



**Systems Thinking and Dynamic Modeling  
Conference  
SUNDAY JUNE 25, 2000**

**8:30-10:30 Registration. Coffee and pastries.**

**10:30 STEVENSON A & B**

***Insightful Little Models*  
KEYNOTE BY GEORGE P. RICHARDSON**

Systems thinking maps and system dynamics models are crafted to help people think about complex dynamic phenomena. Thus, really useful maps and models are those that help create, sustain, and communicate insights. We should be striving for insights every time we map or model.

Insightful maps and models need not be large or complex. In fact, they are often distillations of larger, more complex systems pictures. In this presentation we will give a number of examples, accessible to beginners and interesting to experienced practitioners. Along the way we will provide an introduction to some of the concepts and tools of system dynamics, provide a few building blocks, and contrast what we can learn from qualitative maps and quantitative models.



**George P. Richardson**

George P. Richardson is professor and chair of the Department of Public Administration and Policy in the Nelson A. Rockefeller College of Public Affairs and Policy at the University at Albany. He founded and served for seven years as the executive editor of the *System Dynamics Review* and is the author of *Introduction to System Dynamics Modeling with DYNAMO* (1981), *Feedback Thought in Social Science and Systems Theory* (1991), both of which were honored with the System Dynamics Society's Forrester Award, and the edited two-volume work *Modeling for Management: Simulation in Support of Systems Thinking* (1996). His recent work has focused on public policy problems in social welfare and the use of formal computer-based tools and models to help groups move toward policy consensus in complex dynamic systems.

**12:00–1:30 Luncheon served in the Cascade Ballroom**

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**INTRODUCTORY/BASIC SESSIONS—FOR THOSE NEW TO SYSTEMS EDUCATION  
1:30–5:00 Two Parallel Sessions**

**1. Introduction to Systems Concepts and Tools** - Joan Scurran, Julie Guerrero, and Mike Sloomaker, Waters Grant Project and Catalina Foothills SD

***Stevenson A***

This session is designed to introduce the concepts and tools (behavior-over-time graph, ladder of inference, iceberg, causal loop diagram, archetype, stock/flow map, and system dynamics model) of system dynamics and systems thinking. Participants will have time to practice using the tools and see examples of how various concepts and tools have been used to teach K-12 curriculum.

**2. Introduction to System Dynamics Modeling** - John Heinbokel and Jeff Potash, Trinity College  
***Stevenson C***

This workshop is designed for relative new-comers to system dynamics; its overall focus is to present an introduction to system dynamics as a means to refine and communicate our mental models of complex systems. Participants will have the opportunity to construct a simple model, to explore and manipulate a variety of other computer simulations, and to relate those models to the other tools of system dynamics (Behavior over Time Graphs, Causal Loops, and Stock/Flow Maps). Freely available materials of the Waters Center for System Dynamics will be used to augment direct instruction and discussion.

**ADVANCED SESSIONS—EXPERIENCE NECESSARY**  
**1:30–3:00 Seven Parallel Sessions**

**3. Building a Team's Capacity to Engage in Systemic Conversations – Micah Fierstein, Change Institute**

**Parlor 1**

This session will review the findings of a case study of an elementary school site council's use of communication and inquiry tools drawn from learning organization theory and organizations that are seeking to become learning organizations. The session will also explore how the tools can be introduced and practiced by parents, teachers, and administrators. The qualitative Ed. D. dissertation study occurred over a 19-month period and is titled *Characteristic and Use of Inquiry and Communication Tool in Planning for Educational Change*.

**4. Students' Experiences with System Dynamics: Examples from *Modeling the Environment* – Andy Ford, Washington State University**

**Meadow Room**

The author of *Modeling the Environment* will present materials and models he used with his students in the process of writing his book. One of the more popular examples from the course is the model of the salmon population of the Tucannon River. This presentation describes a STELLA model of the Tucannon salmon life cycle and will focus on what students seem to learn from their experiments with the model.

**5. Right on Target! Developing Classroom-Based Observational Assessments - Johnnie McKinley, Instructional Specialist, Seattle Public Schools**

**Stevenson D**

In this session teachers will learn how to reliably and validly assess students, using one of the most easily accessible classroom methods—observation. Participants will leave with a strategy for systematically creating scoring rules that assess valued learning targets. We will examine the notions we have about competence and valued achievement targets for systems thinking and dynamic modeling.

**6. Teaching Government with System Dynamics - David Wheat, citizen advocate, Wheat Resources Inc.**

**Parlor 2**

A system dynamics approach to teaching about government assumes that any public policy is part of a system that, sooner or later, generates new public issues (i.e., feedback) due to public perceptions of the policy's effectiveness or side-effects. Using behavior-over-time-graphs, causal loop diagrams, and computer simulation (STELLA), this paper presents classroom examples of effective lessons about government, politics, and public policy. The paper should motivate teachers who are looking for practical examples of the application of system dynamics in social science classrooms, including examples that can be tailored to their curriculum and lesson plans right away. In addition to specific lessons, this paper presents a general system dynamics model for approaching the study of government, politics, and public policy that the author has found to be a valuable tool for structuring the course.

**7. Use of SD as a Tool for Collaboration - Margie Varnadoe, Jan Mons, Mary Jo Davis, and Nell McCullers, Waters Grant Project, Glynn County Schools, Brunswick, GA**

**Parlor 3**

Two years ago we brought a group of school administrators to the CLE conference. After that we formed an administrative COHORT group to learn about SD and how to use it in school level decision making. We will share activities we tried and the successes and failures as we moved into our second year. This year we were asked to work with the districts rezoning task force. We continue to try to facilitate the implementation of the use of Systems Dynamics to aid in long range decision making as our district is facing the potential of doubling in population in the next ten years.

**8. Building Sustainable Interest in Modelling in the Classroom: The Implications of the S-curve for Hooking New Practitioners in Schools - Gordon Kubanek, Ottawa Carleton District Schools**

**Hood River Suite**

System Dynamics has had a tough time breaking into High Schools. Like all good ideas the most difficult part is convincing those who would most benefit that this new approach is in their self interest. When system dynamics is only presented as a computer based tool, most teachers will not try it. When we introduce systems methodologies in a way that focuses on the richer, softer and more human side, teachers start to simulate more quickly. Learning the "System Dynamics Way" is in fact introducing a changed relationship of learner, teacher and subject material. Five strategies that have been practiced in three countries will be presented in detail. Systems Thinking can help to build a sustainable learning process. The three distinct parts of the classic learning S-curve that can be represented as "curriculum" are: build *Passion* slowly, accelerate learning through *Risk* taking and consolidate understanding by *Reflection*. Using computer models is the goal because computers are the best tool for student controlled exploration and reflection. To bring practitioners on board stealth should be used to *implicitly* train students and teachers about systems thinking.

**9. The Dynamics of Health Education - Judith Lampi, Mentor, The Waters Foundation, Tubman Middle School**

**Parlor 4**

Over the years, health educators have learned that scare tactics and "just knowing the facts" about topics such as tobacco use, alcohol, and the spread of disease, (STD's and HIV) do not really make a difference in the decisions that teenagers make. The use of system dynamic tools can help teens to:

- Understand long term consequences of risky behaviors
- Realize the leverage in breaking the "chain of infection" and making health decisions

This session will introduce how system dynamics is integrated into the health curriculum in an inner city middle school, to help students achieve a healthier lifestyle.

**ADVANCED SESSIONS—EXPERIENCE NECESSARY**  
**3:30–5:00 Seven Parallel Sessions**

**10. Designing a Skills Matrix. Integrating Systems Thinking and System Dynamics into a K-8 School -**  
Rob Quaden and Alan Ticotsky, Waters Grant Project,  
Carlisle Public Schools, Carlisle, MA

**Stevenson D**

Carlisle (MA) Public Schools have been teaching students ST/SD for several years. Mentors funded by the Waters Foundation will describe the process which has created a sequential, developmental matrix of activities and skills for students in grades K-8. Among topics the session will consider: \* the relationship of mentors and teachers \* adapting and developing specific activities \* adding systems tools to established curriculum \* simultaneous application of a variety of tools at several levels \* how skills are demonstrated and assessed.

**11. What was the Impact of the Industrial Revolution on England, and Ultimately, on the Rest of the World? -** Michael Bishop, Tubman Middle School,  
Portland, OR

**Parlor 1**

Even as this Revolution precipitated radical change in society, are we on the brink of another revolutionary paradigm shift with the emergence of the Internet? Within a series of history lessons designed for middle school students, we will trace the emergence of the Industrial Revolution, modifying the discrimination/oppression archetype for purposes of analyzing how this “system” changed society. We will analyze the outcomes for those who envisioned the radical change of the Industrial Revolution and benefited (financially) thereby. We will also consider those who failed to see the significance of the radical change brought about by the Industrial Revolution and review the results of their inability to change with the times. Finally, we will, through the use of causal loops, extend the Industrial Revolution growth pattern to the present-day Internet “Webolution” and make some predictions—by means of systems thinking analysis—about where people and society will be ten to twenty years from today. We will discuss what we need to do to weather the predicted cultural shift to be brought about by the Internet.

**12. Group Modeling with the Hinesburg School District to Address the Problems of Overcrowding -** Will Costello, Waters Grant Project and Chittenden  
South SD, Burlington, VT

**Parlor 2**

Mr. Costello will describe his work with a sub-committee of the Hinesburg school system (board, superintendent, parents, and planners) in a group-model building exercise to address the impact of regional and local growth upon the school population. He will combine this with a Champlain Valley Union HS Management model, developed with the CVU Program Council and Pathways Committee, which addresses overcrowding issues.

**13. What Behaviors Are Desirable in Students Creating System Models? A Step Before Assessment from the Perspective of 9-12 Mathematics -** Diana Fisher, Portland Public Schools

**Hood River Suite**

Assessment is a major concern currently in the K-12 systems community. If parents and other teachers are to be encouraged to accept this new paradigm for problem solving and analysis then some method for measuring the improved thinking skills of students must be demonstrated. How to accomplish this assessment using traditional tools has proven to be elusive, to this point. This presentation attempts to take one step back from the assessment issue and determine what we feel are desirable traits in a student or student group that has chosen to study

problems from a systems perspective. This experienced teacher will also take a look at integrating a systems approach into the 9-12 mathematics curriculum.

**14. System Dynamics in the Real World -** Jim Lyneis,  
Sr. Vice-President at Pugh-Roberts Associates/PA  
Consulting

**Meadow Room**

Jim Lyneis has been building models, consulting, and teaching system dynamics for over 25 years. He will present examples of how system dynamics models are used to study and solve a wide range of problems. For example, he is working with team of biologists and physicians to build a model of the human immune system to better understand and treat auto-immune diseases. Other models have examined how delays and design changes affected the building of the English Channel Tunnel and major ship-building projects. Another model helped a professional football team plan draft strategies.

**15. The Impact of Simulation Models as a Tool for Chemical Concept Acquisition -** Elina Nasakkala,  
Helsinki School, Finland

**Parlor 3**

This study examines the impact of simulation models as a tool for chemical concept acquisition or investigation work by students in introductory chemistry courses at the high school level. The study illustrates how iconic model-building software (PowerSim) can be used to help students gain a deeper qualitative conceptual understanding. Materials used in this study were developed to incorporate modeling approaches within the chemistry curriculum presently being taught. This study seeks to help teachers initiate changes in the methodology of chemistry teaching by demonstrating the integration of modeling which is applicable across a well-defined range of curriculum areas.

**16. “Stealth” Systems Education for Pre/In-Service Teachers at Every University -** Len Troncale, Director,  
Institute for Advanced Systems Studies, California State  
Polytechnic University

**Parlor 4**

This multimedia presentation will: • Describe a new pathway for attracting K-12 teachers to systems education. • Show how the many stunning features of computerized multimedia presentations can effectively introduce neophyte teachers and students to systems understanding. • Show data for improved learning achieved in the natural and systems sciences by teachers. • Suggest and map 250 potential systems-based case study models in the natural sciences. • Describe two new computerized assessment tools that turn educational technology courseware into “living” courseware for the first time. • Show how we can introduce very large numbers of pre/in-service teachers to the systems education movement by incorporating systems science and modeling into the science general education requirement of every college and university. • Suggest how integrated science teachers can become first-time authors of marketable products in systems education. • Provide a progress report on our plan to sneak systems education into the core of many conventional college-level, teacher-training programs.  
*To affect the future, get new tools into the hands of teachers!*

**5:30–6:30 Wine Tasting, Flerchinger Wines**

**6:30–7:30 Dinner in Cascade Ballroom**

**8:00–9:00 Poster Presentation by Portland Area Students in Stevenson A & B**

## MONDAY, JUNE 26

7:30–8:30 Breakfast served in the dining room

### 8:30–10:00 Ten Parallel Sessions

#### 17. SyM Bowl Update: Encouraging and Recognizing Student Proficiency in System Dynamics Modeling - Wayne Wakeland, Portland State University

##### *Parlor 1*

The judging criteria and modeling process guidelines for the SyM Bowl modeling competition are briefly reviewed. Prize-winning student models from previous SyM Bowls are then discussed in order to show how the students and their teachers appear to have interpreted the criteria and process guidelines. The strengths and limitations of the selected student models, especially the basic model structure & logic, and the process they used to build the model, as evidenced in the reports they submitted, are then presented. We then will consider how the criteria and process guidelines may or may not have influenced the students. We will conclude with a discussion on the strengths and weaknesses of the judging criteria and modeling process guidelines, including how they might be improved to assure that their influence on the student modeling process and model quality is as beneficial as possible.

#### 18. Scientific Method and Sixth Grade Physics - Judy Butler and Jan Mons, Waters Grant Project, Glynn County Schools, Brunswick, GA

##### *Parlor 2*

We have adapted CCSUSTAIN STELLA® physics models from 1993 to use with our sixth grade science curriculum. Our students do not build the models, but use them to investigate relationships between distance, rate, time, velocity, acceleration, friction, gravity and other basic physics concepts. Each model has a problem/question with it and students use a standard scientific method worksheet to understand the relationships, graph them, and develop the formulas. In addition to the models, we use other classroom activities to introduce or reinforce the properties. This continues to be a work in progress, but in its second year of use, students who are using these models have had no previous ST/SD experience.

#### 19. Stories as a Means of Exploring and Understanding Causality and Other Systemic Thinking Concepts - Linda Booth Sweeney, Harvard Graduate School of Education

##### *Cascade C*

This workshop explores how children's stories that embody systems principles can be used as part of systems thinking educational efforts. Through my research, I discovered that many stories embody linear event-and-reaction relationships; the characters' actions never have unexpected changes, and the plot moves forward from beginning to end, as if "setting us up" for linear, non-systemic, non-ecological thinking. But I also found a growing number of stories that embody systems principles and archetypes. In this workshop, we will review the basic story line of several children's stories from around the world, surface targeted systems concepts within each story, and identify practical "debrief" questions for educators. Please come prepared to read out loud and to share your own "systems thinking stories."

#### 20. How the Introduction of Systems Thinking Skills in Middle School Can Impact the Cognitive Development of Adolescents and Modify Their Propensity to Indulge in Risky Behaviors - Joan Engeldinger, M.A. Interdisciplinary Studies

##### *Parlor 3*

This presentation will explore how the introduction of systems thinking in our schools can change the way our adolescents think and behave. Systems thinking skills provide the learner with a holistic and integrated way of viewing the world. I will provide an overview of systems thinking through the eyes of several notable authors and scientists of this past decade.

#### 21. Integrating Systems Thinking and STELLA modeling throughout the Mathematics Curriculum - Anne Boswell, Tubman Middle School, Portland OR

##### *Cascade A*

This session will focus on how systems thinking and STELLA modeling can be incorporated throughout the mathematics curriculum. As math teachers, we are expected to teach a variety of strands such as geometry, probability and statistics, algebraic relationships, number sense, etc. The session will begin with looking at problems from current middle school math curriculum and then exploring how systems lessons can be integrated to enhance the curriculum. Connections will be made to the state and national math standards and benchmarks.

#### 22. How We Got Started: A Story of Three Different Approaches - Experienced Teachers and Mentors

##### *Meadow Room*

- **Opening the Door to Systems Thinking at James M Bennett High School** - Linda Davis

How to introduce systems education into a high school as you learn yourself.

- **Starting A System Dynamics Program in Your School for Students in Grades 7 through 12—The CC-STADUS/SUSTAIN Experience** - Ron Zaraza, Scott Guthrie

The workshop will demonstrate a multi-faceted approach to the problem of starting a system dynamics program in a 7th to 12th grade school environment, helping participants understand what methods might work to influence teachers to try this experiment.

- **An Account of a System Dynamics Course Held for K-12 Teachers, High School Students, and Community Members** - Paul Newton, master's candidate in system dynamics, and Dr. Larry Smith, University of WI

Over the 1999-2000 academic year, an introductory course in system dynamics was held at the high school in Sturgeon Bay, Wisconsin. The class consisted of high school students, K-12 teachers, and community members. Two social studies, one economics, and one biology teacher participated in the course. Our view is that, with proper education, some high school students and retirees can serve their communities through providing system dynamics consulting to their communities.

#### 23. Using Systems Thinking in School Administration - Davida Fox-Melanson, Eileen Riley, Alan Ticotsky, Waters Grant Project, Carlisle Public Schools, Carlisle, MA

##### *Stevenson D*

When administrative leaders want to use systems tools in their work, where do they start and where do they go? Hear about the progress and pitfalls encountered by the Carlisle (MA) administrative team as they spent their first year exploring STITO (Systems Thinking in the Organization). Techniques used included practice with causal loops, inviting systems mentors to administrative team meetings, and participating with faculty and staff in systems roundtable discussions.

**24. Mining for Understanding: A Chemistry Unit -**  
Jennifer Grant Prileson, Mike Sloomaker, Gillian  
Roehrig, Waters Grant Project and Catalina Foothills SD  
**Stevenson C**

What do per cent composition, electroplating, and oxidation-reduction reactions have to do with monopolies and laws of supply and demand? Everything, when it comes to mining copper in the state of Arizona. Come and learn how students progress through a series of chemistry labs, field trips, lecture material, and simulations to build the knowledge base they need to prospect for potential copper mining sites and run their own mining companies via a networked STELLA Mining Simulation. The companies attempt to mine a limited resource in the face of natural economic rhythms, and make decisions which have an impact on both their own success and that of other companies. If time permits, participants may 'play' the prospecting and/or mining simulation.

**25. Fifth Graders Create the Future -** Julie Guerrero,  
Rebecca Stewart, Waters Grant Project and Catalina  
Foothills SD

**Hood River Suite**

Step into the future through the eyes of fifth grade students. This presentation will show how fifth graders used the systems concepts and tools of BOTGs, CLDs, the iceberg, and an archetype as they gathered and analyzed information to gain expertise in their chosen field of housing, transportation, food production, energy use or waste disposal. The new "field experts" then teamed together to design, create, and explain their physical model of a future society.

**26. System Dynamics and Systems Thinking: the  
Curriculum Strategies for an Integrated Approach -**  
Gaylen Brannon, Tubman Middle School, Portland, OR  
**Parlor 4**

Stock/flows, causal loops, archetypes, modeling, benchmarks, course requirements. How do you put the pieces together in a way that makes sense? What's the rationale for integrating systems thinking and system dynamics throughout the curriculum? This session will focus on those questions and present ideas from a 7<sup>th</sup> grade social studies and writing class that could be easily used for any subject and/or grade level.

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**10:30–12:00 STEVENSON A & B**

***Insights from Forty Years in System Dynamics***  
**KEYNOTE BY JAY W. FORRESTER**

System dynamics provides a common language for communication among disciplines. Modeling creates theories about how the real world operates and is an inductive process akin to invention. Generic structures that are found in what may appear to be very different settings show substantial similarity between disciplines and give a student mobility from one field to another. Education should move quickly beyond systems thinking to actual system dynamics simulation modeling, because real life is too complex to be understood by talking, drawing causal-loop diagrams, and guessing about dynamic behavior. It is now time to start planning a unified K-12 curriculum that cumulatively builds from kindergarten to the completion of high school. The next great frontier lies in creating a vastly better understanding of social and economic systems.



**Professor Jay W. Forrester**

Founder of the field of system dynamics, Professor Forrester directed the System Dynamics Program at MIT Sloan School of Management until 1989. System dynamics is a profession dealing with the way policies and structure control growth, stability, and fluctuation in physical and social systems. Professor Forrester is currently applying system dynamics to understanding economic behavior as well as to K-12 education. He received the B.Sc. degree in electrical engineering from the University of Nebraska in 1939, the M.Sc. degree from M.I.T. in 1945, and has been awarded honorary doctorates from nine universities. Before creating the field of system dynamics, Professor Forrester was a pioneer in the early development of digital computers and invented the random-access, coincident-current magnetic storage that was the standard memory device for digital computers for two decades. Among his honors: Valdemar Poulsen Gold Medal from the Danish Academy of Technical Sciences (1969); Medal of Honor, Institute of Electrical and Electronics Engineers (1972); National Inventors Hall of Fame (1979); James R. Killian, Faculty Achievement Award, M.I.T. (1987); National Medal of Technology (1989).

**12:00–1:00 Lunch in the Dining Room**

## 1:00–3:30 Eight Parallel Workshop Sessions

**27. Community Dynamics of Moving toward System Thinking: A Dialogue. “Grounding Community Action in System Dynamics”** - Roy Aiken, Paul Newton, Larry Smith

### **Parlor 3**

<sup>1</sup> Roy Aiken, advocate for broad citizen participation in local decision making; <sup>2</sup> Paul Newton, master’s candidate in system dynamics; <sup>3</sup> Dr. Larry Smith, University of WI. In this session, we will reflect on our experiences in attempting to integrate social, economic, and environmental actions into a systems thinking informed approach to addressing divisive local issues in Door County, Wisconsin. In pursuing this work, we explore and utilize a variety of methods and community-building techniques to move community actions toward more holistic and inclusive results. The specific focus of this paper is our evolving attempt to engage a cross-section of people and build a partnership between K-12 education and the community.

**28. Play the Systems Way** - Tracy Benson, Joan Yates, Waters Grant Project and Catalina Foothills SD

### **Cascade C**

Come and participate in a series of experiential activities that bring systems concepts to life. Adapted from *The Systems Thinking Playbook*, these activities and the accompanying debriefing will have you moving and thinking systemically. Wear clothing and shoes that will allow you to move freely.

**29. Using Systemic Communication to Improve Problem Solving** - Kari Dean, Ron Michalak, Waters Grant Project and Catalina Foothills SD

### **Stevenson C**

How well are students able to understand and operate in a complex system? Participants will experience how middle school English students use systemic communication, a blend of systems tools (iceberg, BOTGs, ladder of inference) and communication skills, (dialog, journaling, Socratic seminar) to understand information, ask better questions, and effectively problem solve in an interactive-fiction, text-based, computer environment.

**30. Learning about Systems Thinking and Thinking Systemically about Learning** - Janis Dutton, Author, *Schools that Learn* (A Fifth Discipline Fieldbook)

### **Cascade A**

Our session will engage participants in exploring the web of learning—the multiple connections required for learning, and the structural dynamics of those connections, beyond the boundaries of the field of knowledge being studied. These dynamic tensions are at play with all learners—child and adult. Participants will help create a framework to reflect critically on their practices in multiple learning environments—the classroom, with colleagues, and in their own learning—to recognize and make these connections.

**31. Staff Development in Support of Systems Thinking and Dynamic Modeling Learning** - Nan Gill and Heidi Taylor, Waters Grant Project and Catalina Foothills SD

### **Parlor 4**

Over the course of the last ten years, a large number of educators—both classroom teachers and administrators—have been exposed to the concepts and tools of systems thinking and dynamic modeling. This session will review the various staff development efforts implemented over the past eight years to increase the use of systems thinking and dynamic modeling applications within classrooms and schools in the Ann Arbor School District. We will highlight achievements and disappointments, outline tentative lessons learned, and share the contents of a new, year-long, for-credit college course that we are piloting in an effort to address some of our learnings.

**32. Build a Model with an Expert** - Jim and Deb Lyneis  
**Meadow Room**

Participants will conceptualize, build and use a model, guided by professional system dynamicist Jim Lyneis. Working as a group and in teams at their computers, they will build a model of student motivation step by step, focussing on building skills in modeling soft variables, drawing graphic functions, using exponential averages, and insuring dimensional consistency. (This session is for those with some modeling experience.)

**33. Systems Thinking/System Dynamics - The Fourth R?** - Mary Jo Davis, Becky Hill, Jan Mons, Clelia Scott, and Eugenia Taylor, Waters Grant Project, Glynn County Schools, Brunswick, GA

### **Hood River Suite**

Introductory reading, writing and arithmetic are taught as field of study of their own and then applied in the study of all topics. In our K-5 program, we are trying an approach of introducing Systems Techniques as one of the basic fundamental skills necessary for future learning in all areas of study. Through a series of lessons, a mentor introduces the tools and concepts of ST/SD, their connections to each other, and the style of teaching that is important in an ST/SD lesson. This presentation will share the introductory lessons and activities teachers and students have done as follow-up within their own curriculum.

**34. Celebrating the Writing Metaphor: Accelerating Learning of Systems Thinking by De-Coupling the Learning Curves** - Barry Richmond, High Performance Systems

### **Stevenson D**

In twenty years of teaching systems thinking in classrooms and seminars, I have single-mindedly focused on discovering ways to make it easier for people to learn to use the concepts, language, and technologies of systems thinking to think, learn, communicate, teach, and act more effectively. Then, about a year ago, I stumbled onto an approach that seemed to offer the possibility of achieving a discontinuous leap in learning productivity. It’s now at a point where I feel it’s worth sharing. A fundamental assumption underlying the approach is that the reason systems thinking is difficult for many people to learn is because there are many diverse learning curves that are jumbled up together. I have discovered that by decomposing the learning agenda into thinking skill-associated chunks, people have a much easier time “getting” systems thinking. The issue is: *What knits the chunks together, what forms the big picture context within which the individual skills are seen as elements in a larger whole?* An answer I discovered, and have had good success using, is to rely heavily on “writing” as an overarching metaphor.

## 3:30 RECEPTION BY THE CASCADE SYSTEMS SOCIETY

### *Cascade B and D*

A thank you to all the educators doing such wonderful things with systems education!

## DINNER ON OWN MONDAY EVENING

TUESDAY, JUNE 27

8:30–10:00 Ten Parallel Sessions

### 35. Systems Thinkers Needed for Today's Science

**Research** - Linda Grisham, Lesley College, and Raquell Holmes, Boston University

#### *Stevenson C*

This session will serve to introduce the community of computational scientists to the community of systems educators so that both can move forward to achieve commonly held goals for the inclusion of systems thinking/system dynamics curriculum in K - 12 classrooms. We will focus on the reasons and opportunities for collaboration with researchers and educators using modeling, simulations and visualization in the emerging field of computational science.

### 36. Systems Thinking in 5th Grade Social Studies -

Scott Suter, Waters Grant Project and Catalina Foothills SD

#### *Parlor 1*

Participants will learn how system dynamics tools (BOTGs, CLDs, and interactive simulation activities) and systems thinking are integrated into a 5th grade social studies curriculum. The focus will be on how the tools are used to help students better understand the world around them.

### 37. Developing a School-wide Approach to System Dynamics with Harriet Tubman Middle School Staff and Students -

Mary Scheetz, Neomia Kendrix, Marianne Hall, The Waters Foundation, Tubman Middle School, Portland OR

#### *Stevenson D*

How can the concepts and tools of system dynamics be integrated into a school-wide program? Tubman Middle School teachers have been implementing systems thinking and system dynamics for two years. What has evolved is a framework for grades 7-8 that includes introduction to basic concepts and tools at each grade level with additional applications that provide students with opportunities for transfer and extension of skills and experience. The overall framework will be presented along with student and teacher examples of applications.

### 38. Using Systems Tools to Construct Knowledge of Linear Equations -

Laura Stepanek and Ron Michalak, Waters Grant project and Catalina Foothills SD

#### *Meadow Room*

This presentation will examine the teaching of linear equations ( $y=mx+b$ ) using a combination of Visual Mathematics and systems tools such as the iceberg, BOTGs, and system dynamics mapping and modeling.

### 39. Learning to Teach about a Sustainable Future -

Jack Byrne, Projects Director, Center for a Sustainable Future

#### *Cascade A*

This session will introduce you to the philosophical framework of education for sustainability, give you an in-depth tour of the software, curriculum, and on-line professional development courses available, and present information on how to become more involved in this national effort. Participants will receive a CD-ROM containing the project software (Ecological Footprint Calculator, What-If Story Builder, Community Planner), samples of the technology-rich, performance-based curriculum units on themes of sustainability, and links to the project's website and other resources.

### 40. Using Systems Concepts and Tools in Counseling and Guidance -

Terri Fletcher, Bari Ross, Waters Grant Project and Catalina Foothills SD

#### *Parlor 2*

Participants will learn how the presenting counselors have used systems concepts and tools both with individual students and small groups to help them make changes, see the big picture in situations, analyze trade-offs, and see cause and effect more clearly.

### 41. A Look at Change in Fourth Grade -

Dick Maki, Larry Weathers, Waters Grant Project and Harvard Public School, Harvard, MA

#### *Parlor 3*

The presenters will share an activity they developed for fourth grade classes. Materials were based on modifications of activities from the STEM Project, published by McDougal Littell in their unit on Visualizing Change. Students engage in predicting, discussing, measuring and then graphically representing linear and non-linear growth in variables they observe in visual, oral, or story formats.

### 42. From Classroom Idea to Published Curriculum -

Debra Lyneis, Rob Quaden, Carlisle Public Schools

#### *Parlor 4*

How can a teacher enhance a current lesson using ST/SD? And if it works, how can that lesson be shared with other teachers? In the Carlisle (MA) Public Schools, Waters Foundation mentors have worked with classroom teachers to develop many lessons which have been published through the Gordon S. Brown Fund. Working together, everyone has learned a great deal in the process. Presenters will discuss the process and the actual K-8 curriculum lessons developed.

**43. Understanding Ways of Knowing/Worldviews/  
Memes in Moving Systems Thinking throughout  
Schools and Communities** - Randy Schenkat, Winona  
Council for Quality, Winona, MN

***Hood River Suite***

This session will link the research on cognitive development with the facilitation of systems thinking. The similarities between systems thinking and more advanced stages will be considered by looking at such models as: Women's Ways of Knowing, Hermann's Brain Dominance, and Beck's Memes. Observations regarding stage levels and styles of participation in school and community change will be shared. The self-perpetuating cycles of ways of knowing that limit systems thinking will be examined. Through group discussion, learners will apply ideas on cognitive levels to working in schools, organizations, and the community, in creating more systems thinking friendly environments. Participants will be challenged to undertake the role of spiral wizards.

**44. A Systems Approach to Education Policy &  
Administration** - David Wheat, citizen advocate, Wheat  
Resources Inc.

***Library***

Virginia's new accreditation standards require that, by 2007, each public school must have at least 70 percent of its students passing four standardized tests on the state's core learning standards in order to retain accreditation. Statewide in 1999, only 7.5 percent of the schools reached the accreditation goal, up from 2.2 percent in 1998. Using a system dynamics approach to education policy analysis, this paper evaluates the accreditation policy, identifies the systemic feedback causing unrealistic test result expectations, and develops an alternative accreditation policy aimed at modifying the effects of that feedback. Using behavior-over-time-graphs, causal loop diagrams, non-linear growth curves, and computer simulation (STELLA), the paper contrasts the intended system (in effect, the mental model of the policy makers) with the actual system that has evolved, and recommends an alternative policy. The paper also identifies other applications of this approach to education policy planning and administration at the state and local level.

**10:30-12:00 Stevenson A & B**

***Learning System Dynamics***

**PANEL OF STUDENTS AND TEACHERS – MODERATOR, TIM JOY**