Welcome to the 13th Biennial Systems Thinking and Dynamic Modeling Conference

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Where we’ve been, where we are, and one mental model of where we’re trying to go and how to get there
Two Journeys Among Many
Who is in the room

Stand up if you …
Anne’s Story
It was 2+20 years ago, today...

Doors into the “Systems” Room

Diagram:
- Computer literacy and skills
- Critical reasoning
- Educational change
- Academic disciplines
- Learning organizations
- Systems perspective
- Systems Thinking and System Dynamics
My plan
My plan

Reality
Knowledge Acquisition as a Continuum

Stage 1
Unconsciously Incompetent

Stage 2
Consciously Incompetent

Stage 3
Consciously Competent

Stage 4
Unconsciously Competent
Just take the next step

Start close in,
don’t take the second step
or the third,
start with the first
ting
close in,
the step
you don’t want to take.

Start with
the ground
you know,
the pale ground
beneath your feet,
your own
way of starting
the conversation.

Excerpt: *Start Close In* by David Whyte
What have I learned from you?

...a series of ideas that transformed my own thinking.
I used to think that “cause and effect” worked in straight lines. I learned from you the concept of endogeneity.

“Systems Thinking is the mental effort to uncover endogenous sources of system behavior...”

George Richardson
What the heck is Endogeneous?

- Literally, ‘born from within’
  - from the Greek *endon*, within, and *genes*, born
- ‘Endogenous sources of system behavior’ are forces for change that arise from *within* a system.
- Systems thinking is the effort to look *within* and find the ‘system as cause.’
I used to think I could learn it on my own. I learned from you to seek multiple perspectives.
5. I wanted to be perfect, but I learned from you to “Do what works.”
...but even though “all models are wrong...,” you should still avoid creating something that’s impossible.
4. I used to think that copying others was bad. I learned from you that it’s really helpful to copy other people’s models.

Processes of Intercultural Musical Production in the U.S.A.
Proposed by Portia Maultsby

- Original Version
- Imitation
- Transformation
- Reinterpretation
A model I couldn’t create, but that I could copy.
3. I learned from you that it’s important to create “pretty” models.
2. I used to think of mental models as a separate “thing.” I learned from you that our mental models are everywhere – in every representation we create.
How is an iceberg like a system?

About 7/8ths of an iceberg is below the surface of the water. What does that imply about what people typically see in a system?

As we describe the behaviors and structure of a system, we are representing our own mental models of how that system works.

Sharing representations of systems help us go beyond our own mental models to better find effective leverage for positive change.
1. Most Importantly – I learned to travel with a friend.

“…and that has made all the difference.”
George’s Story
George’s Story

Diagram:
- Computer literacy and skills
- Critical reasoning
- Educational change
- Academic disciplines
- Learning organizations
- Systems perspective

Hexagon: Systems Thinking and System Dynamics
George’s Story
Mathematics

- $142,857 = 1428|57 = 57|1428 = 571,428 = 4 \times 142,857$
- A duck weighs ten pounds plus half its weight. How much does it weigh?
- 1,279 is the smallest number that can be written as the sum of two cubes in two different ways. $[1^3 + 12^3$ and $9^3 + 10^3$ (Ramanujan)
- There are exactly the same number of points inside a square as there are on one of its edges. (Cantor)
What Changed?

- Researching and developing a course on “systems analysis” in 1972 and stumbling over *World Dynamics*
- NSF Faculty Fellowship in Science Applied to Societal Problems, taken at MIT in 1975-76
- PhD in system dynamics at MIT under Forrester, 1979-1984
What Do I Like to Do?

• Make well-formulated, useful, exquisite system dynamics models,

• Help groups use systems mapping and modeling to reach consensus about tough problems,

• And I love to work with Anne.
A Pretty Model

Commodity Cycles
What Have I Learned from You?

• Undaunted courage
  • Trying systems things in class when you aren’t really sure.
  • Giving your kids freedom to try things when you aren’t sure what they’ll do or how you can help
  • Professors don’t do that.

• Here’s an example from the 2011 St. Louis Systems Thinking in Education Conference
Students had pulled out a feedback loop as a CLD

The teacher was afraid they were wrong to do that, but let them go ahead anyway!

Fear in the Mouse Community → Teasing of Despereaux

Amount Despereaux tries to act mouse-like
I used to underestimate the little kids. I learned from you not to.

Pair of horses, (Mom and Dad)

Bunch of Foals
Using Graphs to Tell Stories

- BOTG’s – Behavior-over-time graphs
- In Science? Sure.
- In English class?! 
- In Spanish class?! 
- Without numbers on the axes?!
BOTG for Some Story

A lot
Some
A little

Early  Middle.  Toward the end
“Could you make this make sense?”

“A graph that looked like this”
An intuitive understanding of Slope!
“..would look like this”

Early          Middle.          Toward the end

A lot  A little  Some
You have shown that Systems Thinking adds value to K-12 content

- Deepens knowledge
- Enhances understanding
- Builds foundations for going beyond what is taught
- Contributes to critical thinking
  - "Will our kids think differently?"
- Helps kids who struggle with traditional schooling as well as kids who find traditional schooling easy
I’ve learned you have skills that I should have

• Balancing praise and criticism to build self esteem and make the challenge of learning fun
• Building up to tough ideas: “Scaffolding”?  
• Games
Sometimes (always?) you have to start with maps that are “wrong”

• The more I study, the more I learn.
• The more I learn, the more I know.
• The more I know, the more I forget.
• The more I forget, the less I know.
• So why study?
A first map of the story. Not great.

The more I study, the more I learn, so the more I know, so the more I forget, and the less I know. So why study?
Closing the loop, changing “why study?” to “motivation”

The more I study, the more I learn, so the more I know, so the more I forget, and the less I know. Motivation for studying.
Seeing an accumulation lets us see reinforcing and balancing loops

Accumulated knowledge

the more I learn

Motivation for studying

The more I study

(R)

(B) so the more I forget

(R)
Explicit inflows and outflows

- Learning
- Accumulated knowledge
- Forgetting
- The more I study
- Motivation for studying

Learning +
Accumulated knowledge +
Forgetting -
The more I study -
Motivation for studying -
How does Studying affect Learning?

- Studying → Accumulated studying
- Learning → Studying

Diagram:
- Learning

- Accumulated studying
- Studying
A sequence of improving maps:

The more I study, the more I learn, so the more I know, so the more I forget, and the less I know. So why study?

Accumulated knowledge + Studying = Learning

Forgetting - Studying = Motivation for studying
Why Am I Here?

• I try to listen
• I try to learn what Anne knows that I don't
• I try to learn what you want to do and what you need
• I try to understand what I might say next that would be helpful
• I try to add a little to your systems understandings and capabilities
An Example: The Hatfields and the McCoys

McCoys

Hatfields

R

McCoys killed by Hatfields

Hatfields killed by McCoys
The same loop as a model, with the negative links correctly as outflows.
The model eventually shows the same problem. The McCoys are going up when they’re killed and we get a negative number of Hatfields!
So what’s the problem? What’s missing?

These variables need to be endogenous.
By adding links from the stocks, the numbers shot are now based on the numbers of people there are.
The key – If there are none, how many can be killed?
Why did we do this?

Chapter 7: Fix-it Fun

This chapter is a little different from the first six. Rather than just building and modifying a model to explore an issue, here you can work to fix a model that's broken or not behaving in a logical manner. Fixing models is one way to get better at modeling systems.

A model's structure and equations affect how it behaves. Adjustments can change what happens over time. As in previous chapters, each model has a story that the model represents. Your challenge is to change the models in a way that fixes the issues and creates behaviors that make sense.
Questions to Explore

What insights about this work connect with your own experience; what did we miss?

What do you hope to experience through your time here this weekend and going forward?

What conversations do you want to have during this conference?
Two Roads Converged in a Yellow Wood
Anne LaVigne and George Richardson – June 30, 2018

Where we’ve been, where we are, and one mental model of where we’re trying to go and how to get there
During the conference, we would like to invite you to start using *Splash!* and tell us what you think. Help us make it better!

You should have gotten an email to access the App on your phone or tablet. Instructions are also in Additional Information in your folder.

If all else fails- ask Ninad!
Topic choices for the Keynote Session on Monday Morning

1. Violence in schools
2. Substance abuse amongst students
3. Peer influence in classrooms
4. Disconnected students
5. Parent engagement
6. Influence of digital media