the Creative Learning EXCHANGE

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DynamiQUEST 2007

by Vicky Schubert

DynamiQUEST 2007 was held May 11, at Worcester Polytechnic Institute (WPI) in Worcester, Massachusetts.

Whether looking at the forces at play in the spread of diseases such as the Avian Flu, or using sophisticated technology to model the causes of "stinkiness" in a campus pond in Nanjing, China, the high-school students participating in this year's DynamiQUEST event at Worcester Polytechnic Institute were not simply completing a school assignment. A key component of their work was to understand how the results of their investigation might be shared with policy makers or engineers to improve outcomes in a larger context.

Ranging in age from 13 to 18, the students variously giggled, discussed, and pondered their way through the daylong event, which included poster presentations, systems-based games, and a facilitated interactive problem-solving session.

Now in its seventh year, DynamiQUEST is a celebration of student work in system dynamics and systems thinking, sponsored by the Creative Learning Exchange (CLE) and hosted by the Department of Social Sciences and Policy Studies at WPI. Faculty members from the participating schools and from WPI and CLE served as coaches, gently questioning and prodding the student presenters to explain their thinking and consider the implications of their findings.

This year's participants came from a charter school, the Murdoch Middle School in Chelmsford, Massachusetts, and a private school, the Vermont Commons School in South Burlington, Vermont, that have made systems thinking an essential element of their curriculum, and from Nanjing Jinling High School and the Affiliated High School of Nanjing Normal University in Nanjing, China. The latter have established a learning partnership with the Vermont Commons School over the past two years.

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THIS ISSUE AT A GLANCE

Diana Fisher Awarded Barry Richmond Scholarship

Diana Fisher has been selected as the 2007 recipient of the Barry Richmond Scholarship from Pegasus Communications. An award-winning teacher at Wilson High School in Portland, Oregon, Diana is the author of numerous resources on system dynamics modeling in the classroom. In an interview with *Leverage Points* editor Vicky Schubert at the ISDS conference in August 2007, she reflected on Barry's influence and on the pressing need for more systems thinking in our schools.

LP: How did you come to know Barry Richmond?

DF: I have a very soft place in my heart for Barry Richmond because he was so critical to my early development. When I first discovered system dynamics and these modeling tools in 1990, I was the only teacher in my area who was trying it. I attended a workshop at Stanford in order to get some training so that I could use these methods with my students, and Barry was there, providing modeling support. He was such an open person; he gave me all kinds of ideas about other resources for continuing my study. And not long after that, I got a National Science

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EDITORIAL

As all of us in education know, this is the real New Year, a time of excitement and renewal, of anticipation, of new faces and new colleagues. That is one reason why I have always loved the fall. Here in New England, not only are the nights cool (finally) and the leaves beautiful, but our activity takes on new shades of meaning and moves to a new level.

As we gear up for our "New Year," we are anticipating our biennial conference, to be held at the lovely Babson College conference center, June 28-30, 2008. At this point, we are gathering ideas to meet the needs of those who will attend. I would love to hear your thoughts and what you would like to come away from the conference having learned. As always, e-mail is a good way to communicate.

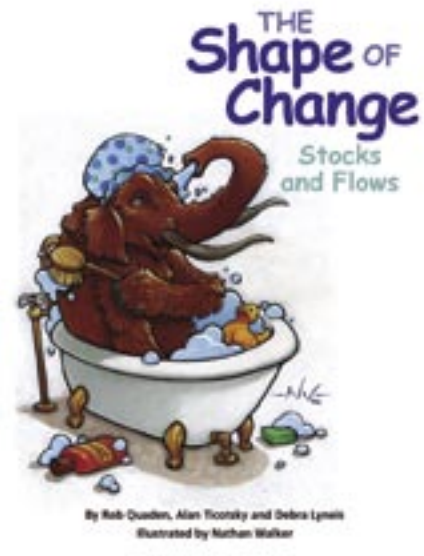
This issue of *The Exchange* looks both forwad and back. We have incorporated some articles from *Leverage Points*, the Pegasus Communications e-newsletter. Vicky Schubert did a fine job reporting on this year's DynamiQUEST and supplied us with a wonderful interview with Diana Fisher.

We look ahead to the Pegasus Conference in November, as well as ours next July. See page 11 for more information. And we are pleased to announce two wonderful new books. See this page and page 10 for details. Enjoy!

Take care,
Lees Stuntz
(stuntzln@clexchange.org)

The Shape of Change: Stocks and Flows is now available

by Rob Quaden, Alan Ticotsky and Debra Lyneis
The Creative Learning Exchange, 2007



The Shape of Change (2004) gave students the opportunity to experience change over time through games, experiments and other classroom activities. Students then drew line graphs to examine the changes more closely: How did a team of friends increase when it doubled each round? How did the population of wooly mammoths change when death rates rose? How did a boiling cup of water cool to room temperature over time? How did the number of trees in a forest change under different planting and harvesting policies?

In *The Shape of Change: Stocks and Flows*, students next seek to understand why these changes occurred. Based on their earlier classroom experience and graphs, and building in small incremental steps, students draw stock/flow maps to capture the feedback processes that caused the changes. Through the lessons, students begin to recognize the basic structures that underlie all change over time. For example, the more friends there were on the team, the more new friends they could recruit, enlarging the team even more for an even greater number of new recruits in the next round, and so on. This reinforcing feedback loop is similar to the mammoth population growing at a birth rate, or a bank balance increasing with interest deposits. Stock/flow maps give students a way to express, examine and understand the causes of change all around them.

Both books can be ordered from the CLE website clexchange.org

The Shape of Change

1-4 copies: $16.00 each; 5 or more: $15.00 each

The Shape of Change Stocks and Flows

1-4 copies: $16.00 each; 5 or more: $15.00 each

Buy together and SAVE! $30.00 for both

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Questions concerning your purchase should be directed to:
Andi Miller, The Creative Learning Exchange
27 Central St., Acton, MA 01720
978-635-9797 FAX 978-635-3737

DynamiQUEST 2007

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A highlight of the day was observing the warm relationships developing between the seven Chinese students and their American counterparts from Vermont. They had had just one week of face-to-face collaboration to put the finishing touches on their joint projects, preceded by months of communicating across a painfully slow video-conferencing connection. Nevertheless, the teams not only managed to achieve high-quality presentations, applying rigorous systems tools to data collected on both sides of the world, but they were clearly enjoying their new friendships as well. (See corresponding article on page 6.)

Linda Booth Sweeney leads the students in systems games

In fact, none of the nervous intensity one typically encounters at high-stakes science fairs was evident. The friendly atmosphere is a hallmark of DynamiQUEST, where organizers work to create an environment free from "winner/loser" constraints, in which students can give and receive feedback that truly deepens their understanding of complex systems. The non-competitive tone was reinforced through a series of win/win games designed to illustrate the dynamics of team learning, led by Linda Booth Sweeney, co-author of *The Systems Thinking Playbook*. The emphasis on mutually supportive learning was also in evidence as George Richardson of SUNY Albany facilitated a collaborative problem-solving exercise focused on the disappearance of the permafrost layer in Fairbanks, Alaska.

That's not to say the students didn't enjoy a well-deserved sense of personal pride in the work they presented and an appreciation for the power of their findings. In some cases, teachers have already arranged opportunities for students to share their research with real-world stakeholders. For example, John Todd of the University of Vermont, who invented a tool for engineering natural systems that he calls the "eco-machine," was delighted to see the students from Vermont and Nanjing using his technology to provide direction to campus administrators for addressing their pond eutrophication problems. And when students shared their observations about the effects of climate change and keystone species on Vermont's maple sugar economy with the regional director of the US Forestry Service, he vowed to make more use of systems modeling in managing the resources for which he's responsible.

It is encouraging to see such fine examples of student work, and hard to overestimate the value that DynamiQUEST brings in the effort to advance systems literacy among tomorrow's leaders. If there are students you know who would be interested in participating in DynamiQUEST, or if you would like to learn more or support the program, please contact Lees Stuntz at CLE.

This article first appeared in the Pegasus Communications e-newsletter ***Leverage Points****, May 2007, Issue 86 http://www.pegasuscom.com/levpoints/lp.html*

See the next two pages for the complete program of student presentation and more photographs.

DynamiQUEST *continued on page 4*

DynamiQUEST 2007 Student Presentations

1. **C. Somers** (Grade 8) Murdoch Middle School
What to Do about Avian Flu?
Students spent a week of math class learning about the spread of the Avian Flu (H5N1) virus by watching video case studies of infected people and reading newspaper articles. Systems tools (BOTGs, Causal Loop Diagrams, and STELLA) were used to better understand the generic model of an epidemic. Ultimately, this thinking was used to help students generate ideas for what the most effective steps would be for containing an Avian Flu outbreak.

2. **H. Novack** (Grade 8) Murdoch Middle School
What Happened at Easter Island?
Students used systems tools, specifically STELLA models, to better understand the population collapse on Easter Island. To build a better understanding of stocks and flows, students began this study by playing "The Tree Game." Creating a STELLA model helped students think about the consequences of consuming natural resources too quickly.

3. **A. Iovanna** (Grade 8) Murdoch Middle School
Global Water Supplies
The connection between access to clean drinking water and life expectancy is strong. Use of Systems Thinking tools (Connection Circles, STELLA) can help students better understand these connections and develop possible solutions.

4. **E. Unger** (Grade 12) Vermont Commons School
A. Jaffe (Grade 9) Vermont Commons School
R. Roy (Grade 8) Vermont Commons School
T. Hinsdale (Grade 11) Vermont Commons School
F. Yu Affiliated High School of Nanjing Normal University
F. Yang Affiliated High School of Nanjing Normal University
Water Pollution of Campus Pond in Nanjing: Considering the "EcoMachine" System Application for Water Quality Improvement
This biology and chemistry problem statement introduces students to living systems by researching wastewater and natural treatment options. In September 2006, Chinese and American student teams elected to study the water quality of a Nanjing school pond, which emits a foul odor each summer. Water quality levels of the pond fall outside of environmental quality standards for surface water in China. Chinese students expressed that, since so many ponds in Nanjing have similar water quality problems, they wanted to learn more about natural and sustainable Ecomachine technologies to simulate the process of treating the polluted water with constructed wetlands through creation of an Ecomachine. The goal of the group's Problem Statement is to identify the most efficient approach to solving the water quality of the Nanjing campus pond using the Ecomachine technology. (Nanjing and Vermont data)

5. **M. Wang and K. Boutin** (Grade 8) Murdoch Middle School
What to Do about Avian Flu?
Students spent a week of math class learning about the spread of the Avian Flu (H5N1) virus by watching video case studies of infected people and reading newspaper articles. Systems tools (BOTGs, Causal Loop Diagrams, and STELLA) were used to better understand the generic model of an epidemic. Ultimately, this thinking was used to help students generate ideas for what the most effective steps would be for containing an Avian Flu outbreak.

6. **S. Mulloy** (Grade 8) Murdoch Middle School
What Happened at Easter Island?
Students used systems tools, specifically STELLA models, to better understand the population collapse on Easter Island. To build a better understanding of stocks and flows, students began this study by playing "The Tree Game." Creating a STELLA model helped students think about the consequences of consuming natural resources too quickly.

7. **I. Hollyer** (Grade 12) Vermont Commons School
J. Decatur (Grade 9) Vermont Commons School
Y. Tong Affiliated High School of Nanjing Normal University
M. Hua Nanjing Jinling High School
Maple Industry
Researching Effect of Climate Change, Keystone Species, and Economics on Vermont's Maple Sugar Production (US and Canada data)

8. **A. Glidden** (Grade 8) Murdoch Middle School
What to Do about Avian Flu?
Students spent a week of math class learning about the spread of the Avian Flu (H5N1) virus by watching video case studies of infected people and reading newspaper articles. Systems tools (BOTGs, Causal Loop Diagrams, and STELLA) were used to better understand the generic model of an

epidemic. Ultimately, this thinking was used to help students generate ideas for what the most effective steps would be for containing an Avian Flu outbreak.

9. **L. Wilson** (Grade 8) Murdoch Middle School
What Happened at Easter Island?
Students used systems tools, specifically STELLA models, to better understand the population collapse on Easter Island. To build a better understanding of stocks and flows, students began this study by playing "The Tree Game." Creating a STELLA model helped students think about the consequences of consuming natural resources too quickly.

10. **A. Meli** (Grade 8) Vermont Commons School
A. Leff (Grade 12) Vermont Commons School
T. Retzloff (Grade 8) Vermont Commons School
C. Yu Nanjing Jinling High School
R. Ning Nanjing Jinling High School
Rocketry
Exploring Chemical and Physical Systemics of Model Rocketry (China and US data)

11. B. Knight (Grade 8) Murdoch Middle School
What to Do about Avian Flu?
Students spent a week of math class learning about the spread of the Avian Flu (H5N1) virus by watching video case studies of infected people and reading newspaper articles. Systems tools (BOTGs, Causal Loop Diagrams, and STELLA) were used to better understand the generic model of an epidemic. Ultimately, this thinking was used to help students generate ideas for what the most effective steps would be for containing an Avian Flu outbreak.

12. E. Conti Grade 8) Murdoch Middle School
What Happened at Easter Island?
Students used systems tools, specifically STELLA models, to better understand the population collapse on Easter Island. To build a better understanding of stocks and flows, students began this study by playing "The Tree Game." Creating a STELLA model helped students think about the consequences of consuming natural resources too quickly.

13. R. Russell (Grade 12) Vermont Commons School
Jack Homer (Grade 10) Vermont Commons School
Emma Campbell-Mohn (Grade 7) Vermont Commons School
Yang Jun Cheng Nanjing Jinling High School
Urbanization
Urban Development of Williston, Vermont: Impact on Local Vermont Indicator Species (Vermont Data)

14. R. Schneider (Grade 8) Murdoch Middle School
What to Do about Avian Flu?
Students spent a week of math class learning about the spread of the Avian Flu (H5N1) virus by watching video case studies of infected people and reading newspaper articles. Systems tools (BOTGs, Causal Loop Diagrams, and STELLA) were used to better understand the generic model of an epidemic. Ultimately, this thinking was used to help students generate ideas for what the most effective steps would be for containing an Avian Flu outbreak.

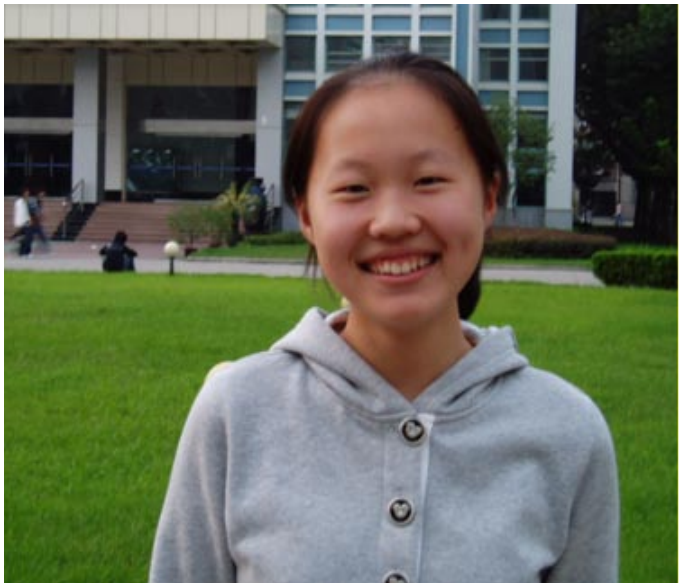
15. Zhenya Naka (Grade 8) Murdoch Middle School
What Happened at Easter Island?
Students used systems tools, specifically STELLA models, to better understand the population collapse on Easter Island. To build a better understanding of stocks and flows, students began this study by playing "The Tree Game." Creating a STELLA model helped students think about the consequences of consuming natural resources too quickly.

16. E. Beauchamp (Grade 8) Murdoch Middle School
What to Do about Avian Flu?
Students spent a week of math class learning about the spread of the Avian Flu (H5N1) virus by watching video case studies of infected people and reading newspaper articles. Systems tools (BOTGs, Causal Loop Diagrams, and STELLA) were used to better understand the generic model of an epidemic. Ultimately, this thinking was used to help students generate ideas for what the most effective steps would be for containing an Avian Flu outbreak.

17. E. Clifford (Grade 8) Murdoch Middle School
What Happened at Easter Island?
Students used systems tools, specifically STELLA models, to better understand the population collapse on Easter Island. To build a better understanding of stocks and flows, students began this study by playing "The Tree Game." Creating a STELLA model helped students think about the consequences of consuming natural resources too quickly.

Vermont Commons School Creates Curriculum with China to Spur Student Interest in Math and Science

The Vermont Commons School, an independent day school serving grades 7-12 in South Burlington, has commenced a multi-year collaboration with Nanjing's schools, coordinated by the Nanjing Educational Technology Center, an information technology hub serving all schools in Nanjing, the capital city of Jiangsu Province, China. The Center is coordinating efforts with the Vermont Commons School to work directly with the teachers and students of Nanjing's schools to co-develop math and science-based curricula employing systems thinking and dynamic computer modeling.



Shelburne residents Ian Hollyer and Andrew Jaffe, and Charlotte residents Emily Unger, Ruby Russell, and Toby Hinsdale met their 'virtual' Chinese teammates for the first time on May 7, when 13 teachers and students from two of China's top high schools arrived in Burlington for a week-long visit with students and teachers of the Vermont Commons School. The teachers and students have worked together this year via a web-based workspace in creating new math and science-based curricula employing systems thinking and dynamic computer modeling. The students presented their findings and models to Vermont community stakeholders during the May visit.

Considered the first collaborative effort of its kind nationwide, the project will help secondary school students and teachers understand the nature of complex systems and learn how to use quantitative modeling tools to solve systemic, real world problems. Over the next several years, students and teachers will exchange data and coursework in a range of disciplines including chemistry, biology, physics, geography, ecology, and social studies. The joint research and curricula will be made available to US schools and the public.

Vermont Senator Patrick Leahy applauds the project. "The benefits of this collaboration will exceed our ability today to imagine them," said Leahy. "This will help expand the learning horizons of the students, the staff, and of both societies. The preparation that is going into this project will help make it a terrific learning and teaching experience for all concerned. It is especially fitting that this announcement comes on the eve of Chinese Ambassador Zhou Wenzhong's first visit to Vermont."

The project is part of Vermont Commons School's own Research & Service program, a hallmark service learning course known for encouraging students to apply traditional scientific research methodologies to selected community issues or prob-

Curriculum with China *continued on page 12*

Learning Systems Lessons from a Newspaper Article

We have often said that reading a newspaper article and looking at the systems lessons within it is a good way to teach our students. At Dynami-QUEST this year, George Richardson led the 33 participating students and their teachers through such an exercise. His questions and approach gave those of us attending new insight into this process.

The article selected was written by Doug O'Harra and published by the Anchorage Daily News, August 14, 2005. It describes the warming trend that is causing the permafrost to gradually recede, causing melting ground to collapse into sinkholes.

"Permafrost is shrinking: warming on the bottom from the Earth's natural heat, warming on the top because of air temperature and deep snows.

It's like holding an ice cream sandwich in your hand on a sunny day. While the icy center stays hard, it shrinks as the top and bottom both melt."

The students were divided up into tables of about six students and at least one adult, either teacher or coach. George led us through the process:

He began by asking, "What's it like to live in Fairbanks?" to give us all a chance to talk a little about what the article was about. (The first student said, "It's cold.")

Then he went through six questions or tasks to be addressed in the individual groups, each followed by discussion by the whole group.

1. Dynamics: Draw one or more graphs over time that this article is talking about. (George mentioned later that another good tack would have been to discuss time frames at this point.)

George Richardson leads the group discussion of temperature

2. Permafrost stocks and flows: Sketch a stock and flow picture of permafrost—see the figure in the newspaper article and the text about an ice cream sandwich. Students proceeded to sketch single stocks with inflows and outflows (freezing, thawing). George interrupted and suggested they "challenge the clouds." The groups then on their own generated pictures with permafrost and the "active layer" (talik*).

3. Group discussion of temperatures along the chain:
- What are they now (expressed as lower, higher, lowest)?
- What were they in an ice age?
- From this the students derived the current "u-shaped" pattern of temperature: higher in the talik, lower in the permafrost, higher in the active layer (seasonally). We contrasted that with the ice-age pattern: higher in the talik, lower in the permafrost, lowest (seasonally) in the active layer, leading to no active layer (lowest at the surface).

4. Thawing permafrost:
- What does it smell like? Why?
- What does that smell represent?
- What does it do to temperatures? (Where is this in the article?)

5. Sketch a feedback loop to tell this story.

The idea here was that rotting bits of frozen animals (mammals, bacteria, and in between) release gases of various sorts, some of which are greenhouse gases (methane), furthering exacerbating the warming. The most interesting variant here from one group was the thought that bacterial activity in the rotting material could generate heat on its own.

6. Enlarging the active layer (discussed in the whole group)
- What are the human consequences? (No feedback discussion here, just

Systems Lessons *continued on page 8*

Diana Fisher Awarded Barry Richmond Scholarship

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Foundation (NSF) grant for training teachers in the use of his STELLA software. Barry came to deliver workshops and was very generous with his time and willingness to work with those of us who were eager to move beyond the basics.

Barry and Steve Peterson helped me polish the materials that I had used in my classes into a product that could be made available to other people. A couple of years ago, after Barry had

"Teach so others can see and understand."
Barry Richmond

passed away, I led a plenary session at the System Dynamics Society conference celebrating how much he had offered the K-12 community as an evangelist for this work. The last sentence in the presentation was something that Barry had said to a colleague associated with our NSF grant: "Teach so others can see and understand." You can see that principle in his software, which he made so easy to use. He included communication features that help you explain your models to other people who may not be interested in seeing the diagrams themselves. He built software with a "Help other people understand" mentality.

Clarity is so important because I don't think you can bring these ideas forward unless you can help the average person see the reason for using models. We must continue to work toward using a technology-enhanced modeling approach to education because we can't keep oversimplifying our math classes. Kids need a way to understand more complex problems. We have computers; we have to use them optimally—not just to write papers, but to help us think. Models—even simple, baby models—expand the toolset that students can choose from when they set out to study a problem. It's an exciting time to be here. I just wish I could figure a way to expose more teachers to this approach.

LP: Can you share a little bit of your own experience with bringing system dynamics into the classroom?

DF: Math tends to be a class that a lot of kids just don't like. I'm always interested in trying different techniques and looking for ways to make it more interesting. Modeling tools first came to my attention at a workshop for computer educators where STELLA software was being demonstrated as a tool for studying populations. I immediately liked the visual nature of it, how the graphs helped the presenter clearly express complicated ideas. So, I bought a copy of it and spent the next six months playing with it to figure out how to use it in my algebra class.

When I first tried using a population model with my second-year algebra students, it was at the very end of the course year, and one of my students—who was not doing well in this class—said, "Why didn't we do this sooner? This I understand." And I thought, "This is a way to reach certain students whom I'm not reaching traditionally." I found that the use of the visual diagramming helped my students better understand how functions behave over time. So, I started incorporating models here and there in the teaching of mathematics.

I also established a modeling class that allowed me to introduce broader system dynamics concepts in studying problems that the kids found more relevant and stimulating than traditional math problems. And some of the kids in the modeling class didn't like mathematics much at all, but ended up really liking the system dynamics (SD) modeling approach.

LP: What kinds of problems were you looking at?

Learning Systems Lessons from a Newspaper Article

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understanding)

- What can the people in Fairbanks do? (Not much. One student said, "Move.")
- Can humans do anything to help? (Discussed briefly in the whole group) This is the crux of global warming political debate.

George then went on to ask more thought provoking questions: What else do you know about this? Add whatever you would like to your group's drawing to tell more stock-and-flow/feedback stories about global climate change. We didn't look at each diagram, but asked each group to talk briefly about what else they added to their pictures or discussions.

It was a pleasure to be in the "classroom" with George.

**A talik is a patch of unfrozen ground in an area of permafrost. In areas of continuous permafrost it often occurs underneath shallow lakes. (thermokarst lakes). It does not freeze during the winter and is thus not merely part of the active layer of the permafrost. Sometimes open, closed and through talik are distinguished. These terms refer to whether the talik is completely surrounded by permafrost, is open to the top or open to both top and unfrozen layers beneath the permafrost, respectively.*

DF: Well, to build their skills I selected fairly classic system stories—from a lot of different areas that I thought would captivate students. I used population studies of various kinds, the spread of epidemics, sustainability issues, predator/prey interactions, etc. When students were, subsequently, required to create an original model, I tried to suggest topics that I understood fairly well. But the students never wanted to choose those topics. They wanted to do their own thing, which was very empowering for them. I gave them a lot of flexibility in what they could choose. For example, one of the students, who was in the second semester of her senior year, did a model to study "senioritis."

This was good for me as a teacher. When a kid chose something I didn't know much about, I became just another person to help them along. As an adult, I usually knew how to find resources better than they did. So, if they were looking for something I'd sit down and I'd say, "Well, maybe we could look here, or look there." It caused me to grow, because I was able to teach in a really different way. I liked the change.

LP: And in fact, you were learning alongside them.

DF: I was definitely learning. At the same time it was empowering for my students, it was scary for me. It was especially scary at the beginning because I thought, "My gosh, I won't know all the answers to all the questions they will be asking me." Math is a pretty protected environment to teach in because the kids don't generally know that much mathematics, so you generally know more than they do. But teaching computer science had actually helped prepare me for teaching SD modeling, to some degree, because kids who are interested in computer science tend to spend a lot more time experimenting than teachers do. That had given me an appreciation for being a facilitator of learning rather than a giver of knowledge.

Modeling fit into that teaching framework, but was even more exciting because the kinds of problems that the kids were studying were really important problems. They were bringing topics from other classes into the modeling class to study and analyze. In math you're pretty much limited to using equations and the simplified problems in the textbooks. But the modeling kids were making me multidisciplinary by bringing in social studies problems, science problems, health problems, economics problems, and so on. I grew a lot in trying to help them explore these areas that I knew very little about. And I continue to grow.

LP: What effect does this kind of approach have on the rest of the system? Have you found administrators willing to make room for the changes it sets in motion?

DF: Yes and no. I've had administrators who were very open and supportive and provided me resources to grow this SD modeling approach. I have also had administrators who have not been interested at all. I've found that I can still use modeling in my classroom if the administration isn't interested, but if I want to take it out of my classroom and do collaborative, cross-discipline work—which is what really needs to be done because that's the beauty of this particular approach—then I need administrators who are willing to support that process. Our best chance for making significant change lies with leaders who want to support the processes that really seem to be working for students in their schools.

LP: You said you wish there were a way you could expose more teachers to this. Where do you see high leverage platforms for promoting systems thinking?

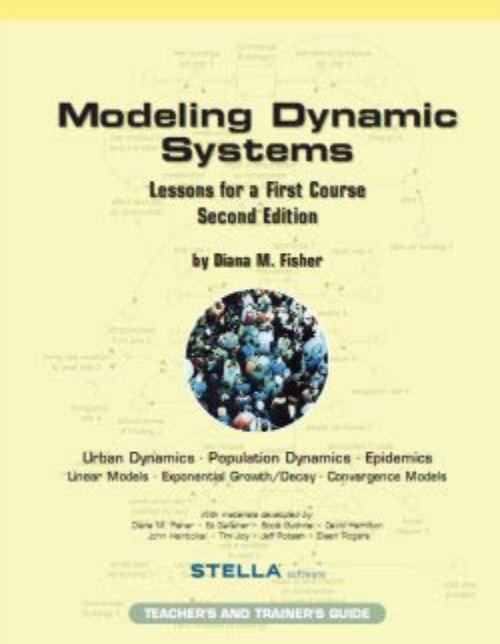
DF: The NSF grants I've gotten have taught me a lot and have pointed up some shortcomings in the training that we've done. We haven't done enough to sustain our trainees as they brought modeling ideas back to their classrooms. Teachers need training available in the summer. There are some fantastic classes out there, but they're only offered during the school year. And they're taught by professors who expect you to do a significant amount of work. That's just not viable for a lot of teachers on top of a full teaching load.

I've found that I can still use modeling in my classroom if the administration isn't interested, but if I want to take it out of my classroom and do collaborative, cross-discipline work—which is what really needs to be done because that's the beauty of this particular approach—then I need administrators who are willing to support that process. Our best chance for making significant change lies with leaders who want to support the processes that really seem to be working for students in their schools.

I could see adding system dynamics strands to masters programs that are completed during sequential summers. Teachers could learn how to create small models and learn to create curriculum pieces, using models and graphs, that could be applied to almost

Diana Fisher *continued on page 10*

Second Edition of Diana Fisher's Modeling Book Now Available



Modeling Dynamic Systems: Lessons for a First Course makes teaching systems modeling easy for teachers and fun for students.

The Second Edition offers:

- Complete curriculum for a one-semester or one-year course in system dynamics
- Interactive lessons for beginning modelers at secondary or college level
- Hands-on modeling and journal writing activities
- CD containing student assignments, STELLA software and models
- Updated and expanded content including chapter on delays, details of the system dynamics process and rubrics for understanding.

This book captures the system modeling assignments that Diana Fisher created and used to teach a year long course in system dynamics modeling at the high school level from 1992 - 2005. The guide contains introductions to each unit and answers to each problem.

To learn more or to order your copy, visit www.iseesystems.com/modelingbook or call 603-448-4990.

Diana Fisher Awarded Barry Richmond Scholarship

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any subject. Having built models themselves, they would be more likely to start using them in their classes, and further develop their models over time to better fit what they're teaching. We need to train teachers in a way that allows them to build their skills enough to internalize the method. You can't do it in a two-week workshop.

The other important piece is to have some modeling curriculum (units/lessons) that are already available and fit into each appropriate discipline (regardless of the text used). Not everybody wants to build their own curriculum. We could start by giving teachers some packets or supplemental materials created by veteran teachers who have learned the system dynamics method.

that forward?

DF: Yes, I think it will happen. And I personally hope to continue working in these specific areas after I leave the classroom. A system dynamics modeling approach to understanding complex problems is just too important. Of all the things that I have tried from the beginning of my teaching—and I've been in the classroom a long time—I have never come across anything as powerful as this approach. I care about this, not just because it's stimulating and empowering to kids, but because we (as a country/planet) have some serious, complex problems we've got to deal with and we need to teach our students a method (already available) to analyze them. Our past teaching methods are inadequate to the task. Kids have to think at a more sophisticated level; these tools and methods can help them do that.

The beautiful thing is, they like it. System dynamics modeling reinforces their natural thinking about problems in cross-discipline ways, which I think kids do more naturally than adults. It only makes sense to make schools more cross-discipline. I mean, that's just the way the world works; it should be the way we think.

This interview first appeared in the Pegasus Communications e-newsletter ***Leverage Points****, August 2007, Issue 89, at http://www.pegasuscom.com/levpoints/lp.html*

Systems Thinking and Dynamic Modeling
A Conference for K-12 Education
June 28-30, 2008
Babson Executive Conference Center
Wellesley, Massachusetts

Join some of the finest practitioners of system dynamics in a learning bonanza designed to foster systemic change and community building in K-12 education.

This year's conference will be designed to maximize your learning, provide practical take-away knowledge, and bolster opportunities to meet and network with others. It will center around

- Workshops with hands-on learning
- Informative plenary presentations
- Discussion roundtables
- Ample opportunities for less formal networking and schmoozing

The offerings will range from Introductory to "Master Class," and will focus on curricula, classroom management, and organizational themes to meet participants' needs for addressing specific grade levels, systems tools, and disciplines.

The Conference Center is located on Babson College's campus in Wellesley, Massachusetts, 20 minutes from Boston and Logan International airport. The campus is lovely, with rolling hills and landscaped grounds. The seclusion and serenity of the setting will ensure the focus of our conference is on learning, engaging, and sharing. The facility offers state-of-the-art meeting facilities, flexible room configurations, professional, platinum-level service, comfortable, pleasing accommodations, and highly acclaimed food and dining.

Please mark your calendars now, and recruit colleagues across grades, disciplines, and organizational roles to make an effective team. Keep an eye on the CLE website and subsequent issues of this newsletter for further details.

The 17th Annual Pegasus Conference
Amplifying Our Impact: Strategies for Unleashing the Power of Relationship
November 5-7, 2007, Seattle, WA; Westin Seattle

Join a purposeful network of over 700 progressive thinkers and action leaders in Seattle this November to build your capacity for catalyzing positive change. For the first time convened in the Pacific Northwest, this year's conference will include keynote presentations from Debra Meyerson, C. Otto Scharmer, Van Jones, Peter Senge, and a panel from Boeing's commercial aircraft division. As always, the cross-professional conference community will bring together systems thinkers from business, education, government, and the nonprofit world, to learn from each other and open new doors together.

Special pricing is available for teams of four or more. Call Rachel Baker at 781-398-9700, or visit the conference website [http://www.pegasuscom.com/stapage.html] to learn more and register today! Download a conference brochure [http://www.pegasuscom.com/pc07/STA07final.pdf]

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Shared Curriculum with China

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lems in an effort to create positive change. Two projects the students have already elected to study involve analyzing and cleaning a polluted pond in Nanjing and researching the effect of climate change on Vermont's maple sugar production.

"At a time when US education officials are taking a closer look at how our students are being prepared for the future, this project with China allows us to trade best practices in education," states Robert Skiff Sr., co-founder and former Headmaster of the Vermont Commons School. "China produces students with sound fundamental skills in math and science, and we have been practicing inquiry-oriented pedagogy and systems thinking for ten years. Our students will be even better prepared for the future as a result of exchanging new ideas and methodologies with China. We're all excited about this."

In addition to regular Internet conferencing and file sharing, the groups have planned to visit each other annually. The school has appointed Piper Lounsbury Stover, former director of the United States-China Business Council's Beijing operations, to direct the effort and to select corporate partners for the project. Peter Goff, school science chair, and Robert Skiff, Jr., social science chair and school co-founder, both teach the class.

About Vermont Commons School: Founded in 1997, the Vermont Commons School of South Burlington is an independent college preparatory school for grades 7-12 known for its innovative curricula focusing on ecological citizenship, high quality teaching staff, and small class sizes.

Contact: Piper Stover, Executive Director, The Commons Project, Vermont Commons School 802-865-8084 x 29; piper@vermontcommons.org

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- In paper format via US mail ($15.00 outside the USA)

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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.

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