Overview: Exploring Situations of Power and Control

The Behind Closed Gates simulation/model is loosely based on an experiment conducted at Stanford University in 1971. The psychologist who designed that experiment, Phillip Zimbardo, wanted to see how typical people would act if they were asked to take on roles of prisoners and guards.

The experiment and model are certainly about a prison environment, but they are also relevant to many other similar scenarios. The experiment is frequently referenced when trying to understand current and historic situations involving power and control.

Now you can build most of the underlying model and explore questions and situations beyond those presented in the simulation.

Create the structure below and input the equations as indicated. Equations to input for question marks (?) are in the gray box.

\[
\text{Increase in resistance} = \frac{(\text{Indicated resistance} \times \text{Willingness to resist}) - \text{Prisoner resistance}}{\text{Time to increase resistance}}
\]

\[
\text{Decrease in resistance} = \frac{\text{Prisoner resistance} \times \text{Fraction decrease in resistance}}{\text{Time to decrease resistance}}
\]

Building the Model continued on page 3

1 The simulation has five key stocks. The model you'll build has only four key stocks. This adjustment was made to simplify the structure, but the behaviors are basically the same as in the simulation.

2 This exercise presumes access to modeling software and previous use of the accompanying Behind Closed Gates (BCG) simulation. The icons and instructions are created using STELLA® Professional 1.0.3, but other system dynamics modeling options (see the Acknowledgements section) will work as well.
EDITORIAL

On March 11, we kicked off this year’s spring season with another successful DynamiQueST held at WPI. The topics were varied and the students even more conversant with ST/SD than last year’s group, our first of the revived DQ events. It was a lot of fun to interact with students from age 7-17 presenting, learning, and interacting. As soon as next year’s event is scheduled, we will let you know, so more of you can put it on your calendars. It is an event not to be missed!

With DynamiQueST behind us, we are charging ahead, looking forward to a stimulating 12th biennial Systems Thinking and Dynamic Modelling conference. Although the weather folks predict the hotter-than-normal weather will continue into the summer, the ambiance and the food (and perhaps the air-conditioning!) at the Babson Conference Center will be welcoming. Put the conference on your calendar (June 25 - 27, with June 24 for the Introductory Workshop) and join us here in the Boston area. The draft program is available online as well as on page 9 in this issue. Scholarships are still available.

Enjoy the spring weather, as we are, with our crocuses coming up through the latest 3 inches of snow. I love reveling in the light at this time of year! Hope to see you soon.

Take care,

Lees
(stuntzl@clexchange.org)

Updates…

A Virtual Way to Experience the Habits of a Systems Thinker

Now Available in the Google Store!

Explore the universal Systems Thinking Habits (ST Habits) app for Android devices (coming soon for iOS devices). Watch the video to see a quick tour of the app. Then visit Google Play Store to download to your devices.

The ST Habits app includes 14 Habits of a Systems Thinker that describe ways of thinking about how systems work and how actions taken can impact results seen over time. They encompass a spectrum of thinking strategies that foster problem-solving and encourage questioning. The Habits also encourage flexible thinking and appreciation of new, emerging insights and multiple perspectives.

A variety of the app’s elements allow the user to assess and practice different habits in a fun and engaging way.

Download the ST Habits app today!

Camp Snowball 2016
July 11-15, 2016, Sacramento, CA

Join members Waters Foundation Systems Thinking in Education team at Camp Snowball this summer. Camp Snowball is a highly interactive (and fun) professional development program that offers participants:

- Common systems tools and approaches that can be used — no matter what your role — so you can successfully collaborate across departments and other boundaries to improve learning outcomes.
- Intensive workshops (core modules), learning journeys, and enrichment sessions that provide both theory, and most importantly, practice.
- Opportunities to share your work, and to teach and learn from peers.
- Visit campsnowball.org for all the details and for registration information!
Check

Make sure that the stock is allowed to have negative values by unchecking the “non-negative” box. Set the model’s “Run Specs”

- Stop Time = 30
- Time Units = Days
- DT = 1/32
- Integration Method = Runga Kutta 4

Create a graph for “Prisoner resistance” and run the model. The graph should show no change (flat line). If the behavior is different, recheck all of your connections and equations before moving on.

Experiment

Run some experiments, changing one variable at a time to consider these and other questions you have.

Consider questions about resistance, such as:

- What happens if it takes more or less time to change behavior? Change “Time to increase resistance” or “Time to decrease resistance” variables to values between 0.1 - 5.

- What happens if prisoners are more or less willing to resist? Set “Willingness to resist” to a value between 0.01 - 2.0.

- What happens if more or less resistance is warranted? Change “Indicated resistance” to a value between 0 - 1 or “Fraction decrease in resistance” to a value between 0 - 1.

- How does the amount of resistance affect the outcome? Change the initial value of “Prisoner resistance” to a value between 0.01 and 1.0.

Reflect

- What have you discovered so far?
- What three basic behaviors can you see, given the model above?
- Why do you think the Prisoner resistance graph can’t go up and down in the same run?

Part 2

Build

Add the fear structure and input the equations as indicated. You will need to change a couple of equations, based on adding the new parts. Note the following:

- Make sure that the new stock is allowed to have negative values by unchecking the “non-negative” box.

- An equal (=) sign means that the variable is the same as the one pointing to it.

- A squiggle (→) sign means that you must create a graphical function showing the relationship between parts. See the Appendix for all graphical function equations and graphs.

- The flow for “Change in fear” has an arrow on both sides. This is called a biflow. Select the biflow option from the menu and then draw it the same way you would draw an inflow. It’s important that the biflow arrow closest to the stock looks the same as the arrow for an inflow. With STELLA® software, the arrow pointing out of the biflow is dotted.

Check

Add “Prisoner fear” to the graph. Run the model to see what happens. If all the initial values are correctly entered, you should see graph lines with no change (flat lines). If the behavior is different, recheck all of your connections and equations before moving on.

Experiment

Run some experiments, changing one variable at a time to consider these and other questions you have.
Consider questions about fear, such as:

- What happens if it takes longer to change behavior? Change “Time to change fear” variable to a value between 0.1 - 5.
- What happens if prisoners are more or less fearful? Set “Tendency to fear” to a value between 0.01 - 2.0.
- What happens if more or less fear is warranted? Change “Indicated fear” to a value between 0 - 1.
- How does the amount of fear affect the outcome? Change the initial value of “Prisoner fear” to a value between 0.01 and 1.0.

Reflect
- What have you discovered so far?
- How does fear affect the behaviors?
- Why do you think fear affects resistance in this way?

Part 3
Build
Now let’s add in the guard behaviors. Add to the structure you’ve created so far and input the equations as indicated. You will need to change a few equations based on adding the new parts. Also note that two additional biflows are part of the structure. Note the following:

- Make sure that the two new stocks are allowed to have negative values by unchecking the “non-negative” box.
- Create the dotted stock by using the ghost tool. A ghost is simply a copy of the actual stock; its purpose is to minimize crossed lines in the model. A clear model is more easily shared with others.
- A squiggle (~) sign means that you must create a graphical function showing the relationship between parts. See the Appendix for graphical function equations, tables and graphs.
Check
Add “Guard distrust” and “Repression by guards” to the graph. Run the model. The graph should show the behaviors indicated in the figure on the right. These graph lines represent the basic behaviors seen in the original Zimbardo Prison Experiment. In that case, the experiment was stopped after just six days, when fear and repression were considered to be at dangerous levels. If the behaviors are different for your model, recheck all parts, connections and equations before moving on.

Experiment
As before, run some experiments, changing the value of one variable at a time to consider questions you have.

Imagine that your goal is to create different results than those seen in the graph. How can you use the model to find leverage, i.e., a small change that creates a large desired impact? Try changing one or more variable values in order to identify the highest leverage point(s).

Reflect
- What have you discovered?
- How would your discoveries relate to other real-life situations?
- How could you relabel the model to apply to other situations?
- How do the leverage points previously identified relate to one or more of these new situations?

Acknowledgements

Model
The model is based on one created by Barry Richmond in 1993 to illustrate the Zimbardo Prison Experiment. It was adapted for the simulation by Jen Andersen and Anne LaVigne with permission from Kathy Richmond and isee systems (2013). Information about the original model was also gleaned from from the chapter, “The Power of the Situation: Modeling Classic Experiments in Social Psychology” by James Doyle, Khalid Saeed and Jeanine Skorinko in Tracing Connections.

The free simulation is available on the Creative Learning Exchange website: http://www.clexchange.org/curriculum/simulations/prison_simulation.asp

Icons
STELLA® icons and graphics from STELLA Professional software, provided by iseesystems, Inc.

Appendix – Graphical Functions Overview
The Appendix contains graphical functions, i.e., graphs that show a cause-effect relationship between two parts of the model. They are not the same as graphs that change over time. For example, the first graph shows the impact of fear on resistance. So if fear is high, resistance is low.

Note:
Although STELLA® software was used to create this lesson, other system dynamics modeling programs are also options to consider. A list of many options is available here: https://en.wikipedia.org/wiki/Comparison_of_system_dynamics_software

If using different software, some adjustment to the instructions may be needed, based on the function of any particular package. Other options used by the author are:
- InsightMaker – https://insightmaker.com/
- Sysdea – https://sysdea.com/
- Vensim or Vensim PLE – http://vensim.com/
Among the Hidden
by Gail Falewicz

Gail Falewicz has inherited the Critical Thinking and Reading (CTR) class from Mairead Orpen. (See The Creative Learning Exchange, vol. 22, no. 1, Winter 2013.) http://static.clexchange.org/ftp/newsletter/CLEx22.1.pdf. As the CTR teacher, Gail teaches every 5th grade student at Innovation Academy Charter School (IACS), a public charter school, in Tyngsboro, MA. Here is her summary of the class structure and a report of a unit she taught based on the novel Among the Hidden by Margaret Peterson Haddix. (1998, Simon and Schuster, Book One in the Shadow Children series)

The purpose and scope of CTR can be summarized into three goal areas:

- improve reading and comprehension skills
- develop critical thinking and problem solving skills
- promote the school’s four outcomes—Community Membership, Effective Communication, Problem Solving, and Self-Direction through whole class, small group and partner work

These goals are pursued through an academic curriculum that supports students across content areas. To improve reading and comprehension skills and develop critical thinking and problem solving skills, students learn to apply proven reading strategies. One day students may be working on breaking down a math word problem, another day may be devoted to understanding higher level vocabulary in a science text, and another day students may be interpreting characters’ traits and mood in fiction.

The outcomes grow as students build academic skills. Community Membership expands while they listen to each other’s opinions, work in groups, and share materials. Effective Communication is reinforced as students, some for the very first time, speak to a group of their peers about a particular reading, sharing their ideas and opinions. Students are learning to become independent Problem Solvers by being encouraged to think “outside the box” and come up with alternate endings and outcomes. Self-Direction is practiced as students learn to take on the role of teaching others and to self-advocate their opinions and ideas.

As students work on improving academic skills and polishing outcome skills, they are encouraged to utilize systems thinking tools to help them understand themselves and the world around them. CTR class is the student’s first opportunity to use systems thinking tools and explore how they can help “see” the changes occurring.

Our first shared reading experience, Among the Hidden, was an effective vehicle for introducing reading skills and three systems tools: Behavior-Over-Time Graphs (BOTGs), Connection Circles, and computer simulations.

Among the Hidden introduces us to Luke Garner, a third child in the Garner household. Luke and his family are knowingly violating population laws created by the Government in response to a perceived food shortage and concerns of overpopulation.

Students used BOTGs early in the novel to graph Luke’s emotions as his life changed from one of relative freedom on his family’s farm to complete isolation when he had to remain hidden. Students used context clues and their own background knowledge to imagine what it would be like not to be allowed to leave their house, have no access to electronics, and ultimately, be left home alone every day. These graphs were shared and discussed by the whole class. Students supported each other by searching for evidence of Luke’s emotions, suggesting changes to graphs, and citing parts of the novel their classmates may have forgotten or overlooked.

Connection circles were introduced to students around the midpoint of Among the Hidden. They reflected on causal relationships among the changing elements in the book. Working in small groups, students developed a set of 8-10 elements that changed from the beginning of the novel to this point. Some elements students identified: land, income, population, expenses, loneliness, courage and freedom. With partners, students looked for cause and effect between elements and identified feedback loops to understand how the elements impacted character development.

As students continued to read Among the Hidden, they also read current event articles related to China’s One Child Policy. During this time, China officially changed its policy limiting families to one child. The connection between fiction and real-life became strongly apparent, as the students debated whether a population policy was necessary and how population affects natural resources and the economy.

Teachers demonstrated a STELLA population model, which students helped build as a whole class. They were able to view simulations, hypothesizing and interpreting population growth models. Through the model, students were able to illustrate why population laws could be thought to be necessary. This led to
discussions and debates about natural resources and whether or not government regulations need to be imposed.

Students at IACS continue to use systems thinking tools in CTR class, and in others, to help them understand at a deeper level and see connections between parts and how they impact each other.

**Connection Circle Template**

What’s the problem: What is changing? How is it changing?

Choose elements of the story that satisfy all of these criteria:
- They contribute to the problem.
- They are nouns or noun phrases.
- They increase or decrease in the story.

Write your elements around the circle.
Include no more than 5 to 10.

Find elements that cause another element to increase or decrease.
- Draw an arrow from the cause to the effect.
- The causal connection must be direct.

Look for feedback loops (loops that connect back to each other). Tell their story.
This year’s DynamiQueST was again held at Worcester Polytechnic Institute. The System Dynamics group graciously hosted us once more at Salisbury Labs. It was an invigorating day, filled with activity and terrific, capable students. The students ranged in age from 7 through 17. Their posters, 26 in all, were diverse in nature, including topics from Bicycle Helmet Usage and Head Injury to Feedback Loops in the Neolithic Revolution; from Rocket Modeling to Police Brutality; from Opioid Addiction to Wolves in Yellowstone. (See the DynamiQueST program on the CLE website.)

The 62 students attending helped teachers and system dynamicists coach other students’ presentations. There were games and an afternoon Group Juggle with debrief, capably led by Rebecca Niles and George Richardson. What was impressive about this year’s event was the quality of the posters and the poise and knowledge of the students. The younger students interacted competently with the older ones, both groups showing a knowledge and fluency with the tools of SD that was impressive.

The event was an exposition of student learning, with novice students learning from more experienced ones, new teachers gaining knowledge and techniques from teachers who have taught systems thinking and system dynamics for years, and everyone gaining new insights and appreciation for system dynamics from those who are proficient. Perhaps the most impressive learning at DynamiQueST was, as in years past, the students showing the adults how well they can think when aided by ST/SD tools and concepts.

We are looking forward to next year and another in a long string of successful DynamiQueSTs!
The Creative Learning Exchange
2016 ST/DM Conference
June 25-27
Babson Executive Conference Center, Wellesley, MA

The 2016 ST/DM Conference will offer three keynotes and several types of sessions. Keynotes by John Sterman, the Jay W. Forrester Professor of Management at MIT; Peter Hovmand with Megan Odenthal from the Brown School of Social Work and the Ritnour School System; and Brad Morrison, Associate Professor of Management at Brandeis University, with Tracy Benson, President of the Systems Thinking in Schools Group from the Waters Foundation, will address global, national, and local challenges by using Systems Thinking and System Dynamics. In workshop sessions on Saturday afternoon, we’ll focus on skill refinement and development. Sunday morning offers both full-morning and partial-morning sessions, in which participants will see how technology has been integrated using a systems approach and hear how educators have used Systems Thinking in their curriculum.

DRAFT PROGRAM

SATURDAY
Morning 10:00-12:00  Keynote
Why and How SD Has Informed the Process of Addressing Climate Change Throughout the World – John Sterman

Afternoon 1:30-5:00 – Skills-Based Workshops
• Introductory Workshop
• From Connection Circles to Feedback Loops
• What is a Stock and Flow? Stock/Flow Diagrams to Simple Models
• Changing the Game: The Integration of Systems Thinking in a School System
• Setting Up the Structure of a Classroom
• Building Insights with STELLA. Using STELLA Software to gain insight into Systems

Evening 8:00-9:00
• isee systems’ New Offerings, A Workshop For Experienced Modelers
• Resources for ST/DM in K-12 Education, CLE and others

SUNDAY
Morning 8:30-9:30  Keynote
The Students and Advisors from the Brown School of Social Work and Ritnour School System in St. Louis with their Group Modeling Process - Megan Odenthal and Peter Hovmand with interns from the Brown School of Social Work (Washington University)

9:45-12:30 – Full morning sessions
• Continuation with the Brown School Students

Integrating Technology with a Systems Approach
• Incorporating Innovative Technology into 21st Century Learning for Pre-K – 12 Classrooms
• The Use of Modeling and Other Technologies in Science Education
• Building Systems from Scratch

Stories: Integrating Systems Thinking and Dynamic Modeling
• Deepening Intercultural Competence: Using the Systems Iceberg as a Tool for Debriefing Critical Incidents
• The Evolution and Diffusion of Systems Thinking/Systems Dynamics into the PREP Out-of-School-Time Experience
• Introducing SD to High School Students in the Ukraine

9:45-11:00 and 11:15-12:30 – Partial morning sessions
• ST/SD in High School Environmental Simulations
• How to Start as a New Teacher in Science and Social Studies
• Systems Thinking in Education for Sustainability (Efs)
• Systems Education at the Institute of Systems Biology
• Impact of Accountability Policies (High Stakes Tests, Teacher Evaluation Systems, etc.) through a Systems Lens
• A Review of Group Modeling Building Practice, How and What is Being Used
• Teaching for a Complex World: Systems Literacy for Our Students

Afternoon 1:30-5:00 – 3-Hour Workshops
• Climate Interactive - John Sterman
• Rethink Health - Rebecca Niles

Evening 6:00-7:00
Student Projects from DynamiQueST and elsewhere

MONDAY Morning 9:00-12:00  Keynote
Using Systems Tools and Concepts to Unpack a Complex Educational Problem - Brad Morrison and Tracy Benson
Launch Modeling the Environment
August 8 - 12, 2016
WPI Campus
for 9th and 10th Grade Students

Learn about the concept of sustainability in complex systems through use of computer models, online simulations, and hands-on games. You will gain a new perspective on some of the toughest environmental problems we face today and learn what we can do to bring our use of natural resources into balance. Together with the Creative Learning Exchange, WPI offers you the chance to learn a whole new way of thinking about our environment. What happens when we don’t balance our use of natural resources? How do we regulate industries for sustainability? What part does climate play? You will start to explore the answers to these questions and more through computer modeling and hands-on activities!

Environmental Learning

This learning and research opportunity is for students entering freshman and sophomore years of high school. You’ll spend your days focusing on current problems and challenges in the field of Systems Engineering. Along with faculty, current WPI students, and classmates, you will use state-of-the-art experimental, analytical, and computer technology to complete projects and assemble your findings. Attend as a day student or choose our residential option and stay overnight. FMI: https://www.wpi.edu/academics/k-12.html

Invest in Education!

Your financial support of our effort here at The Creative Learning Exchange is always 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!
The Creative Learning Exchange, 27 Central Street, Acton, MA 01720