

System Stories for Children

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As the parent of a wonderfully inquisitive toddler, I frequently find myself wondering how he will learn to live in a world where everything everywhere appears to be connected to everything else. Or, as a system dynamicist might ask: how will he learn to understand and predict the behavior of social systems that are increasingly dynamic and complex? What does he need to learn, to understand, for example, the escalating behavior of two bullies on a playground; the impact of oil spills on the environment; the spread of epidemics, or boom-and-bust cycles in the marketplace?

As I consider my own son's learning process, I see that much of what he learns comes from the reading and rereading of favorite books. (On some days, he'll devour 20 books before bedtime.) Common sense and, now, a growing body of research, tell us that children remember what they hear and learn through stories.¹ All this evidence in favor of story as a powerful educational method invokes the question: why not learn to think systemically through story?

But how many children's stories embody systems principles? Over the past several years, I've been on an absorbing journey in an attempt answer to that question. I discovered that many stories embody linear event-and-reaction relationships; the characters' actions never have unexpected changes, and the plot moves forward from beginning to end. One has to wonder, *are we (particularly in Western cultures) actually "set up" by the structure of our stories, habituated at an early age to look for linear cause and effect relationships?*

However, I also found a growing number of stories that embody systems principles and archetypes. I've included two of my favorites here. This excerpt is taken from a longer piece that includes an introduction to targeted systems concepts, an analysis of 15 stories and tips on how to use the collection. I am now in the process of turning this paper, which emerged from a pilot study conducted at the Harvard Graduate School of Education, into a booklet for parents and educators. If you have comments or other stories you would add, please get in touch.

If You Give a Mouse a Cookie

By Laura Joffe Numeroff, illustrated by Felicia Bond, HarperCollins 1985; picture book, fiction, targeted at ages 3-7.

Systems thinking concepts: Simple interconnectedness, circular feedback, unintended consequences, delays, selecting time horizons, solutions often create new problems.

This is the story of the unforeseen consequences of giving a hungry little mouse a cookie. Seems innocent enough? But the next thing you know, the energetic mouse will want a glass of milk. Then he'll want to look in a mirror to make sure he doesn't have a milk moustache. Then he'll ask for a pair of scissors to give himself a trim, and a broom to sweep up. The mouse rascality tumbles on like dominoes throughout this delightful book. At the book's end, we are back to where we started, with the mouse requesting yet another cookie.

In real life, people tend to exclude side effects, feedback processes, and delays when making decisions. We all need practice. This is a good story to help older kids (ages 7-10) practice the skill of tracing cause and effect relationships to see how an event (giving the mouse a cookie) feeds back on itself.

As a way to explore the systems thinking related lessons in the book, first ask your students or child to think about different kinds of cause and effect relationships. For example, there are what can be thought of as domino models (A causes B causes C). Children may just call them “dominos.” We see domino models in a simple food chain. Another model of causality is one that is circular (A causes B causes C which impacts A). Reading *The Day Jimmy’s Boa Ate the Wash* (by Trinka Hakes Noble) or Felicia Bond’s *Tumble Bumble* in conjunction with *If You Give A Mouse A Cookie* provides a way to contrast a cyclical feedback model with a linear, domino model.

For younger readers (age 3-6), you may also simply ask:

- What happens?
- When have you seen this same kind of thing happen, when one thing makes another thing happen and then another until you end up back where you started, and you keep going around?

For older readers, you may ask them to trace and visually depict the circular causality in the story and consider some of the following questions:

- What other types of chain-of-events situations can they think of that eventually feed back on themselves?
- What are the possible unintended consequences of some solutions to everyday problems? (For instance, suppose city planners add an extra traffic lane to a crowded highway. Would this produce less traffic or more traffic?)

Voices from the Field

Tim Lucus, Director of Curriculum and Instruction, Glen Rock Public Schools in New Jersey, and contributing author to the *Schools that Learn Fieldbook*, has used this story with children in kindergarten through the fourth grade:

“We were able to unearth some important systems thinking and system dynamics language that we could build on, and we introduced causal loops. We worked with the ideas of stocks and flows.

“Students started with the idea of the bathtub, but then started to see other objects in the classroom and school as stocks and identified the flows that impacted them. We started with garbage cans, (who filled them and emptied them), lunch boxes, lost and found boxes in the office, and even classrooms filled with students. We were able to draw simple STELLA maps (not models) and identify converters that impacted the flow. As an example, the number of students in a class (stock) was impacted by new families that moved in and out of the school community, and the number of houses on sale in the neighborhood.

“We also expanded students’ mental models of the use of a word or concept—like ‘home.’ We would send teams of students throughout the school looking for homes. They would report back that your nose is a home for your glasses, your pocket is a home for your pen, a parking lot is a home for a car, etc.

“One of our culminating activities was to have the students make their own circular story and draw out the major events on a long (4 ft.) strip of paper, similar to a cartoon. Then we would make a circle out of the paper by taping the ends together with the pictures inside. If you stuck your head in the circle or story and spun the cartoon you could never tell where the story started or stopped (e.g., a causal loop).

“We would hang them from the ceiling in the classroom with some careful stringing at ‘kid height.’ Students would walk around the room, stick their heads in a paper circle, and spin each other’s stories. We were definitely ‘spinning tales.’”

Partner Stories: Other books by Numeroff which reinforce the notion of circular causality: *If You Give a Moose a Muffin*; Laura Joffe Numeroff, Felicia Bond (*Illustrator*); *If You Give a Pig a Pancake*; Laura Joffe Numeroff, et al, and *If you give a Bunny a Birthday Cake*.

The Butter Battle Book

By Dr. Seuss, Random House, New York, 1984; picture book, fiction, targeted at 4th grade reading level and up but excellent for adults, too.

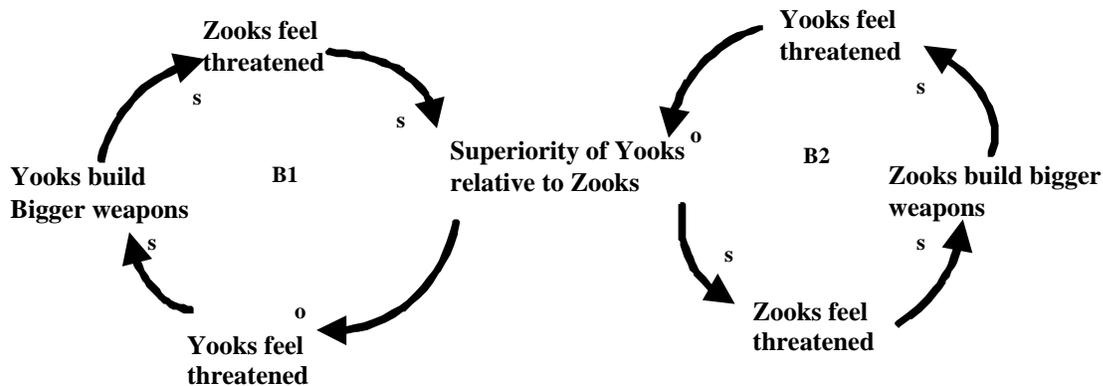
Systems thinking concepts: Simple interconnectedness, cyclical models of feedback, positive feedback loops, escalation, “structure drives behavior drives events,” how (perceived) rational microbehavior can lead to disastrous macroresults.

In this story, Dr. Seuss tells of a feud between the Yooks and the Zooks. The source of the conflict—one clan eats their toast butter-side-up and the other eats it butter-side-down. They build a wall to keep the two clans apart and begin their feud with hand-held slingshots. Eventually, they move onto more sophisticated weaponry, building Triple-Sling-Jiggers and such, until each side has the capacity to destroy each other, and the world!

As the Yooks and the Zooks roll out a succession of increasingly fantastic and dangerous weapons, Dr. Seuss sets up a compelling paradigm for the cold war arms race. Looked at from a systemic perspective, the on-going feud between the two Seuss-ian tribes provides educators with an opportunity to explore the archetypal dynamic of escalation and possible high-leverage interventions.

Escalation generates some of the most troubling systems behaviors we face, and is one of the more commonly occurring system structures. Young children immediately understand this archetype when the example of two bullies on a playground is given. One shoves the other, the other shoves back harder until an all out brawl ensues. In organizations, the “escalation” archetype can be found in typical price wars. In a more deadly confrontation, the escalation structure can lead to catastrophic consequences. The Cuban Missile Crisis in 1962, for example, caught U.S. President Kennedy and Soviet Chairman Khrushchev in an escalation structure that led their countries to the brink of nuclear war. The arms race between the Soviet Union and the U.S. is another example.

In *The Butter Battle Book*, the conflict arises, as we know by now, over which side to butter one’s bread. The reinforcing nature of this conflict can be found in the two intersecting balancing loops illustrated below.



The conflict then grows as follows: one party (The Zooks) takes actions that are perceived by the other as a threat (“a very rude Zook by the name of VanItch snuck up and sling-shotted my Snick-Berry Switch!”) The other party (The Yooks) responds in a similar manner by building a “Triple-Sling-Jigger” and increasing the threat to Zooks. As a result of this move, the Zooks take even more threatening actions.

After asking students to draw the causal relationship inherent in this story, ask them to consider the following questions:

- What happened? What do you think might happen next?
- What other stories, either from real life or not, include the same kind of behavior?
- In your opinion, who or what is being threatened here? What is the source of the threat?
- For kids: What do you think the different characters were thinking (cite different points in the story.)
For adults: What are the deep-rooted assumptions that lie beneath the actions taken in response to the threat?
- Is there a larger goal here that might include the individual goals?

Partner Stories: For another story that addresses escalating behavior, see *Billibonk and the Thorn Patch* by Philip Ramsey.

¹ For two related references, see Kieran Egan's book, *Teaching as Story Telling: an alternative approach to teaching*, University of Chicago Press, Chicago, Illinois, 1986. Also, see Usha Goswami, article: *Analogical Reasoning in Children, Essays in Developmental Psychology*, Lawrence Erlbaum Associates, Hillside, 1992.

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