2014 Systems Thinking and Dynamic Modeling Conference for K-12 Education

June 28—30, 2014
The Babson Executive Conference Center
Wellesley, MA

FRIDAY, June 27
9:00-5:00
THAMES Pre-Conference Introductory Systems Workshop (registration required) – Anne LaVigne, Creative Learning Exchange and Waters Foundation, and Alan Ticotsky, Innovation Academy Charter School

SPECIAL: Throughout the conference, Jeff Potash, an experienced modeler with extensive K-12 experience, will meet with you by appointment to discuss your model or how to incorporate modeling into your curriculum. Schedule a time with him. Sign-up at the registration desk.

7:00-9:00 pm Conference Registration in Conference Center Lobby

SATURDAY, June 28
8:30-10:00 Registration/Continental Breakfast

10:00-12:00 Welcome, Introductions, and Keynote

MYSTIC A/B
What Gives System Dynamics Wings?
Skills students need to complement SD in order to make meaning
Featured Speakers:
Linda Booth Sweeney, Systems educator & author; Brad Morrison, Brandeis University; Rebecca Niles, ReThink Health; Michael Goodman, Innovation Associates Organizational Learning

12:00-1:30 Luncheon
1:30-5:00 Five Parallel Workshops

1. Creating a Classroom Environment – Rob Quaden, Carlisle Public Schools, Carlisle, MA; Alan Ticotsky, Innovation Academy Charter School, Tyngsboro, MA

2. A Brief Introduction to Systems Thinking Tools – LeAnne Grillo, SoL Education Partnership; Ginny Wiley, Systems Thinking Collaborative

3. Using ST/SD to Address the Common Core – Sheri Marlin, Waters Foundation

4. Finding Systems, the News to Use – Warren Farr, system dynamicist and citizen advocate for system dynamics; Diana Fisher, system dynamics modeling teacher and author of Modeling Dynamics Systems and Lessons in Mathematics

CONNECTICUT
Have you ever read an article that was of personal interest and that seemed to contain systems concepts, but you were not quite sure where to start a systems diagram? Sharing or teaching from that article can be interesting and relevant. The Finding Systems, the News to Use seminar targets educators interested in gaining experience with pulling system lessons from everyday articles. Several examples will be used to illustrate the ins and outs of getting started. Participants will be able to recognize when an article contains enough system information and how to begin pulling the information out into a system diagram that can be shared and discussed. Time permitting, we will also work on developing a simple model that simulates from one of our examples.

5. Continuation of Friday Introductory Workshop
   – Anne LaVigne, Creative Learning Exchange and Waters Foundation

THAMES

6:00-7:30 Dinner

7:30 Evening Session

Use of systems thinking and dynamic modeling and on-line education to interest students: A hypothetical charter school based on discovery learning and system dynamics – David Massias and Linda Nichols, Shadow Health

POTOMAC

This session will introduce a hypothetical new charter high school (Discovery High School) developed by a coalition of entrepreneurs, educators, and concerned community members and based on the principles of systems thinking, discovery learning, and entrepreneurship. Discovery High School will prepare students to live and work successfully by using a system dynamics approach to build a personal narrative as students learn by creating. Upon graduation, students will have the entrepreneurial skills to write code, create a product, and prepare it for their market. The co-founder of this new high school is the CEO of an educational simulation company and will facilitate the session, engaging the participants in a review of the case study, facilitating inquiry and debate of the strengths and obstacles to this creative challenge.

SUNDAY, June 29

7:00-8:30 Breakfast

8:30-10:00 Four Parallel Sessions


POTOMAC

The heart of the Changing the Game initiative in Milton is the focus on the culture and process created to address a Community Literacy Initiative over the past few years. Using specific systems tools and strategies, the leadership has been helping the larger group of stakeholders (including teachers, trainers, parents, Board, and community members) see the big picture, use systems tools, and make decisions for sustainable change that impacts learning and the entire community. In the process, Milton is developing an understanding of the existing mental models that people hold to be true, building partnerships across the community, and, most important—nurturing an openness of mind, heart, and the will to reach their goals to do what is best for their children.

2. The Northbridge Experience – Sherri Travers, Northbridge High School, Northbridge, MA; Neal Mitchell, Consulting Engineer and system dynamics citizen advocate

CONNECTICUT

Three years ago the Northbridge Superintendent of Schools permitted a teaching team to offer an honors seminar on Systems Thinking. The initial class included second, third and fourth year high school students. The seminar instruction format used three hour time blocks on Saturday. The course involved self-study, discussions, and presentations. Model building using Stella and the use of the Diana Fisher High School Workbook had to be abandoned when the students started to focus on the model building rather than the thinking that could be developed using the modeling ideas. Some students blossomed with this opportunity to look at things in a different way, while some were completely turned off by the potential of failure. The success and failures of this program will be presented along with the conclusion that the most significant failure was that this course was taught too late in the student’s educational development. This has led to suggestions of how and when these ideas should be introduced, along with suggestions as to what should be covered, as well as how it should be covered.

3. Systems Thinking across the Curriculum: The IACS Experience – Teachers from Innovation Academy, Tyngsboro MA

MYSTIC A

Innovation Academy Charter School (IACS) is a public school for grades 5-12. IACS includes systems thinking as a founding and continuing principle in the school’s charter. In this session, faculty members demonstrate how the school’s structure implements their mission and present some recent applications of systems thinking in the curriculum.

4. Introducing Critical Thinking with System Dynamics in Indonesia: Developing a Model Learning and Teaching Approach and Systems Introduction for the Indonesian Context – Ken Moore, Center for Research and Knowledge Exchange, Indonesia

THAMES

This session will share an educator’s experiences introducing systems thinking and dynamic modeling to pre-service teachers and K-12 students in Indonesia. The session will...
cover the Educational Design Research (EDR) approach to answer the following question: How can Indonesian students be most effectively engaged in a critical thinking process that allows them to confront the challenges they face everyday? The EDR process involves testing an educational intervention over multiple iterations, documenting its effectiveness, and improving it with each iteration. The presenter hypothesized that introducing systems dynamics would (A) not only be a highly effective way to inject more critical thinking into the Indonesian classroom, but also (B) give students tools that they could begin to use immediately to confront the issues they face every day. This session will first explain the Indonesian societal and classroom context, and then share the model teaching approach and curriculum that was tested to introduce Systems Dynamics to Indonesian students. Results and lessons learned will be shared, and participants can engage with the tested curriculum and give feedback for its improvement.

10:30-12:00  Keynote
MYSTIC A/B  Group Modeling: Theory and Practice
George Richardson, Emeritus Professor, University at Albany, SUNY
Peter Hovmand, Washington University

12:00-1:30  Luncheon

1:30- 2:00  MYSTIC A/B
The Use of Simulations of All Kinds in Teaching Systems Thinking and Dynamics Modeling – Anne LaVigne, Creative Learning Exchange

2:00-4:00  Four Simulation Exercises
1. Using Simulations across the Curriculum – Jeff Potash, Center for Interdisciplinary Excellence in System Dynamics
SUSQUEHANNA
Jeff will demonstrate two uses of simulations in the classroom:
• How to teach financial literacy from the two books, Dollars and Sense: Stay in the Black and Dollars and Sense II: Our Interest in Interest.
• How to understand the impact of demographics on the course of history. This simulation introduces a new project using population demographics and its impact through history. You will be able to give input into this exciting new project.

2. Kinesthetic Games: The Bean Game – Tracy Benson, Waters Foundation
CONNECTICUT
The very popular "Bean Game" will engage participants in a multi-generational, low-tech and hands-on experience that will be debriefed using a variety of systems thinking habits and tools. "Essential Questions" that guide this simulation include:
• What effects do the values and actions of one generation have on subsequent generations?
• How do mental models of "need" differ and impact the interactions between human populations and their environment?
• How does access to innovation or advanced technologies impact system structures and mental models?

Participants do not need experience with systems thinking. They will learn as we progress through the simulation.

3. Engaging, Online Simulations to Explore Complex Systems in a Variety of Contexts – Anne LaVigne, Creative Learning Exchange and Waters Foundation
THAMES
What do playground dynamics, fishing, ecosystems, a hog market, and burnout have in common? For one, it is the ability to explore these systems using easy-to-implement simulations. All you need is an internet connection and you’re ready to go. Students from 1st grade through high school ask “What if” questions as they explore the impact of their decisions on the dynamics of a system over days, weeks, or years. Some simulations are even multi-user, allowing the decisions of one student team to impact their results as well as the results of other teams. Each simulation also has free, accompanying lessons and handouts.

4. STELLA Modeler: Creating Models on the iPad – Bob Eberlein, isee systems
POTOMAC
Quickly build, simulate, and share models. Create models that visualize and build understanding of how complex systems work and things change over time. Based on Systems Thinking and the language of stocks and flows, models created with STELLA® Modeler serve as practice fields to simulate “what-if” scenarios and discover the “why” behind outcomes.

5:00-5:45  POTOMAC
Fireside Chat – Jay Forrester, Founder of the field of System Dynamics, Professor Emeritus, MIT, with George Richardson, Professor Emeritus, University at Albany, SUNY
7:30-9:00
POTOMAC
What Creates a School Culture that Encourages Learning? - Rebecca Niles, Peter Senge, LeAnne Grillo, and Lees Stuntz

A group of educators, both teachers and administrators, has been meeting in the Boston area for over 18 months. We have used our tools of systems thinking and system dynamics—behavior-over-time graphs and causal loop diagrams with stocks and flows—to frame our discussions. With the able help of Rebecca Niles’s expert mapping and modeling skills, we based our latest discussion on the Repenning and Sterman article about the Capacity Trap:

http://web.mit.edu/nelsonr/www/Repenning=Sterman_CMR_su01_.pdf

MONDAY, June 30

7:00-8:30 Breakfast
8:30-9:30 Five Parallel Sessions

1. **SmartCards** – Amir Bar, University of Houston

**MYSTIC A**

Smart Cards are a tool to combine low-tech learning from printed, tangible cards and high-tech learning through eLearning modules via a QR (Quick Reader) code placed on each card. The set of cards covers 31 key topics in a Systems Thinking course. Each card offers a definition of a key term, examples and some visuals. In addition, students can use the QR code to access additional material, including a short video, additional text and a short assignment.

2. **Education for Sustainability: A Case Study from Secondary Schools in Mauritius, Indian Ocean** – Anneloes Smitsman, ELIA- Ecological Living In Action, Mauritius

**CONNECTICUT**

Through a case study, the session will focus on the sharing of lessons learned and best practices in applying Systems Thinking and System Design principles in the Education for Sustainability Programme that is being piloted by three secondary schools of the Bureau of Catholic Education in Mauritius, with the intention for replication and up-scaling in 15 additional schools. In Mauritius, the secondary school system caters to students who are in the 11 – 17 years age group.

3. **Teaching Environmental Systems through Modeling** – Chris DiCarlo, Innovation Academy Charter School, Tyngsboro, MA

**POTOMAC**

In this session we discuss a semester-long high school class that uses system thinking tools to analyze the challenges we face in the management of our natural resources. The class is broken into three units: land, air, and sea, with an independent project at the end. We apply connection circles, causal loop diagrams, STELLA computer modeling and online simulators to get a deeper understanding of these systems. The ideas of sustainability and feedback loops are stressed throughout the class as recurring themes.

4. **Systems Thinking to Enhance Preschool Emotional and Intellectual Development** – Jennifer Dooley and Jen Parker, Catalina foothills SD, Tucson, AZ

**SUSQUEHANNA**

This session will introduce and showcase the impact of several systems thinking visual tools on the cognitive and emotional development of preschoolers. Participants will experience a two-year journey incorporating ST tools into early childhood classrooms. ST tools shared will include BOTG, Stock-Flow, Casual Loops, Ladder of Inference, and Story Archetype. Examples shared will focus on incorporating ST tools across the curriculum. Resources and take-away examples will be shared, as participants will be encouraged to try these new tools in their own classrooms.


**MYSTIC B**

Participants will be introduced to the first in a sequence of three online professional development courses, the first of which will be available this summer. The course is 10 weeks long and provides 3 graduate credits (quarter term credits) from Portland State University. The structure of the hands-on system dynamics model building course, some of the lessons, and some of the online instructional videos will be presented. Information about the second and third courses will also be discussed. The first course will also be available in the fall, but the instruction will be spread over 20 weeks instead of 10, to give teachers more time to complete the assignments. The course is appropriate for high school, community college, and undergraduate instructors of math and science.

10:00-12:00 Keynote

**MYSTIC A/B**

So Now What? Integrating what we have learned into effective learning environments

Peter Senge, MIT and the SoL Education Partnership, and Tracy Benson, Waters Foundation