Building Systems Thinking Capacity: An essential skill set for policymakers

Abstract
Policymakers, worldwide, must tackle some of the most challenging and complex issues, yet their political environments make solving these issues nearly impossible. Political environments that are polarized, partisan, and divisive are ineffective and do not permit policymakers to be effective. System dynamics-based thinking skills are an essential skill set for policymakers facing adaptive challenges. The Georgia Health Policy Center created an innovative educational initiative that applies system thinking skills to health policymaking. This approach to legislative education can begin to change the way legislators frame issues, ask questions, build understanding and develop solutions to complex health care issues. In this paper, we describe how the traditional approach to legislative education – providing more and better information -- is necessary but insufficient for creating high leverage policies. We describe how the Legislative Health Policy Certificate Program, an intensive training for policymakers in Georgia (USA), integrated health policy content with conversational systems thinking skills, stock and flow maps, and simple and complex models to move policymakers into evidence-based, more collaborative decision-making. We provide examples of how we used each approach and suggest lessons learned that can be applied to anyone interested in fundamentally shifting political discourse.

Introduction

Policymaking at the national and state level is a difficult, complex challenge that researchers and practitioners have been studying for decades. What factors ultimately impact the processes used by decision-makers? What information and reasoning do they most utilize when making difficult policy decisions? What does their thinking process really look like? Perhaps most importantly: *How can they work together more effectively to develop policies with high leverage impact?*

The Georgia Health Policy Center (the Center), an applied research center at the Andrew Young School of Policy Studies at Georgia State University, has spent the last eight years trying to understand and improve this process (Minyard 2014). The Center was interested in testing a systems thinking approach to legislative education that could begin to change the way policymakers frame issues, ask questions, and consider solutions to complex health care issues.

System dynamics is concerned with building understanding of dynamic complexity: how connections between components of a system – be it environmental, social or political – generate the behavior of interest. System performance often surprises us and may behave in counterintuitive ways. (Forrester, 1971; Meadows, 2008) System dynamics (and its more commonly referred to discipline of Systems Thinking) is a way of approaching a problem that utilizes multiple disciplines and critical thinking skills such as: dynamic thinking (looking at a problem over time rather than as a single event); system-as-cause thinking (considering the boundaries of the system under consideration); and forest thinking (looking at the system from 30,000 feet above to see how things fit together) (Richmond 2000, Soderquist and Overakker 2010). It is a disciplined, collaborative approach that can accelerate learning by pooling multiple perspectives in ways that build understanding about wicked, intractable issues (i.e. adaptive

challenges). We decided the curriculum needed to build this type of "learning capacity" and it became the basis for our work with Georgia policymakers.

The Legislative Health Policy Certificate Program

At the Georgia Health Policy Center, we understood that the typical approach to legislator training was inadequate to generate the type of policy impact we – and policymakers – desired. The Legislative Health Policy Certificate Program (the Certificate Program) was created for state policymakers and legislative staff in the State of Georgia (U.S.A.) wanting a deeper understanding of health and health policy. The Certificate Program consists of four six-hour sessions. Two sessions address 'core' health policy topics such as health financing, insurance coverage and access, while two sessions are devoted to issue-specific topics determined by the participants, ranging from childhood obesity to trauma care. In order to build the adaptive leadership "learning" skills, an explicit goal of the Certificate Program was to help build participant skills to approach policy issues by:

- Looking at the big picture (over space and time);
- Integrating diverse perspectives to consider multiple factors and their changing dynamics; and
- Exploring/identifying higher leverage interventions to address Georgia's most intractable health challenges.

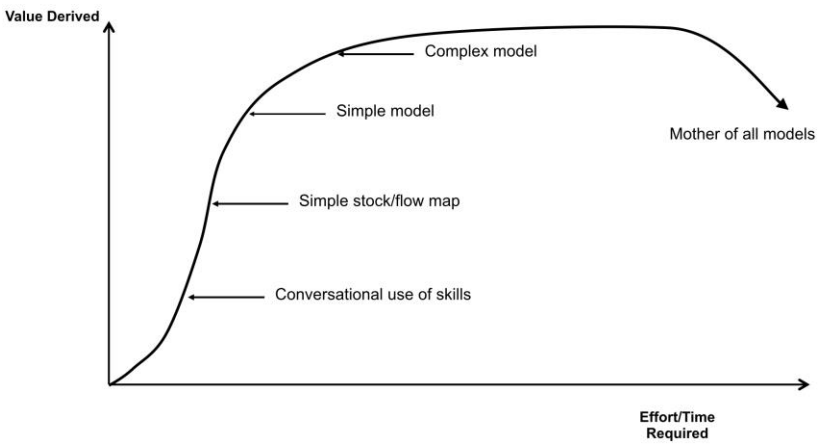
Although working with a lay (novice) audience, our objective was to provide them with skills based on the system dynamics methodology placed in the context of health policy issues relevant to our state. Challenging issues included: How could we balance building their skills to understand and apply the more rigorous language of stocks and flows in four educational sessions? How could we increase their ability to mentally simulate policy implications – with the potential for time delays and unintended consequences – while not building their capacity to build simulation models? Was there a "sweet spot" of skill-building and health-related content that could move them along the continuum to more effective systemic policymaking?

We hypothesized that a system dynamics–based approach to legislative health policy education could begin to change the way legislators frame issues, ask questions, build understanding, and develop and weigh solutions to complex health-care issues.

The Sweet Spot

Our first need was to determine the range of desired skills and the best experiences to develop those skills. Barry Richmond's *Value per Effort* graph (Figure 1) is a useful organizing framework. (Peterson 2008). Richmond's

Figure 1. Barry Richmond's Value per Effort Graph



assertion was that even with a short amount of time and effort, someone (or a group) applying system dynamics skills and principles could generate additional insight beyond standard analysis or conversation. Simply asking questions, such as these, that are based on these principles could dramatically improve the quality of conversation:

- How can the issue be expressed as trends over time? What do those trends look like?
- How can we expand the boundaries of inquiry over broader spatial/temporal dimensions?
- With the proposed policy, what could be some potential unintended consequences?
- How long might it take to see measurable improvements in the outcomes we desire?

Further along the continuum, someone could develop a simple stock and flow map (or causal loop) to represent assumptions and their implications. If policymakers can read and even develop these maps, would that improve their impact? Given simulation models of varying complexity, could they use them to improve policy exploration and build confidence that the policies they choose will have the desired impact?

To test this framework, we designed a curriculum that would have them receive and integrate health policy content using several system dynamics-based activities – ranging from *conversational use of skills* to experimenting with *complex models*. Our "sweet spot" of skills / activities fell along the steep part of the curve in Figure 2.

In our curriculum design we had three operating principles:

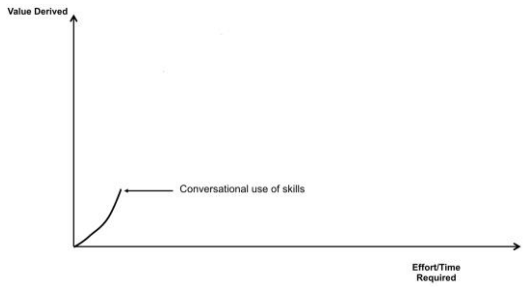
1. As a result of this work, policymakers should be better equipped to identify, develop, and implement high leverage policies.
2. *We won't build mappers and modelers…*but we should strive to build competency to think systemically, ask better questions, and to be better consumers of system dynamics tools and analyses (e.g., trend graphs, maps and models).
3. In order to build these skills, we must select the most compelling health policy content of interest to participants, and then apply the activities to this content.

Applying System Dynamics "Thinking" to the Curriculum

Our approach to designing the curriculum was to ensure that we included activities that fell along the curve in Richmond's chart from Conversational Use of Skills up to the asymptote of Complex Model. We believed that we could most effectively build the systems thinking capacity of participants through engaging exercises that were easily understood, and could be transferred to multiple issues. Each section below describes our approach to those activities, as well as one or more examples.

Conversational Use of Skills

Figure 2



Often practitioners use various visual and analytic tools to apply these skills. We wished to test their belief that even in the absence of visual and analytic tools, policymakers could still apply these conversational use of skills (figure 2). To test this

hypothesis, we developed the Six Question Framework (Figure 3). Based on concepts from the system dynamics field, the Six Questions served as the foundation of the educational design and provided a construct for evaluating specific health content in the policy arena. During the Certificate Program, policymakers were not only asked to apply the Six Questions in each of the sessions to various policy issues, but they were also encouraged to use them when tackling challenging health-related problems during the legislative session.

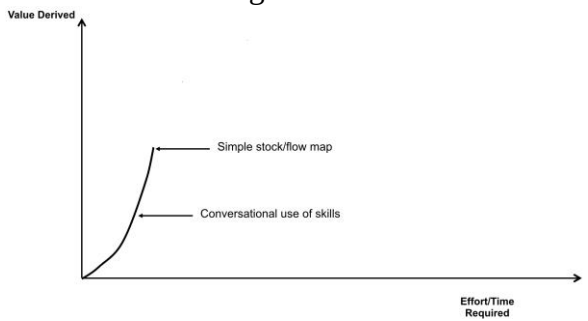
Figure 3. A Six Question Framework for Evaluating Policy

1. What is the important (perhaps troublesome) trend related to health in Georgia? What is the shape of this trend over the past several years?
2. Who are the stakeholders concerned about the trend?
3. Why this trend (what's the cause, what is responsible)?
4. Where is there leverage (some policy) to address the underlying cause of the trend?
5. How will it work? How will it play out over time? How might unintended consequences occur? How might the policy positively or negatively impact…
    a) Health status?
    b) State health spending?
    c) Health care system?
    d) Health equity?
6. When would the policy create an impact on health status? When would you see an improvement in some other indicators (i.e., spending, services)?

As part of the Six Question Framework, we asked legislators and their staff to think about issues as trends (behaviors over time). The obvious systems thinking tool for question 1 was behavior over time graphs, so we provided guidance about why trend over time graphs were useful, as well as how to build such graphs. Legislators were often asked to draw behavior over time graphs where they think about an issue not just from a single point in time but rather dynamically over time. They learned that data focused on one point in time artificially narrows the boundary of the problem – whereas expanding to longer term trends changes the nature of both framing a problem and thinking about solutions.

We used the Parachuting Cats in Borneo story – used by educators to introduce *unintended consequences* to participants – to illustrate what we called *Bump in the Rug* dynamics. Participants were given the story and asked to create the string of unintended consequences in Borneo, from the initial introduction of DDT to the ultimate conclusion of parachuting cats to kill the overpopulation of rodents. By naming this dynamic the Bump in the Rug, which is an easily understood concept in the political realm, we were able to refer to this dynamic throughout the program.

Figure 4



Stock and Flow Maps

The ability to apply stock and flow thinking (and feedback loops) – to develop causal theories of behavioral dynamics – is an essential component of the system dynamics methodology. Research suggests that our current ability to think in terms of stocks and flows is anemic at best. The implications are staggering; for example this poor mental simulation contributes to the lack of urgency and action on climate change (Sterman 2006). In our experience, these mental simulation skills can be built and applied – even in the absence of computer simulation. Appropriate use of stock and flow maps increases the likelihood of understanding dynamic systems and identifying high leverage solutions, even when applied to highly complex, adaptive challenges.

Stock and flow maps can depict a system in a common visual language and allow stakeholders to see how things are connected, where the boundaries of the system are, and how feedback loops contribute to the complex dynamics that occur in real-life situations. For example, a multinational aerospace corporation was able to use stock and flow mapping to develop a strategy and implementation plan for a workplace leadership initiative. (Soderquist and Shimada 2005)

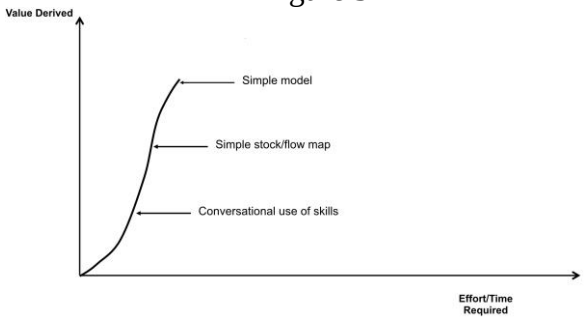
In the Certificate Program, participants generated one such map about disease prevention during the first session of the Certificate Program. The map is drawn "live" in the room, requiring participant input to contextualize and complete. The conversation was energetic and included comments and insights from most of the participants. The process of creating the map helped policymakers better understand the system in which this complex problem "lives," identify the levers for making change, and neutralize conflict or bias. Perhaps more importantly, its impact lasted well beyond the session by transforming how they framed this issue in subsequent policy meetings and dialogue. Ultimately, they were able to transfer this concept of treating competing symptoms, versus investing in structural prevention, to many of the important issues they wished to address.

There were several other stock/flow maps (often incorporating feedback loops) built in the room with participants to better facilitate different health policy content during subsequent sessions. In post session evaluations, these maps (e.g. understanding insurance reform, mental health) were consistently rated as being extremely useful in building understanding by synthesizing the content and facilitating more rigorous dialogue.

Simple Models

Further up the *value relative to effort* curve (Figure 5) is the practice of using small simulatable models to facilitate learning. On a few occasions, participants had "ah-ha" moments when they experienced models producing behavior counter to their expectations. We created models to communicate important system principles and to enhance the rigor with which they could discuss and apply those principles to important adaptive

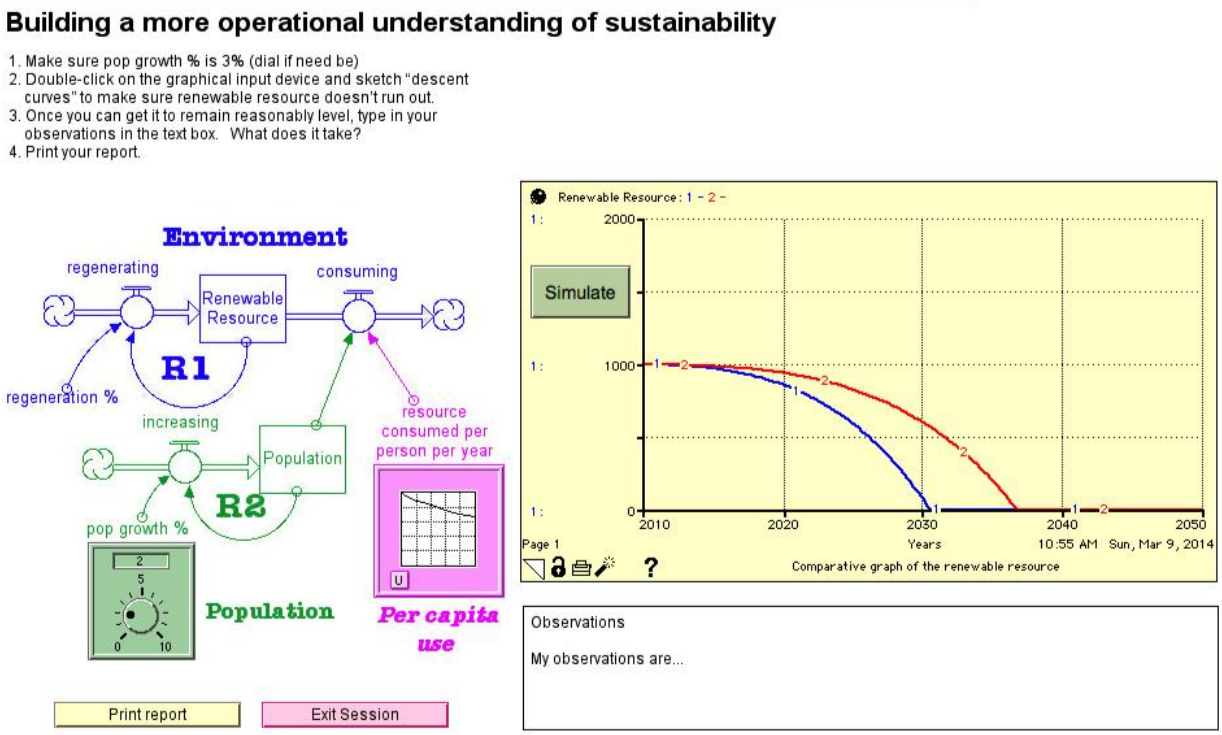
Figure 5



policy challenges.

We learned during the delivery of the program that appropriate framing of a simple model exercise – as a chance to rigorously describe assumptions and test their logical implications and not as a real world prediction tool – was sufficient to create a learning environment. One principle we wanted participants to understand was the concept of exponential growth. Often the underlying exponential growth (reinforcing feedback loop), whether population dynamics or economic growth, will dwarf efforts to address any resulting symptomatic issue through incremental and linear improvements. We introduced this exponential growth concept using a simple model of a world with one renewable resource and a population exhibiting exponential growth. In a large group setting, we mapped and simulated the simple structure shown in Figure 6. This generated spirited discussion about the ineffectiveness of linear improvement policies (annual reductions in costs/patient) when the prevalence of many conditions is growing exponentially.

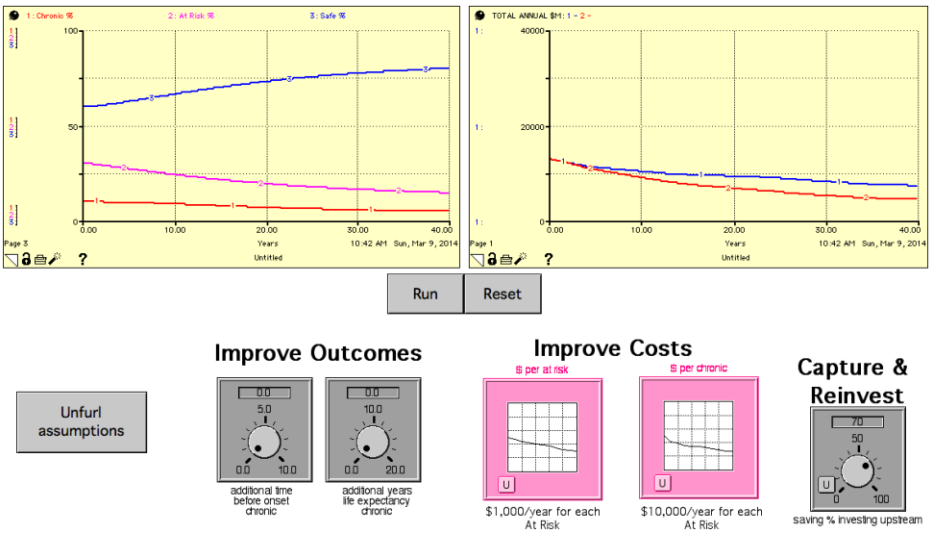
Figure 6. Screen of simple model of sustainable v. exponential growth



We also used a simple model to communicate another systemic principle: the challenge of intervening in ways that first address inefficiencies in the system and then reinvest savings upstream in prevention. A major challenge in dealing with many health conditions is that it is politically infeasible to decrease funding from treating symptomatic conditions and apply that money to prevention. This challenge is effectively raised in many U.S. communities as they apply the *ReThink Health* model and other models designed to improve regional population health (Hirsch *et al* 2012). One way many communities in the U.S. are considering handling this

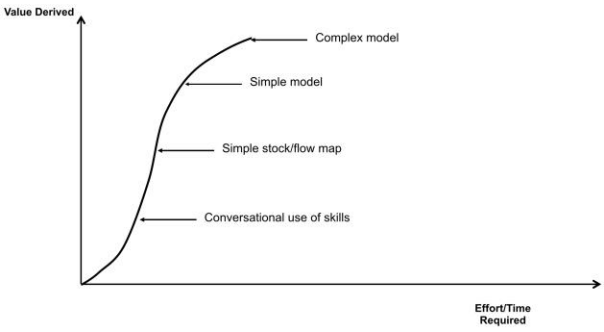
challenge is to negotiate savings reinvestment in prevention activities. We were able to surface the challenge and present this potential solution to legislators using a simple model as seen in Figure 7. After many months learning about the need to work upstream, legislators found this potential solution appealing.

Figure 7. Screen of simple model on 'capture and reinvest'



Complex Models

Figure 8



A fourth component of the program (further up the *value to effort curve* as seen in Figure 8) was to have legislators experience the application of a more complex learning tool – a sophisticated simulation model – to allow participants to explore likely future health and economic impacts of specific policy changes on a selected problem. The legislators chose to model childhood obesity because obesity among school-age children in the U.S. has tripled in recent decades – and Georgia is no exception. Reversing this complex epidemic requires a diverse set of policies and interventions, making it an ideal candidate for the systems thinking framework featured at the core of the Certificate Program. To test this theory, prior to the 2009 legislative session, the Georgia Health Policy Center convened 15 Georgia legislators and staff for half a day and gave each of them a laptop with a proprietary computer simulation based on system dynamics modeling. The simulation was designed by a collaborative team that included state legislators, legislative staff, and experts in nutrition, exercise physiology, epidemiology,

economics and system dynamics. It relied on epidemiological data and structure from a similar tool developed by the Centers for Disease Control and Prevention (Homer 2006).

The simulation occurred in a real-time, hands-on learning lab environment. Participants were encouraged to express assumptions, predict outcomes, and inquire into differences between their expectations and the model's outcome. Following the simulation, participating legislators commented that the model informed their deliberations during the legislative session and contributed to the passage of a bill requiring fitness testing and stricter enforcement of physical education requirements in Georgia's school system.

Conclusion and Lessons Learned

Introducing a systems thinking curriculum into a health policy course for state policymakers was a risk that paid off. Overall, participants were extremely receptive to this approach. In fact, the first year of the program was considered a test as to whether legislators would find a system dynamics-based curriculum useful, or even engaging. Due to overwhelming reviews of the value of the material, we not only continued including systems thinking into our program, but expanded its use, as well. The standard program has been delivered four times; the advanced program once. After four years of the program and having over 100 legislators and staff attend the program, here are the major lessons learned:

Using aids like the Six Question Framework, participants can learn the skills to identify, develop and potentially implement high leverage policies to improve health. Participants can learn to develop trend graphs and apply the systems thinking concepts during a short training program. There are important systems lessons that can be learned and applied to real world issues by just being taught to think like a systems thinker.

While we didn't create mappers and modelers, we built competency to be better consumers of system dynamics tools and analyses. Participants were engaged by – and appreciated – the stock and flow maps, especially when built with their involvement. We learned the best approach was to develop them and draw them on the wall in "real time," asking questions and facilitating conversation during development. Some of the best learning moments occurred during these large group discussions. In evaluations about what worked well, participants often cited the maps and the conversations surrounding them.

Maps, models, and simulations supported the ability to rigorously challenge deep seated assumptions. Several times during the program, when a participant strongly disagreed with an assertion made based on a map or model, we were able to ask what assumptions they wished to challenge. This was possible to do in ways that reduced defensiveness – by exploring the map or the model in "real time" – and provided opportunities for learning. It was likely aided by the introduction of conversational capacity and the skills to facilitate more productive conversations, which were rated extremely high in post-session evaluations.

We used a team approach to weave health policy content with the systems thinking skill-building. Small group exercises supported engagement and learning. Most sessions included at least one small group exercise, where participants applied the system dynamics concepts to

specific health policy content. More spirited conversation occurred and they enjoyed having the opportunity to present their small group's analysis to the larger group.

In developing the complex learning model, it was essential to have legislator support and buy-in. Due to legislators' hectic schedules, we found it difficult to have them attend modeling team meetings. By including trusted staff members, we were able to keep legislators in the loop during development. We learned that if you can't have the decision maker involved, include someone they trust.

Based on eight year of experience with Georgia policymakers, we found that system dynamics-based thinking skills are essential for effective policymaking. Conversational (and collaborative) systems thinking skills, stock and flow maps, and simple and complex models can move policymakers into evidence-based, more collaborative decision-making. The potential to apply this training approach to other policy topics (i.e. education, transportation) and it other environments is great. The Center plans to continue to offer the courses and innovate to design enhancements to further improve the systems thinking skills of policymakers.

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