for the trainer. Suitable for all ages.

Available through [Chelsea Green](http://Chelsea Green)

### ***When a Butterfly Sneezes: A Guide for Helping Kids Explore Interconnections in Our World Through Favorite Stories***

**by Linda Booth Sweeney**

Kids face all sorts of situations throughout their lives that demand their understanding and problem-solving skills. As parents and educators, we want to help them understand why troubling things happen, and then figure out what they can do about them. This powerful resource will help you engage children in a fascinating and stimulating world in an imaginative, playful and memorable way.

Contact Linda Booth Sweeney ([linda@lindaboothsweeney.net](mailto:linda@lindaboothsweeney.net))

### ***Connected Wisdom: Living Stories about Living Systems***

**by Linda Booth Sweeney**

How do we learn to live sustainably – or within the means of nature — on this planet? Would you believe that Aesop's Fables, the Brothers' Grimm and other ancient folktales have much to teach us? Through this book, readers from 10 to 110 will explore, through 12 timeless folktales and modern examples, how the laws that guide living systems can also guide how we live and learn. Available through [Chelsea Green](http://Chelsea Green)

### ***The Systems Thinking Playbook for Climate Change: A Tool for Interactive Learning***

**by Linda Booth Sweeney, Dennis Meadows and Gillian Martin Mehers**

Simple interactive exercises, we call them 'games' or 'strategic exercises,' have the potential to help participants understand by doing. In *The Systems Thinking Playbook for Climate Change*, we present 22 games that will be useful to those who are trying to communicate with others about the causes and consequences of climate change.

Some of the games in this book have been adapted from *The Systems Thinking Playbook*, first published in 1995 and some are entirely new. Contact Linda Booth Sweeney ([linda@lindaboothsweeney.net](mailto:linda@lindaboothsweeney.net)).

## ***Tracing Connections: Voices of Systems Thinkers***

**by *isee systems* and The Creative Learning Exchange**

*Tracing Connections* is for anyone who's ever wondered how systems thinking can be effectively used to significantly and successfully transform education, business, public policy and research. In ten chapters, professionals from many fields lead the reader through an amazing spectrum of applied systems thinking that leads to unexpected realizations and critical understanding. Available through [iseesystems.com](http://iseesystems.com)

## ***Thinking in Systems***

**by Donella Meadows, edited by Diana Wright**

Donella Meadows' manuscript, *Thinking in Systems*, is a concise and crucial book offering insight for problem solving on scales ranging from the personal to the global. Edited by the Sustainability Institute's Diana Wright, this essential primer brings systems thinking out of the realm of computers and equations and into the tangible world, showing readers how to develop the systems thinking skills that 'thought leaders' across the globe consider critical for 21st-century life. Available through [Chelsea Green](http://ChelseaGreen.com)

## ***Schools That Learn: A Fifth Discipline Fieldbook for Educators, Parents, and Everyone Who Cares about Education***

Peter Senge, a trio of innovative educators, and the original Fifth Discipline Fieldbook authors team up to show you how to create systemic educational change using the five disciplines of organizational learning. Ideal for use in the classroom, in educational systems, and in professional learning communities, *Schools That Learn* is brimming with stories and examples of people who are unleashing the power of learning and bringing it to the forefront of their visions and practices. Available through Amazon

## **Websites:**

### **Waters Foundation Website. The Systems Thinking and Dynamic Modeling Site**

<http://www.watersfoundation.org>

Provides educators with background information, examples, and guidance in the use of systems thinking and dynamic modeling in K-12 education. The work shared here is generated by educators supported by Waters Foundation K-12 Educational Partnerships.

### **CC Modeling Systems: Modeling Real World Challenges**

<http://www.ccmodelingsystems.com>

This website is maintained by Diana Fisher to support the use of system dynamics in K-12 education. It contains examples of student work, basic SD information and resources.

### **Linda Booth Sweeney's Website**

<http://www.lindaboothsweeney.net>

As a systems educator and writer, Linda Booth Sweeney is on a mission to make systems – rather than fragments -- the context for the way we think about decision-making, learning and design. Linda translates the concepts of complex systems theory into accessible materials and seminars for innovation in organizations, schools and communities. Linda is the author of several books and numerous articles.

### **The Maryland Virtual High School of Science and Mathematics**

<http://mvhs.shodor.org/>

Links to many student projects, including models built with STELLA.

### **Fish Banks, Ltd. Simulation**

<http://forio.com/simulate/mit/fishbanks/simulation> Or Contact Dennis Meadows:  
[lataillede@aol.com](mailto:lataillede@aol.com)

Widely utilized in K-12 education, Fish Banks, Ltd. is a game about teamwork and natural resource depletion. The game illustrates the causes and consequences of over harvesting and is based on the archetype system structure for renewable resource use. One set of materials serves a session of up to 40 participants and requires one hour to play. The exercise is used by thousands of teachers around the world; it has been translated into many languages. A K-12 guide is available on the CLE site.

### **The Donella Meadows Institute**

<http://www.donellameadows.org>

Among the many sources of inspiration that drive the Institute's exploration of sustainable strategies, the life and work of its founder, Dana Meadows, remain central. Dana warned us that it takes clarity and courage to challenge existing systems. She recognized that, along with analytical thinking, empirical evidence, systems thinking and modeling, the creation of sustainable futures requires visioning, networking and learning.

### **The System Dynamics Society**

<http://www.albany.edu/cpr/sds>

A webpage containing information about society membership, publications, and an email discussion group.

### **isee systems, inc.**

<http://www.iseesystems.com>

The software developer of STELLA and iThink, a resource for software, books and curriculum for systems thinking.

### **Listserve:**

#### **K-12 E-mail Discussion Group**

To subscribe: <http://www.clexchange.org/cle/k12listserve.asp>

A K-12 system dynamics email list that discusses the use of system dynamics and systems thinking in K-12 education.

### **Periodicals:**

#### **CLExchange published by the Creative Learning Exchange.**

A free quarterly publication devoted to K-12 education. [Register for our free newsletter.](#)

### **Bibliography of Systems Thinking and System Dynamics Literature**

<http://www.clexchange.org/resources/additionalresources.asp>