Beginning Systems Thinking
Using Games
(and anything else that works)

CLE Conference 2010

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Guiding Questions

• WHAT changes?
• HOW does it change?
• WHY does it change?
• SO WHAT?
Tools for understanding change

- Behavior Over Time Graphs
- Connection Circles
- Causal Loop Diagrams
- Stock Flow Maps
- Computer Models
Method

- Active Simulations
- Inquirer
- Constructivist Hands-On
- Learner Centered Team Work
Behavior Over Time Graphs

- Time is represented on the horizontal axis.
- Graph the behavior on the vertical axis.
- Indicate scales (quantitative or qualitative).
- We are interested in overall shape of the graph, NOT points on the graph.
For each ‘story’ below make a Behavior Over Time Graph. The behavior to be graphed is put in parentheses at the end of each paragraph. Indicate the time scale that you use.

1. Prices are now rising more slowly than at any time during the last five years. (PRICE)

2. After the concert, there was a stunned silence. Then one person in the audience began to clap. Gradually, those around her joined in and soon everybody was applauding and cheering. (NOISE LEVEL)

3. In the spring, my lawn grew very quickly and it needed cutting every week, but since we have had this warm spell, it needs cutting less and less frequently. (LENGTH OF GRASS)

4. When doing a jigsaw puzzle, I usually spend the first half an hour or so sorting the edge pieces. When I have collected all the ones that I can find, I construct a border around the edge of a table. Then I start to fill in the border with the center pieces. At first this is very slow going but the more pieces you put in, the less you have to sort through and so the faster you get. (NUMBER OF ‘CONNECTED’ PUZZLE PIECES IN PUZZLE)

5. A ‘typical’ Red Sox season (GAMES WON)
Career Efficacy

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Behavior Over Time Graphs: Deepen Understanding

• Go back to your previous graph and draw a second behavior on the same set of axes.

• Is there a relationship between the pattern of behavior of the two graphs? If so, make a hypothesis.
The Mammoth Game

• Start with 20 dice in a box: this is your herd.
• Each round represents a year in the life of the herd.
• Add or remove dice according to the following rules:
The Mammoth Game

• 1 = a calf is born
• 2 = the mammoth is killed by a predator
• 3 = the mammoth dies of starvation
• 4 = the mammoth keeps living another year
• 5 = the mammoth keeps living another year
• 6 = the mammoth keeps living another year
The Mammoth Game 2

- 1 = a calf is born
- 2 = the mammoth is killed by a predator
- 3 = the mammoth dies of starvation
- 4 = the mammoth is killed by a hunter
- 5 = the mammoth keeps living another year
- 6 = the mammoth keeps living another year
Salt Graphs

- Take your bottle and add one scoop of salt. ‘Jiggle’ the bottle to make the salt as even as possible. Measure the height of the salt.
- Make a table to track the height of the salt versus the number of scoops.
- Graph the data:
  - Number of scoops on the horizontal axis.
  - Use your table of values to plot points.
  - Draw a smooth curve through your points.
  - Do NOT identify which bottle you are using.

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THE LORAX

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Connection Circle Rules

• Draw a large circle.
• List important elements around the circle.
  - Restrict the number to between five and ten.
  - All elements should be nouns or noun phrases.
  - Elements can increase or decrease.
• Identify an element that causes another element to increase or decrease.
• Draw an arrow from the cause to the effect.
  - Make sure that the causal connection is a direct one.
  - Identify polarity of arrow and label at the arrow head.
• Continue to identify elements with causal connections.

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The Lorax CC

Truffula Trees

Thneeds Made

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Truffula Trees

Animals

Money Made

Pollution

Factories

Thneeds Made

Onceler's Family

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Truffula Trees

Anger of people

Animals

Factories

Money Made

Desire for Money

Pollution

Thneeds Made

Lorax Anger

Onceler's Family

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Truffula Trees

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Truffula Trees → Thneed Production → Desire for more money → Money Made

Trees make Thneeds → Action

Lorax Loop

Pollution → Anger → Animals
Contact Information

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