Why Are There Not More Elephants?
Population Dynamics

by Anne LaVigne and Jennifer Andersen in collaboration with the Creative Learning Exchange

Overview

Lesson 3B in the Oscillations lessons from the Characteristics of Complex Systems Project explores how animal populations can grow and decline over time through use of a simulation. This very simple model allows students to impact the birth and death rates based on input for different animals. The simulation displays what happens to the different populations over time. Students can compare the resulting trends for different animals and consider why those trends occur. Students may also research additional animal data in order to create their own simulation model runs.

Learning Goals Level B – Ages 8+
• Compare animal population trends through use of a simulation.
• Represent and interpret data on a line graph.
• Describe what impacts an animal population’s growth and decline over time.
• Explain why animals are limited in their growth by a carrying capacity.

Time
Two 45-minute sessions

Materials
• One computer for every 2-3 students
• Simulation online at http://www.clexchange.org/curriculum/complexsystems/oscillation/Oscillation_PopulationB.asp
• Handouts

Curricular Connections
• Science: Populations, ecosystems, scientific method
• Math: Representing and interpreting data*
• Reading: Describing connections among ideas*

* Common Core Standards

Key system dynamics concepts and insights
• Nature contains limits (carrying capacity) so that populations do not grow forever.
• Populations may grow or decline to carrying capacity.
• Various factors affect how a population grows.

Student Challenge
Compare animal populations in order to determine which population is most successful over time. Be able to explain why.

Lesson Details
Preparation
1. Create groups of two to three students each.

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As the summer approaches, excitement builds for two important events in system dynamics and systems thinking in K-12 education. The first is our own Creative Learning Exchange conference, the Systems Thinking and Dynamic Modeling Conference, being held at Babson Conference Center, Wellesley MA, June 30 - July 2. Those who have attended this event before know what a wonderful blend of learning and celebration it is. Experienced teachers and system dynamics experts give their time and energy to this conference. Their knowledge and enthusiasm is “dynamic!” The schedule is relaxed enough to encourage networking and learning on a deep level. The conference program is printed on pages 10-13 in this newsletter. There is still time to register. If you haven’t signed up yet, give us a call or visit the website for complete conference information and registration details. Join us to celebrate the 10th biennial ST&DM conference!

The second event almost immediately follows our conference, and will be held in Tucson AZ. This, the second annual Camp Snowball, will be rolling along July 9-13. Join educators and inspiring keynote speakers at this “cool” event. http://campsnowball.org/

For all of you winding up the school year, we wish a peace-filled and revivifying summer. Come back to your students refreshed and relaxed.

Take care,
Lees Stuntz
stuntzln@clexchange.org

Healthy Chickens in Brazil

Linda Booth Sweeney returned to Brazil, sponsored by SEED (http://www.planetseed.com/home), to run workshops integrating three “literacies”: systems, science and self-knowledge for Brazilian educators. This is the second time she has held workshops centered around activities from Healthy Chickens, Healthy Pastures for SEED in Brazil to encourage the use of systems thinking and education for sustainability in Brazilian education.
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2. Copy included handouts for each student or student group. Make multiple copies of the Simulation Record Sheet, based on the number of simulation runs you would like students to complete. The simulation includes settings for five different animals.

3. Check computers to make sure you can access the simulation.

Session 1

1. Discuss the following in preparation for using the simulation:
   a. Introduce any vocabulary as needed, including population, lifespan, area, productive females, animal density, birth rate, death rate, and litter size.
   b. Brainstorm a list of animal populations.
   c. How are animal populations similar and different in terms of their reproductive patterns? While answering the question, ask students to consider average lifespan, litter size, productive females and how these elements interact to help a particular species survive over time. For example, a mouse has many litters and many babies per litter which offsets its short lifespan. An elephant lives a very long time but has very few offspring in comparison to the mouse.
   d. How much space do animals have to live? In the simulation, each of the animals (except the elephant) has 1000 units of land. In reality, different animal populations might have more or less land. For example, a mouse might live on the vacant lot next to a neighborhood or on thousands of acres within a forest.

2. Using the Animal Populations Simulation handout, have students open the simulation, read the introduction, and view the parts of the simulation on the “Introduction” screen (Figure 2).

3. Students can use the Simulation Record Sheet handout to record data as they explore different populations and compare the resulting trends (Figures 3 and 4). Note that students will need five or more copies of the handout page, so they can complete multiple simulation runs, making comparisons for different animals.
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4. Additional Options:
   a. Students can make minor adjustments to the settings for the animals within the simulation, asking questions such as, “What if there were fewer than 1000 animals to begin?” or “What if the animals had more space or less space to live?” By exploring these questions, they can compare additional trends.
   b. Do research on other animals and run the simulation with the new data. Note that not all animals will fit within the confines of the simulation parameters. For example, students would not be able to enter data for an amoeba, since the simulation parameters are not designed to handle the required settings. In addition, if the sliders are pushed to their extremes, the graphs may produce erratic behavior.

5. After they have completed the desired number of simulation runs, students can begin working on the Animal Comparisons handout, representing all the animals on one graph.

Session 2

1. If needed, have students complete the simulation within their small groups.
2. After running the simulation multiple times, students can continue to the “Debrief” and “Next Steps” sections (Figures 5 and 6).
3. Debrief the simulation experience using ideas for bringing the lesson home and assessment. For example, after researching an endangered species, collecting information about what impacts both births and deaths, students can complete Assessment 2 in the handouts. See the next page for an example of a completed map (Figure 7). Note how the students added additional connections (in blue) about their particular animal. They can then “tell the story” of the map, describing the additional elements they included. You might also ask students to include their recommendations for new policies for protecting the species and preventing extinction. The student example shows how a captive breeding program could add to the births.

Bringing the Lesson Home

- Have students explore the “Debrief” section of the simulation within their small group or as a class.
- Consider why the animal population did not grow forever.
- Discuss carrying capacity and how that impacts population growth.
**Assessment Ideas**

Have students use one or more assessments to summarize their learning:

- Assessment 1 to describe the parts of the model and the loops embedded within the simulation.
- Assessment 2 to have students add components to the map to represent an animal they researched.
- Assessment 3 to make connections between the patterns seen in the simulation and other life systems.

![Diagram](image)

*Figure 7: Example of Completed Debrief Map*

*This lesson with accompanying handouts is available to download from the Creative Learning Exchange website, [www.clexchange.org](http://www.clexchange.org). The simulation is also on the website at [http://www.clexchange.org/curriculum/complexsystems/oscillation/Oscillation_PopulationB.asp](http://www.clexchange.org/curriculum/complexsystems/oscillation/Oscillation_PopulationB.asp)*
Using Systems Tools In Music Class
by Andrew Frankhouse, with Alan Ticotsky

At Innovation Academy Charter School (IACS) in Tyngsborough, MA, music teacher Andrew Frankhouse uses systems tools in creative and perhaps unexpected ways. Behavior-over-time graphs (BOTGs) help students analyze and appreciate different pieces of music, and visualize graphically how aspects of compositions develop. Andrew also uses feedback loops to help students understand the business of music.

VISUALIZING MUSIC

Because most of his students lack the formal training in the theory and notation systems necessary to study music structure in depth, Andrew uses a combination of simple analytical processes and software to aid students in analysis.

Andrew provides examples of many genres of music for students to study. In addition to working with selections of popular music, his students analyze and compare works from baroque, classical, and romantic period composers like Bach, Mozart, Beethoven, Berlioz, and Schubert. Every semester, students tell Andrew that they find themselves listening to their favorite popular music with an ear tuned to form and texture. Many students remark about how similar most popular music is, both within and between genres.

Andrew has been guided in his own studies by a broad variety of scholarly work, and he credits his studies with musicologist Dr. Peter J. Evans as a major influence. He acknowledges that care is needed so as not to overdo the emphasis on structure at the expense of other musical elements. Students who are very data driven in their thinking may reach logical but erroneous conclusions about paths of influence in music history, based solely upon similarities in music revealed by graphs. Overall, however, Andrew considers that the benefits of using software to visualize music far outweigh the drawbacks. Most students extend their attention spans and interest in diverse pieces and increase their aesthetic sensitivity.

Students are provided with a template for the first activity, which Andrew calls “Sound Energy Analysis.” As they listen to a piece of music, they assign it a “score” based on different attributes, using a template like the one below. (Figure 1) “Higher energy” attributes (fast, loud, etc.) are given a positive score, while “lower energy” attributes get a negative score. This process can be used to score a whole work or each individual section.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>+2</td>
</tr>
<tr>
<td>Loud</td>
<td>+1</td>
</tr>
<tr>
<td>Bright</td>
<td>+0</td>
</tr>
<tr>
<td>Oblique</td>
<td>-1</td>
</tr>
<tr>
<td>Complex</td>
<td>-2</td>
</tr>
<tr>
<td>Angular</td>
<td>-</td>
</tr>
<tr>
<td>Wide</td>
<td>Consonant</td>
</tr>
<tr>
<td>Dissonant</td>
<td>Simplified</td>
</tr>
</tbody>
</table>

Figure 1: Sound Energy Analysis
They compare their ratings and analyze them as a class. When they become comfortable with the process, Andrew has them score several pieces of music, spanning a broad spectrum of genres. Students put their data on a single histogram so they can compare the music in a graphical context. The resulting diagrams are visually striking and add insight to students’ grasp of how composers and performers use a variety of attributes to create unique compositions.

![Figure 2: Student graph comparing Sound Energy attributes for eight popular songs.](image1)

![Figure 3: Student graph of the Haydn symphony movement pictured above.](image2)

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Using Systems Tools In Music Class

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When Andrew has students listen to longer selections, he uses behavior-over-time graphing to track the changes and development within a single piece. He uses software called “Sonic Visualiser,” which he describes as easy to use and is free to download (www.sonicvisualiser.org). The graphs he uses with students clearly show changes in the music throughout the pieces and make precise, objective comparisons possible. Students study spectrograms like the example in Figure 4 that show divisions and changing forms within a piece of music, clearly contrasting the structure among different parts. Note the contrast in volume level and texture between sections.

Andrew has used graphing software to demonstrate how compressed music files “look” compared to larger formats. With so many people, especially younger listeners, hearing music through small earphones and on speakers built into computers, it’s important to know what compromises in sound quality are being made. An important connection is made for students between music class and physics class, and between art and science.

USING BOTGS WITH THE CHORUS

One day Andrew was listening to a recording of a recent rehearsal with the school chorus. The recording software happened to display the pitch and volume of the sound graphically as it played over time. Inspiration struck. Andrew realized that the singers could get valuable feedback by not only listening to the recording but also from watching the spectrogram.

“See here?” he said, pointing to an area on the screen where the colorful line widened. “They really weren’t too together there.”

At another point, he saw the line of sound thinning as it extended into an area of quiet: “Some of them held on longer at the end.”

Not only would the chorus hear how they sounded before beginning the next practice, but they would see exactly where they needed to improve their coordination.

THE BUSINESS AND HISTORY OF MUSIC

As a professional musician himself, Andrew is familiar with the challenges facing artists trying to make a living from their music. The electronic distribution of music has made piracy an enormous problem, and Andrew explored its detrimental effects with his class. During a class discussion,
students brainstormed ideas about this complex issue using a systems tool called a connection circle (Figure 5).

Figure 5: Connection circle about music sales and piracy

The students traced the causal connections and found a reinforcing feedback loop. Not only was the illegal copying of music unfair to the artists and producers, but students theorized that prices were driven up as well. Follow the loop around to understand their logic (Figure 6).

Figure 6: Reinforcing feedback loop

Piracy decreases music sales, and that weakens the financial strength of the companies. They are forced to raise prices on music they can sell, which tends to increase the incentive for illegal downloading. This reinforcing loop drives down music sales and raises prices while theft increases. For those of us who might not think we’re hurting anyone if we copy music to give to a friend, this feedback loop helps us see that there are victims to our crime.

NEW USES FOR SYSTEMS TOOLS

Andrew is a systemic thinker who is always on the lookout for ways to use new methods to teach about music. He teaches a popular elective course on African-American music. In addition to learning about the aesthetic roots of the music, students trace the struggles for recognition and financial compensation the artists have faced. Students recently completed a study of blues music, where they compared original recordings of Delta blues singers with contemporary interpretations of their songs by artists like Eric Clapton, The White Stripes, and others. Comparing and contrasting musical interpretations results in rich conversations in class and follow-up searches by students working independently.

Currently, Andrew is working on ways to graph the history of African-American music with his class. Once again, interdisciplinary connections are made relevant for students as they study music in context with American history and economics. The confluence of cultural influences, technological advances, economics, and history provides a rich and complex background for high school students to enjoy and learn about one of the

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2012 Systems Thinking and Dynamic Modeling Conference for K-12 Education
June 30—July 2, 2012
The Babson Executive Conference Center, Wellesley, MA

Friday, June 29
7:00-9:00 pm—Registration

Saturday, June 30
8:30-10:00—Registration/Continental Breakfast
10:00-12:00—Welcome and Introductions

Featured Speaker: George Richardson
O’Leary Professor of Public Administration and Policy, and Informatics, SUNY Albany

Creating Critical Thinking in our Students through System Dynamics

1:30-5:00—Workshops to Learn and Explore

A Beginner’s Guide to the Use of ST Tools in the Classroom—Mike Hanson and Brett Thompson, Tahoma Public Schools
Are you excited about integrating systems thinking tools in your classroom or school but unsure where to start? This workshop will help educators who are new to ST/SD see how the tools (Behavior Over Time Graphs, Connections Circles, Stock Flow Diagrams, Causal Loop Diagrams, Iceberg Models, and Mental Models) can be used to help students better understand complex problems. Participants will leave having experienced each of the above tools from a student perspective and with ideas for how to incorporate the tools into their own classrooms. This workshop will be presented from a secondary classroom perspective, but the tools can easily be applied at all levels.

Using the System Dynamics Process to Teach STEM and Common Core Math & Science—Diana Fisher, Portland Public Schools
There is increased emphasis on the value of modeling in the Common Core math and science standards and in STEM to help students surface their mental models so misconceptions can be addressed. System dynamics models help students construct and test hypotheses as active participants in the scientific process. Participants will build models involving resource depletion and predator/predator interactions, among others. This workshop is appropriate for middle and high school math and science teachers. Participants should have a laptop computer for this intermediate level workshop.

Using System Dynamics Principles to Create a Learning Organization in a Classroom—Alan Ticotsky, Innovation Academy, and Rob Quaden, Carlisle Public Schools
This workshop examines both the practical and philosophical aspects that contribute to a dynamic, learner-centered classroom. We will look at teaching and learning from several points of view, including system skills, pedagogy, and content. Participants will engage in hands-on activities that can be used in a variety of classes and grade levels. No previous experience is necessary, and the session is suitable for classroom teachers, administrators, and other educators.
Lions, Tigers, and Bears: Creating Simple Financial and Population Models—Anne LaVigne, Creative Learning Exchange and Waters Foundation, Systems Thinking in Schools

This session is intended for individuals who have some systems thinking background and would like to explore the basics of dynamic modeling software as a way to represent a system. Participants will become familiar with the icons of STELLA® software (stocks, flows, converters, connectors, and graphs) in order to build simple models that demonstrate different patterns of behavior. As time allows, participants will explore changing parameters for additional pre-built models and simulations, including some that are freely available online. Please bring a laptop computer for this session. If you don’t have one, it may be possible to share with another participant.

How School and District Leaders Apply Systems Thinking to 21st Century Educational Systems—Tracy Benson and Kathy Scheppe, Tucson Public Schools.

In this workshop, participants will experience practical applications of systems thinking habits, concepts and tools as applied to:

- the development of healthy school and district culture and climate
- planning and decision-making for desired outcomes
- professional development time for staff
- opportunities for student leadership development and student support and interventions
- parent and community involvement.


In creating STELLA, Barry Richmond strove to make system dynamics modeling accessible to a broad audience. In his subsequent work with K-12 educators, Barry used his unique talents and insights to explain where and how systems thinking (and dynamic modeling) tools offered a unique language and structure for facilitating a set of higher-level critical thinking skills (including dynamic, closed-loop, and non-linear thinking). Participants in this session will revisit Barry’s ideas as they continue to guide best practice and inspire among K-12 educators a vision that Barry coined “Systems Citizenship.”

7:30—After-dinner Reception

Chat with system dynamics pioneers, including George Richardson, Peter Senge, and Dennis Meadows, while enjoying posters showcasing students’ learning in systems thinking and system dynamics as well as teachers’ work in integrating ST/SD into curriculum nationally and internationally.

Sunday, July 1
9:00-10:30—Specific Curriculum Demonstrations and Special Topic Discussions

Hands-on with STELLA Version 10—isee systems

During this workshop you will build a system dynamics model using STELLA version 10. The workshop is intended for both new and experienced STELLA users. Come join us for some hands-on experience and see how version 10 features make it even easier to build models for your classroom. Please bring a laptop computer.

Creating Curricula Using Systems Thinking and System Dynamics—Innovation Academy

Innovation Academy Charter School (IACS) is a public charter school serving students in grades 5-12. IACS has used systems thinking and system dynamics as a guiding principle since the school’s inception in the 1990s. During this session, faculty members will demonstrate applications of systems activities and principles they have developed, adapted, and integrated for use in their classrooms. Examples to be shared represent systems tools in music, language arts, math, and social studies curriculum, with conversations extending to whole school implications. This interactive workshop will be of interest to educators from upper elementary grades through high school, and is suitable for people of all experience levels.

Embracing Systems Thinking in the Primary Years—Liane Bouffard, Anna Geras, Maria Simpson, and Nicole Wooten, Winston-Salem School District, NC

Kindergarten students cannot do systems thinking? Systems thinking is only for older students? This session will debunk that myth. Four elementary teachers will share their successes and lessons learned introducing systems thinking in their primary years classrooms. Participants will receive practical examples of how to use the systems thinking tools with primary students. Participants will also receive a list of skills, texts, and content knowledge that lend themselves to particular systems thinking tools. The session will also cover how systems thinking tools can be used in classroom management and building student efficacy.

Financial Literacy: Dollars and Sense II—Jeff Potash, Center for Interdisciplinary Excellence in System Dynamics

This session offers a pre-publication exploration of the CLE’s upcoming second book on personal finance issues—Dollars and Sense: Our Interest in Interest. Participants will explore simulations and accompanying materials designed to offer students open-ended and hands-on opportunities to explore how interest-bearing savings accounts, credit cards, and installment loans (e.g., car, mortgage, personal) work, and, more importantly, how to successfully manage them to achieve personal financial goals.

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Five Important Feedback Loops from \textit{Limits to Growth}—Dennis Meadows, author, \textit{Limits to Growth} and \textit{The Systems Thinking Playbook}

2012 is the 40th anniversary of the first presentation of World3, the model adapted from Jay Forrester’s pioneering work for use in the book \textit{Limits to Growth}. Dennis will summarize the main conclusions from that study and describe five feedback loops that are important in producing those results.


How do school leaders facilitate and involve students, staff, parents, and community stakeholders in a systems approach that helps create a sustainable 21st century learning environment? Join us as we explore a three-to-five-year process that includes creating a shared vision based on the challenges facing students, designing collaborative action plans with stakeholders, using data to make informed decisions, developing leadership skills throughout the schools and community, and improving communication to build a sustainable 21st century learning environment.


Bill McDiarmid, former Boeing Professor of Education at the University of Washington, and now Dean of the School of Education at the University of North Carolina at Chapel Hill, says research shows that teachers self-select into elementary education because of their fear of math. Systems thinking and dynamic modeling offer a way for students in middle and high school to regain their interest in math and to come to understand and value the scientific method, and for elementary school teachers to overcome their fear of math and to ensure their students enjoy becoming mathematical and scientific thinkers. This session will illustrate how systems thinking and dynamic modeling can achieve these goals via its application to subject areas other than math and science, and thereby increase the number of students interested in STEM.

2:00-3:30—Specific Curriculum Demonstrations and Special Topic Discussions

Exceptional Thinking for Exceptional Learners—Karen Abbott, Winston-Salem School District

Crossing grade levels and ability levels, systems thinking is a great way to elicit thoughtful responses from students with special learning needs. This session will focus ways to successfully integrate systems thinking into an elementary resource room setting. The presenter will share strategies for using systems thinking to not only scaffold student thinking, but also manage student behavior and build student efficacy.

Evolving from a Test-Based to a Curriculum-Based Approach in Evaluating a Systems Thinking Curriculum—Zahra Jalili, Asemaan Group, a ST organization in Iran

In bringing systems thinking to Iranian schools, our main goal in the evaluation process is to find reliable and valid evidence to evaluate our success or failure in fostering ST skills. In our first evaluation approach (Test-Based Approach), we focused on the output of our education process through measuring the change in students’ ST skills by designing pre- and post- tests. However, due to the accumulation (stock) nature of proficiency and the delay, we decided to shift our focus from measuring the ST skills—the output of our education process—to observing the whole educational process and looking for valid evidence through the process, which helps us evaluate the whole curriculum. In our second approach (Curriculum-Based Approach), we set new evaluation goals and tools to observe the whole curriculum.


Children learn best when they are curious, interested and \textit{interacting with people and things around them}. Jean Piaget, John Dewey, Paulo Freire, Maria Montessori and Seymour Papert all emphasized this \textit{constructivist} or \textit{learn-while doing approach}. In this workshop, we’ll use several systems playkits to explore how games can give “players” (both students and teachers) a hands-on opportunity to:

- “Connect the dots” and see systems, rather than fragments, as the context for decision-making, communication and learning
- Explore hidden connections and unintended consequences
- Learn to make systems visible
- Discover patterns of behavior that repeat themselves in entirely different settings. (I call this “homologous reasoning.”)
- Try out and develop language that will enable players to ask better, more systemic questions
- See the influence they have on natural systems and their role in igniting change at the local level.

11:00-12:30

Panel: Embedding SD/ST into Schools and School Districts

Moderator: Greg Orpen, Innovation Academy Charter School. Panelists: Tracy Benson, Waters Foundation; Bud Harrelson, Winston-Salem Public Schools; Kathy Scheppe, Tucson Public Schools

This session will begin with an overview of the intersecting systems thinking and dynamic modeling (ST&DM) related initiatives of the K-12 education, university education, non-profit, citizen advocacy, and industry sectors in Washington, and will hypothesize their effects on the adoption of ST&DM in K-12 education in the State. Participants will informally share stories of similar or other initiatives in their geographies. We will then think together about commonalities and differences in our experiences and begin to develop stock-flow or causal loop diagrams that represent our hypotheses about why our various initiatives have either failed or succeeded in achieving their intended results.

From Kindergarten through High School and into the Great Beyond: “Playing” with Complex, Dynamic Systems Online —Jennifer Andersen, Creative Learning Exchange, and Anne LaVigne, Creative Learning Exchange and Waters Foundation, Systems Thinking in Schools

What do springs, playground relationships, and populations have in common? They all oscillate over time! These ups and downs across multiple contexts form the basis for this series of free, easy-to-use, online simulations and lessons. Initiated by Jay Forrester and developed through the Creative Learning Exchange, each simulation in this first series of simulations explores one of Forrester’s key characteristics of complex systems—“the cause of the problem is within the system.” Having students experience these lessons can create conversation about how system structures generate behaviors and help them make connections to other similar systems within their lives. Please bring a computer to experience the models firsthand.

Next Generation Science Standards (NGSS), Common Core State Standards (CCSS) and Systems Thinking/Dynamic Modeling (STDM) - Overlapping Tools for Deeper Learning—Larry Weathers, Arlington MA Public Schools

As the Common Core State Standards in ELA and Math begin to solidify, the NGSS is weighing in to complete the tripod of foundational standards to guide deeper learning. The NGSS include a set of expected Cross Cutting Concepts which make STDM a perfect fit for not only implementing the new standards, but also creating deeper learning. This session will explore what the Cross Cutting Concepts are, how they mirror systems approaches to education, and what activities utilizing these Cross Cutting Concepts might look like in classrooms and schools.

4:00-5:30  
Featured Speaker: Dennis Meadows
author, Limits to Growth and The Systems Thinking Playbook

Sustainability Games

Dennis Meadows will conduct a set of games selected from The Systems Thinking Playbook, which he co-authored with Linda Booth Sweeney. He will briefly introduce and debrief each exercise to relate its principal lesson to the issue of sustainability. As we go through the games, he will delineate the principles of introducing, conducting, and debriefing games to a classroom.

7:30—Celebrate the 10-year anniversary of Barry Richmond’s keynote speech at the 2002 ST/DM conference.

Video and discussion with educators who were influenced by Barry’s vision.

Monday, July 2
8:30-12:00

Featured Speaker and Facilitator: Peter Senge
author, The Fifth Discipline and Schools That Learn

Now What? How Do We Implement the Common Core Standards and the STEM Process Using Systems Thinking and System Dynamics in our Educational System?

ST&DM Conference June 30 - July 2

It’s not too late to register for the conference or apply for a scholarship. The registration fee of $560.00 includes the conference, 6 meals—lunch and dinner on Saturday, breakfast, lunch, and dinner on Sunday, breakfast on Monday—and a continuous break buffet.

There are three ways to register for the conference:

• Register online with credit card payment.
• Fax your completed registration form with a purchase order to 978-635-3737.
• Mail the completed form with payment or purchase order to us at the CLE.

For more information, email Andi Miller.
Using Systems Tools In Music Class

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greatest musical traditions in the world.

Using systems tools in classrooms has many advantages. Watching Andrew Frankhouse teach music provides a wonderful example of true interdisciplinary learning. It might seem difficult and unlikely for high school teachers to extend their curriculum outside the highly specialized skills they need to teach. But given a teacher with a systemic viewpoint and broad intellectual curiosity, students can use tools like BOTGs and feedback loops to help them understand complex ideas.

This article is available to download from the Creative Learning Exchange website www.clexchange.org.

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