The CREATIVE LEARNING Exchange
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Thinking about Drinking

What are the Effects of Drinking Alcohol?

Jeff Potash

Instruction Guide For Teachers

Introduction

The purpose of this simulation is to increase awareness of the potential effects of alcohol on the body over a 12-hour period. Because drinking alcohol affects a number of behaviors that can put one at risk, it is important to understand the implications of consuming alcohol. The simulation provides students and adults an opportunity to "see" what happens over time after the consumption of alcohol. This "system" involves three stages or flows. Each stage involves different periods of time, which are influenced by a number of personal characteristics.

This simulation is designed neither to encourage drinking, nor to give exact data to accurately predict individual results.

An underlying system dynamics model tracks the different rates of time at which alcohol is consumed, absorbed, and excreted. Based on the nature of a drinking episode (# of drinks per hour, over # of hours) AND a number of individual characteristics, levels of Blood Alcohol Concentration (BAC %) will vary widely. Using tables, graphs, and visuals, the simulation shows changing levels of BAC during a single drinking episode. This output may surprise students both for the length of time that BAC levels can remain high, long after drinking, and the accompanying forms of physical and mental impairments. Students are encouraged to use this simulation to explore how different patterns of drinking involving people with different physical characteristics affects BAC levels up to 12 hours following consumption.

Men's BAC Estimates

	WEIGHT								
Drinks	100	120	140	160	180	200	220	240	
0	.00	.00	.00	.00	.00	.00	.00	.00	Only Safe Driving Limit
1	.04	.03	.03	.02	.02	.02	.02	.02	
2	.08	.06	.05	.05	.04	.04	.03	.03	
3	.11	.09	.08	.07	.06	.06	.05	.05	Driving Skills Impared
4	.15	.12	.11	.09	.08	.08	.07	.06	
5	.19	.16	.13	.12	.11	.09	.09	.08	
6	.23	.19	.16	.14	.13	.11	.10	.09	
7	.26	.22	.19	.16	.15	.13	.12	.11	
8	.30	.25	.21	.19	.17	.15	.14	.13	Legally Intoxicated
9	.34	.28	.24	.21	.19	.17	.15	.14	
10	.38	.31	.27	.23	.21	.19	.17	.16	Possible Death

How the Simulation Works

http://www.clexchange.org/curriculum/simulations/alcohol_simulation.asp

THIS ISSUE AT A GLANCE

Thinking about Drinking continued on page 2

EDITORIAL

As we hunker down for the cold New England winter, the Creative Learning Exchange is a beehive of activity.

You will note from the first page article that we amalgamated the many alcohol models that have been circulating into one user-friendly simulation. We hope that you will use it and encourage the Health teachers in your school to use it as well. It is a wonderful example of the "Trojan Horse" curriculum that uses system dynamics to teach feedback and delays in a complex system, using a topic every parent and teacher wants teens to know about.

We are also gearing up for the summer 2014 Systems Thinking and Dynamic Modeling Conference. This year we are offering a new twist—an introductory workshop in conjunction with the conference, starting the day before (Friday, June 27). This, our 11th biennial Systems Thinking and Dynamic Modeling Conference, will be held June 28-30, 2014, at the Babson Executive Conference Center in Wellesley, Massachusetts.

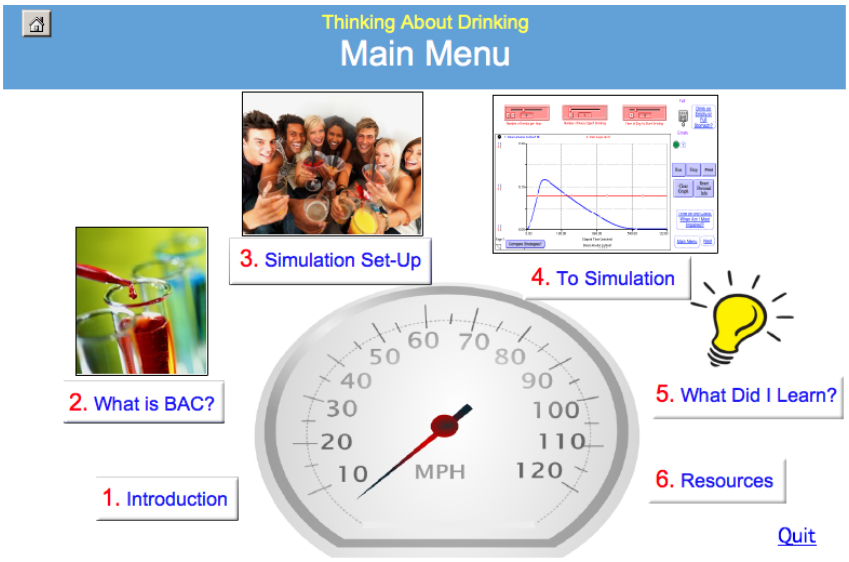
I hope your winter solstice celebration, be it Christmas or another holiday, is a time of peace and joy. Don't forget to join us on Facebook to keep in touch!

Take care,
Lees
(stuntzln@clexchange.org)

Thinking about Drinking

continued from page 1

The Main Menu guides users through a powerful sequenced learning process:

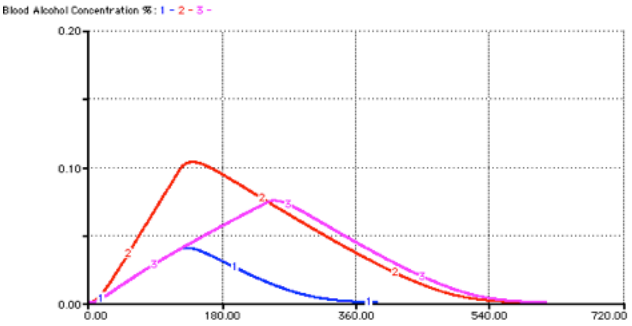


1. The **Introduction** provides an overview of the impact of varying levels of alcohol in the body on a variety of mental and physical behaviors.
2. Next, **What is BAC?** introduces two approaches for calculating Blood Alcohol Concentration: a mathematical equation and a "systems" look at the model that drives the simulation.
3. The **Simulation Set-Up** incorporates a set of relevant personal characteristics (gender, height, and weight) that contribute to considerable variations in individual BAC, given the same amount of alcohol consumed.
4. Progressing **To Simulation**, students input information about a particular drinking episode, involving numbers of drinks per hour and hours spent drinking [NOTE: The American standard definition of a "drink" is one 12 oz. beer (4.5% alcohol), or 1.25% oz. of 80 proof (40% alcohol) liquor, or a 5 oz. glass of wine (12% alcohol).] Students may then compare episodes using Graphs or Tables that track changing BAC over a 12-hour period. In addition to translating BAC numbers into types of mental or physical impairment, the simulation also focuses on driving while impaired, including reaction times for braking and overall increased probabilities of getting into a deadly accident.
5. Finally, **What Did I Learn?** offers debriefing materials that identify and ideally reinforce discoveries made while asking multiple "What if's," and **Resources** suggests places where additional information can be found.

Suggestions for Maximizing Student Learning

While the simulation supports independent learner-directed learning (users explore "what if's" of their own choosing), particular insights may best be fostered through teacher facilitation:

(1) If students focus on the experiences of a single individual, they should be encouraged to change numbers of drinks and also the amount of time over which the same amount of alcohol is consumed. **Comparative runs** (using the second page of the graph, accessed by clicking on the dog-ear in the bottom right of the graph) inform the non-linear manner in which BAC increases, based both on different numbers of drinks (lines 1 and 2) and also with the same amount consumed over different time periods (lines 2 and 3).



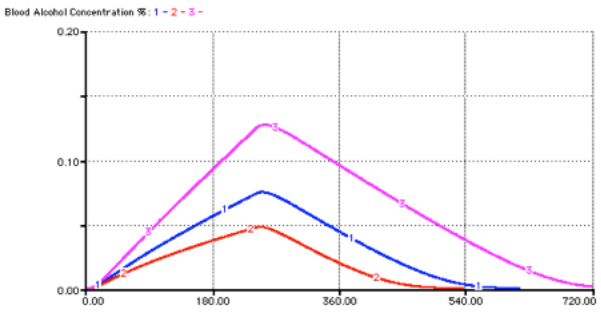
In the illustration above, a 5'7" 150-pound male consumes:

Line 1: 1 drink/hour for 2 hours

Line 2: 2 drinks/hour for 2 hours

Line 3: 1 drink/hour for 4 hours

(2) Encourage students to compare different individuals who consume the same amount of alcohol. Use the personal characteristics of the three "Friends" identified on the **Simulation Set-Up** page and the last episode described earlier (1 drink per hour, each hour for 4 hours).



In the second graph, three Friends are:

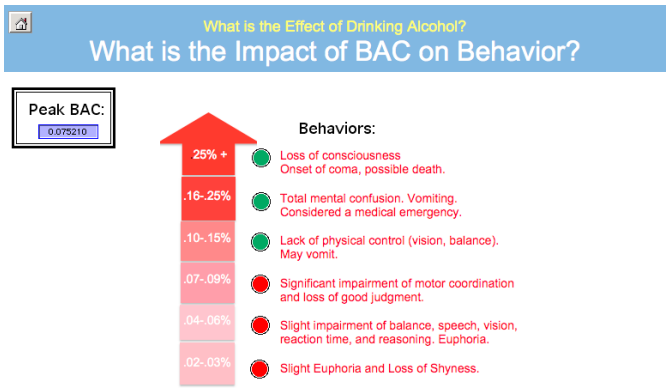
Line 1: Male, 5'7", 150 pounds

Line 2: Male, 6'0", 225 pounds

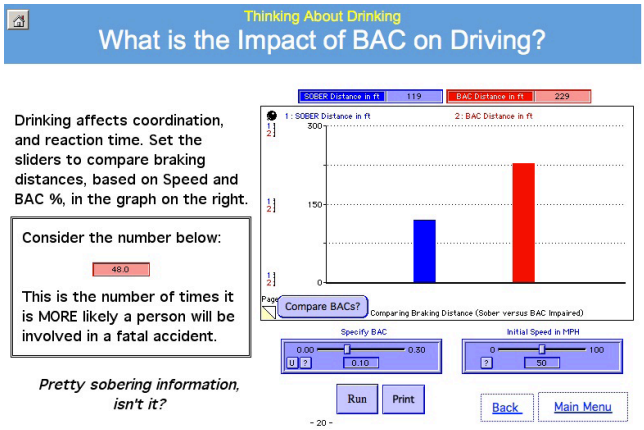
Line 3: Female, 5'0", 100 pounds

(3) Reference the additional output pages to facilitate additional conversation on potential risks associated with alcohol consumption:

- **What is the Impact of BAC on Behavior?** links a drinking episode's **Peak BAC** to specific physical and mental behavioral reactions.



- **What is the Impact of BAC on Driving?** translates **Peak BAC** into delayed reaction times and braking distances while driving in a car, as well as increased possibilities for being in a fatal accident.



To help teachers maximize student learning using this simulation, we highly recommend using the debriefing materials incorporated in the simulation. In addition, the handout helps guide student exploration and assess the value of their experiences.

Thinking about Drinking *continued on page 4*

NAME _____ **HANDOUT**

Simulation: Thinking about Drinking

What are the Effects of Drinking Alcohol?

http://www.clexchange.org/curriculum/simulations/alcohol_simulation.asp

1. Open the simulation, then read the **Introduction** and **What is BAC?** sections. List and briefly describe at least five factors that influence Blood Alcohol Concentration % over time and why.

2. In **Simulation Set-up**, describe the personal characteristics of a person (Individual #1) who will be drinking. (The simulation defaults to a 5'7" male weighing 150 pounds.)

   Male (0) or Female (1): _____
   Weight in pounds: _____
   Height in inches: _____

3. Next, go **To Simulation** page. Run using the default condition (1 drink per hour, 1 hour spent drinking, empty stomach, start drinking at 3 p.m.). Use **Impact of BAC on Behavior** and **BAC and Time of Day** pages to record information for the last three columns. Repeat runs for the same individual under different conditions and record.

   Individual #1: "Impact of BAC on Behavior" "BAC and Time of Day"

# Drinks per Hour	# Hours Spent Drinking	Stomach Empty/Full	Peak BAC %	Describe Behavior Impairment	Time (hours) BAC > .08%
1	1	Empty			

4. Click on the **BAC Impact on Driving** button and use your three highest **Peak BAC %** numbers to identify if or how drinking impacts driving. Describe results below.

5. Describe on another page a surprise or unexpected result you noted from any one or more of the simulations. Then, on reflection, explain the cause(s) underlying the result. NOTE: You may choose to print either Graph Page 1 or Graph Page 2 (showing comparative runs) to help with your explanation.

6. What difference do personal characteristics make? Using either the personal characteristics specified for "Friend 2" and "Friend 3" (on **Simulation Set-Up** page) OR two other individuals of your own choosing, run the same scenarios you ran before and record the results below.

Individual #2 M/F____ Weight (pounds)____ Height (inches) _____

# Drinks per Hour	# Hours Spent Drinking	Stomach Empty/Full	Peak BAC %	Describe Behavior Impairment	Time (hours) BAC > .08%
1	1	Empty			

Individual #3 M/F____ Weight (pounds)____ Height (inches) _____

# Drinks per Hour	# Hours Spent Drinking	Stomach Empty/Full	Peak BAC %	Describe Behavior Impairment	Time (hours) BAC > .08%
1	1	Empty			

7. Use the information for your three individuals to describe on another page how personal characteristics can influence the effects of drinking alcohol under different conditions.

8. What aspect of this simulation would you describe to a friend as most important to understand when potentially making future choices about drinking?

SYSTEMS TOOLS IN HIGH SCHOOL

Interdisciplinary Learning in a Science Classroom

Alan Ticotsky

Teaching Across the Curriculum

Chris DiCarlo teaches high school classes in several different disciplines at Innovation Academy Charter School (IACS). While technically in the science and math departments, he has taught physics, pre-calculus, robotics, environmental systems, financial literacy... and that's just in the past two years! The threads that tie together all of Chris's classes are a tightly woven combination of his own dynamic teaching style and the learning environment at IACS.

Chris worked with IACS high school principal, Greg Orpen, to design a one-semester elective systems course for fall 2012. Environmental Systems and Computer Modeling was designed to provide students with an overview of the Earth's physical systems and how human activity affects those systems. Juniors and Seniors were eligible to enroll.

Course description

This class will examine three environmental systems: land, air, and sea. For each of these topics, we will use systems thinking tools such as causal loop diagrams, behavior-over-time graphs, and computer modeling to get a better understanding of how the system works. We will seek to identify key components that have a strong influence over the behavior of the system, and work to find ways that we can make each of these systems more sustainable.

Background: Four Outcomes and Systems Thinking

A regular reader of this newsletter may recall previous articles about the work other teachers are doing at IACS. To summarize very briefly, students in this 5-12 Massachusetts public school learn in a project-based curriculum that seeks to build responsible citizens, as well as academically proficient students. They are encouraged to grow in four specific outcomes:

- Self-direction
- Problem solving
- Effective communication
- Community membership.

Teachers like Chris structure their classrooms to help support these outcomes. Students frequently work in teams, combining individual mastery with the power of collaboration, and then reporting and sharing with the class about the results of their work.

Another element for effective learning is built into this unique school. The IACS Charter states that systems thinking and system dynamics "will provide a conceptual framework and guiding force in the development of curriculum." Students are expected to gain competence with systems tools and be able to apply them to help understand complex issues and ideas.

Studying Environmental Systems: One Classroom, Several Disciplines, Big Ideas

The class syllabus divides Earth's systems into three interrelated domains: land, air, and sea. Chris wanted students to use tools he had found useful while teaching previous courses:

- Behavior-over-time graphs
- Connection circles and feedback loops
- Stock and flow maps and STELLA computer models.

Students analyzed data, beginning with examples Chris chose and compiled. Later in the course, they did research on their own or in teams. Among the topics studied:

- Land
  - The Lorax
  - Easter Island
- Air
  - Carbon cycle
  - Global climate change
- Sea
  - Fish populations in Lake Victoria
  - Fishbanks simulation.

In order to use the tools accurately, students needed skills traditionally considered parts of several academic disciplines:

- History - How did we get to this point?
- Politics - Why have specific decisions been made?
- Math - What is the quantitative description and how can we model it?
- Science - How do these natural processes operate, and how has human activity affected them?
- English/Language Arts - What is the author saying in this article?
- Anthropology - Why did that society suffer a negative outcome?

Learning through Using System Dynamics

Students used STELLA software to build working models while studying historical and current conditions. Constructing models gave them an opportunity to think operationally and to test a variety of variables. Greg had

explained that an advantage of building and using models is the extended time students spend thinking about problems. They are engaged longer, as they construct their models and then test and expand them.

After some introductory instruction, Chris trusted students to figure out how to use the software and get their models running. Students used a model about Easter Island after learning the history of the civilization. That helped them grasp how the stocks and flows fit together, and how the equations replicated the decline of the society. The structure of the classroom made teamwork and collaboration a natural feature of model building; students sat around tables in groups and talked freely while at their computers.

Chris made several observations about events that occurred in the class because students used systems tools.

1. **Educating all students.** Students who didn't have strong academic research skills were motivated to obtain data for their models. Everyone benefitted from the rigor needed to build computer models, but it was most evident among "non-traditional" learners, that is, those without the strongest academic skills.

2. **Relevance and meaning.** Early in the course, students investigated the structure of the spread of rumors and its similarity to the spread of disease. Local and regional issues were real topics of study, providing meaningful applications for investigation and modeling. Students did projects researching areas of their choice.

   One student created a model of deer population, calibrated it with historical population data, and then used the model to test various hunting regulations in an effort to find a policy that would be sustainable in the long term. Another student researched historical data for Bald Eagle populations and use of DDT. Using behavior-over-time graphs, he was able to show the correlation between these two quantities.

   Chris focused on current events, which motivated students to find news about local topics, such as the depletion of Massachusetts fishing stocks and controversial policies designed to help them recover.

3. **Engagement.** Greg and Chris observed that modeling gave the students space to explore and test individual ideas, thereby increasing engagement. STELLA gave students a way to play around with ideas, rather than stopping after their models were built. The goal isn't simply to arrive at a correct solution, but to push one's thinking and explore further.

Student Feedback from Written Evaluations

When Chris asked students to reflect on the class, their responses were predominantly positive.

"This class …helped me further develop my understanding of systems …

"…by making the step from a connection circle to a working STELLA model, every step seems more relevant."

"This unit helped to teach me quite a bit about sustainability and …gave me more hope for the world."

"This course opened up my mind to what is really going on in the world. … I loved the course and it made me want to help solve [global warming] more in the future."

"I thought this class was a really cool class to take. I was really proud of all the work I did … and I liked telling my friends from other schools and even my college friends … and they were really impressed."

"I believe this course helped me to see 'systems thinking' in everyday life."

"By far the most helpful part was noticing the connections between everything and how changing just one small thing can have a tremendous impact on the world."

Looking Forward

As Chris plans for offering Environmental Systems and Computer Modeling in 2013-14, he wants to add more modeling opportunities for students.

"I would like to give students a basic toolbox of the types of overall behaviors that they will see so they can correlate basic model structures to the behaviors that they produce."

Students have been willing to jump right in and build models. More practice on simpler, generic models first may smooth the way later when they build complex models, such as the carbon cycle and regional fishing stocks. Chris has been influenced by Diana Fisher's book, *Modeling Dynamic Systems*[1], where she writes about model structures in Chapter 3. He expects to use some of Diana's lessons with next year's class.

It's a powerful formula for learning: a dedicated teacher facilitating students' work on interesting, complex problems in an interdisciplinary team structure using systems tools.

Systems Tools *continued on page 10*

Are You Interested in Contributing to the Conference?

Proposals for Presentations due February 1, 2014

The following types of sessions will be offered at the 2014 ST/DM conference:

- Workshops (Beginner to Advanced) for learning in depth about systems thinking and system dynamics and their use in K-12 education; skills and conceptual building sessions encouraged (3 hours)
- Sessions to share stories, curricula, teaching techniques, and lessons learned, with a special emphasis on the use of ST/SD tools to integrate classrooms and schools (90 minutes)
- Simulations of all types, games, on-line simulations to stimulate learning and critical thinking (90 minutes).

Potential Topics

- Systems Thinking and System Dynamics as a vehicle for collaboration, questioning, and the integration of educational initiatives, including Common Core and STEM
- Training sessions for all levels from neophyte to experienced practitioners, as well as how to train
- Educational technologies and simulations that contribute to learner-centered learning of systems thinking and system dynamics
- Tools for the integration of understanding and communicating in the classroom and in school administration
- Successive improvement—how have we done it? What are the markers of our failures and triumphs?
- Case studies—where has ST/SD made a difference, both in education and in the world?
- People enter systems education through various doors. How do we create paths from those doors? What paths have worked or have not worked?
- Learner-centered learning in K-12 and ST/SD
- Other relevant possibilities

How to Submit a Proposal

The proposal should include all presenters' names, emails and addresses. A paragraph about the session should include:

- a description of the session
- the context and history behind the session
- the experience level of the participants for whom it is geared.

A more complete outline or paper is expected by June 2, 2014.

Submission Deadlines

February 1, 2014

Submit an abstract to Lees Stuntz via e-mail (stuntzln@clexchange.org) that includes the context and history of the session topic and the experience level of expected participants.

February 25, 2014

All authors will be notified of the status of their submission via e-mail.

June 2, 2014

A final outline, presentation, or paper due via e-mail for incorporation into the conference CD.

INTRODUCTORY TRAINING IN SYSTEMS THINKING

Get a jump-start on learning about systems thinking and dynamic modeling! Attend a workshop the day before the conference and participate in tailor-made sessions woven throughout the conference to increase your knowledge and help you benefit from the offerings of the conference. Work with systems mentors having decades of experience for 11 hours of introductory content, and use their guidance in integrating the stimulating material and discussion presented throughout.

The introductory workshop will be held at Babson Executive Conference Center on **June 27th**, the day before the conference. The $110 fee for this training will include 8 hours on Friday (9 AM — 5 PM), breaks and lunch on Friday, a 3-hour workshop session on Saturday afternoon, and mentorship time scheduled during the conference.

REGISTER NOW!

CreativeLearning Exchange.org

June 28-30, 2014
Babson Executive Conference Center
Wellesley
Massachusetts

Systems Thinking & Dynamic Modeling Conference for K-12 Education

INTEGRATING LEARNING ENVIRONMENTS

● June 28 – June 30, 2014 ● Babson Executive Conference Center ● Wellesley, Massachusetts

The Systems Thinking and Dynamic Modeling Conference for K-12 education will provide resources and opportunity for educators and interested citizens to explore what is current and possible in K-12 systems education.

With Common Core being implemented and education evolving, we all look for effective methods to improve learning. The variety of tools available today can lead to disjointed instruction. However, with an effective approach to integrating all aspects of the learning environment, students learn and teachers succeed. System dynamics and systems thinking provide such strategies. System dynamics is a methodology to explore complexity, interconnectedness and change over time.

FEATURED SPEAKERS

Peter Senge
George Richardson
Linda Booth Sweeney
and others.

- **WORKSHOPS WITH HANDS-ON LEARNING**
- **INFORMATIVE PLENARY PRESENTATIONS**
- **DISCUSSION ROUNDTABLES**
- **AMPLE OPPORTUNITIES FOR LESS FORMAL NETWORKING**

The conference will run from registration, which starts at 10:00 AM Saturday morning, June 28, to noon on Monday, June 30th. The conference will be held at Babson Executive Conference Center, located on Babson College's campus in Wellesley, Massachusetts, 20 minutes from Boston and Logan International Airport. With rolling hills and landscaped grounds, the seclusion and serenity of the setting will ensure that the focus of the conference is on learning, engaging, and sharing.

NEW!! INTRODUCTORY TRAINING IN SYSTEMS THINKING

A new, introductory workshop will be held at Babson Executive Conference Center on **June 27th**, the day before the conference. This training workshop will include 8 hours on Friday (9 AM — 5 PM), breaks and lunch on Friday, a 3-hour workshop session on Saturday afternoon, and mentorship time scheduled during the conference, tailor-made to increase your knowledge and help you integrate the offerings of the conference. Work with systems mentors with decades of experience in 11 hours of introductory content and utilize their guidance in integrating the stimulating material and discussion presented throughout. The workshop is offered for an additional fee of $110.00. This does not include lodging on Friday night.

REGISTRATION

Please register online at CreativeLearningExchange.org or by mailing the registration form.

LODGING

The conference registration does not include a room reservation. Babson Conference Center hotel rooms with one or two queen beds cost $144/single or double occupancy, per night, during the conference dates of June 28-29. Rooms at the Conference Center before or after those dates cost $168/single occupancy or $194 double occupancy, per night, including breakfast. All room rates are subject to a 9.7% Massachusetts room tax. Reserve early to be assured of room availability. To reserve a room at the Babson Conference Center, please call or email Mr. Silvano Senn, 781-239-5816 or silvano.senn@babson.edu. Mention the CLE conference for group rates.

MORE INFORMATION

Bunny Lawton, Creative Learning Exchange, lawtons@clexchange.org, 978-635-9797

Systems Tools in High School

continued from page 7

During the next class cycle, we'll post the syllabus on the CLE website. Some educators have expressed doubt about whether high school classes can be presented as interdisciplinary courses. "High school curriculum is too specialized, too departmentalized," says the pessimistic critic. But teachers like Chris DiCarlo are developing a systemic approach within their individual classrooms, and supporting student learning with systems thinking.

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1. Diana M. Fisher, Modeling Dynamic Systems: Lessons for a First Course. STELLA Software Teacher's Guide, isee systems, Lebanon, NH, 2005.

Newsletter Subscription Information

The Creative Learning Exchange newsletter is available in three different formats:

- On the web site at www.clexchange.org
- As an attachment to an E-mail
- In paper format via US mail ($15.00 outside the USA)

Since we vastly prefer electronic distribution to paper because it is so much less expensive, please E-mail us at any time when you would like to have an electronic subscription.

info@clexchange.org

Interested In Investing?

If you would like to invest in our effort here at *The Creative Learning Exchange*, your contribution would be appreciated. You may donate any amount you wish; perhaps $50.00 is a reasonable amount for a year. All contributions are tax-deductible.

Enclosed is _____ to ***The Creative Learning Exchange*** to help invest in the future of K-12 systems education.

Name_____

Address_____

_____

E-mail_____

THANK YOU!
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