

## SYSTEMIC PLANNING

By Ralph Brauer, John Heinbokel, and Jeff Potash

It was Lees Stuntz who started it all by broaching a revolutionary idea—in Concord, Massachusetts no less. It was a drizzly summer day not far from the hotel where Thoreau once ruminated the Mexican War, within walking distance of the homes of Emerson and the Alcotts, and down the road from Author’s Ridge where Emerson lies under a white quartz boulder and Thoreau’s simple marker is often surrounded by wilting flowers and odd bits of wood. Further down the same road lies the “rude bridge” where the shot was “heard round the world” and an intersection that leads to Walden Pond.

As we packed boxes at the end of that year’s CLE conference, Lees proposed that we needed a systemic understanding of how school systems functioned. At the time she made this suggestion, no one had built a System Dynamics model of a school system—most educators had never heard of System Dynamics and only few of them had any inkling of what systems thinking involved. The buzz-word at the time was “systemic reform,” but there was very little that was systemic about most of these efforts. Those of us in education had less understanding of the interrelationships of a school system than we did of the inner workings of the atom.

Curiously, the atmosphere in education was not unlike that in America during the years leading up to the events that made Concord a household word for revolution: a great deal of activity and innovation along with a growing frustration. At the conference the air was full of talk about research studies of various new programs. There was a healthy spirit of innovation that had spawned a wealth of programs in classrooms across the country. What we lacked was any clear sense of how all these efforts fit together. What was especially frustrating was that reformers had spawned successful innovations, only to find they could not replicate them at other sites.

We seemed to have more questions than answers. Should a district hire a few high salaried experienced teachers or a lot of lower salaried novice teachers? Option two might lower

class sizes but would it lead to an increase in student performance? How much more support would these inexperienced teachers require than their more experienced colleagues? How important were advanced degrees for teachers? What was the ideal ratio of administrators to teachers and students? Would material support efforts such as adding more computers have an impact on the number of teachers? On performance? Most of all there was the “big” question nagging us all, one which had inspired not a few skirmishes reminiscent of what had occurred so long ago in Concord: How could we be spending more money than ever before and still have large numbers of students who were not performing well? What did it take to improve student performance? Where are the maximal leverage points? Are these the same for all systems?

Lees started us on a journey that has led to our creating a System Dynamic’s-based process some of you may recall seeing at the last CLE conference, almost two years ago. Because the model was in its draft stages, we wanted to use the conference as an opportunity to hear what people thought about our efforts. One evening after that presentation, the three of us [*ed. note*: Ralph Brauer, Jeff Potash, John Heinbokel] took a drive to York Beach and walked in the sand not far from the Nubble lighthouse. We spent the evening pondering suggestions from Barry Richmond, George Richardson, Jay Forrester, Peter Senge, Lees, and others. All had been more than gracious with their time and ideas, reinforcing the value of a conference that brings together so many different people, from the founder of the discipline to researchers, educators, practitioners, and others.

Perhaps the biggest change over the last 18 months has been our reconceptualizing the project as a process rather than a tool. When we presented the model at the last CLE conference, we thought of it as a software tool that would enable K-12 educators to better understand their systems. As we have used the model in various school districts, we have come instead to see it as the center of a systemic planning process. The difference is not a trivial one. If seen as software, the model could possibly end up in a locked office with a single user punching a few keys and manipulating a mouse with the hope the model would produce “an answer.” If seen as a part of a

systemic process, the model inevitably becomes the facilitator for group discussion and analysis, the results of which are deeper understandings of the tradeoffs of possible alternatives, and, most important, better questions about the whys of their situation.

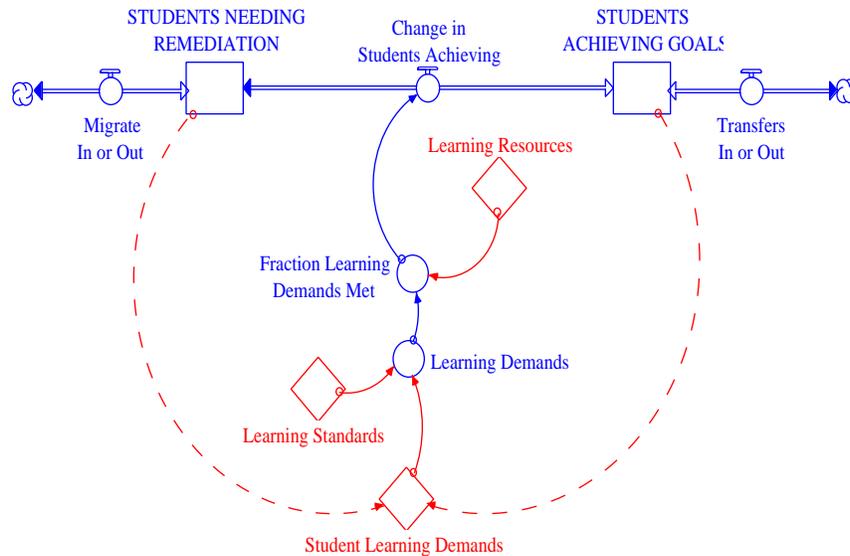
In the course of improving the process we have been fortunate to have had the assistance of a team of educators and researchers who have helped us to better understand the questions raised by the model building process. Because creating a model building team is perhaps the most important part of the process, we wanted ours to include classroom practitioners as well as university researchers. Team members included: Superintendent Jim Oraskovich and teachers Jim Boos and Jim Minerich from the Pequot Lakes, Minnesota school district; Betsy Chase, an administrator from the Chaska, Minnesota school district; Mark Davison, head of Minnesota's Office of Educational Accountability, and Kyla Wahlstrom, Assistant Director of the University of Minnesota Center for Applied Research and Educational Improvement. We also have received funds from the Bush and Blandin Foundations and the state of Minnesota to aid our efforts, although, as with many grants, the time and effort made by team members have far-exceeded the level of funding.

As those of you who have built models know, the choice of what to model is a critical one, driving the key stocks and flows that form the superstructure that anchors everything else, much like the steel framing of a skyscraper. For us, that choice was an easy one: we wanted to focus on the one issue that has been plaguing education since *A Nation At Risk*: student performance.

We chose to construct the model such that the definition of performance would be flexible enough to accommodate a variety of goals and assessment measures. We did not want to be caught in the trap of focusing only on test scores. All of us believed that the present emphasis on using standardized tests to judge the performance of schools, districts and teachers is misguided and dangerous. Most schools have a wealth of performance data, some of which is published in local newspapers and others sent to state and federal officials as part of various

reporting requirements. Within these reams of spreadsheets, what is often missing is a clear and useful understanding of the feedbacks (systemic complexity) that underlie and control those correlations.

Based on several daylong meetings of our team we built a very basic outline model that we continued to refine over the next few years. We call it an outline model, in that while it functions as a System Dynamics model, it is not intended to be run, but rather is a summary in model form of our key ideas. That basic model is shown below.



The story behind the basic model is a simple, but powerful one: students are either achieving or still trying to master user-defined goals which can be attendance, discipline, graduation rates, extracurricular participation, as well as multiple standardized tests and assessments. The STUDENTS NEEDING REMEDIATION stock can include students who have not yet achieved goals, as well as “backsliders” who may have initially mastered them, but, without adequate reinforcement, have regressed. The student stocks have inflows and outflows for enrollment changes.

The key part of this outline model is obviously the flow governing the movement of students between the two main stocks. Notice this is a biflow, representing a concept familiar to every teacher, administrator, student and parent: students can move in either direction. This biflow is affected by the three process diamonds, which represent dozens of interrelated submodels and equations. To understand these and their accompanying feedbacks, you need to know about the “currency” of the model. In early drafts, we had used money, following the conventional wisdom of asking, “how much does it cost?” When we began a major rebuild, Mark Davison suggested we should build the model using "time" instead of money as the focus.

This was a radical insight, the implications of which we are still just beginning to understand. To the teachers and administrators who were working with us on the project, the insight seemed obvious: students take different amounts of time to master something. Teachers, based on skill and training, take different amounts of time to teach those students. We factored time into the model as measures we called demand and resource units—which represent the time demands presented by each individual student and the time the system has to meet those demands. The Student Learning Demand process diamond includes sub-models of academic demand (what is their intellectual ability to master the goal) and behavioral demand. As we all know, a student can be a genius but also a huge, time-consuming behavior problem. Behavior proved interesting, for we found there was very little research or data on how behavior influenced learning, even though everyone talks about it. We ended up creating a rubric of our own to define the various levels of behavior.

The basic functioning of the system revolves around how much demand the students collectively represent and what resources are available to meet that demand. In essence, the model is a supply-demand equation, albeit a very complex and powerful one. The Learning Resources process diamond includes sub-models of all the resources of the system: teachers, administrators, and support (which includes everything from staff, aides, and paraprofessionals to computers and classroom supplies). All of these are valued in terms of time: a master teacher

can usually teach a skill to a class in less time than a novice, not only because he or she has more experience and training with the subject matter, but also because they have more experience and training with classroom resources and, of course, with classroom management, including discipline. The rest of the system helps to enhance or diminish this “efficiency.”

The third series of sub-models represents the Learning Standards for the achievement goals, standards that include school and district expectations, the expectations of the community, and whatever standards and expectations state and federal governments impose. The gaps between these and actual performance, and between themselves, are, as we know, drivers of powerful feedbacks that control the dynamics of the system. If student performance is below state or federal expectations, No Child Left Behind and similar legislation may impose a penalty on the district. If performance is below community expectations, it can result in lower funding levels, teachers bailing out of the system, changes in administration, and enrollment shifts

As the old saying goes, “The devil is in the details.” To minimize the potential for devilry, the larger model built on this basic structure underwent numerous validity tests. Minnesota districts entered data from past years, and we then ran the model, using the policy decisions they had made, to see if the model results conformed with what had happened. We subjected the model to a statistical technique called path analysis to confirm the correlations between various variables and sub-models. This was especially crucial since it helped to confirm the relative strength of various correlations.

As those of you who have used models in the classroom know, the actual physical model should be part of a good lesson plan. Although we were gratified that the model passed all the above tests, we knew we needed to develop a systemic process that facilitated maximal use of the model. Crucial to this development were funds from the Blandin Foundation, which were awarded to us to incorporate a goal-setting process facilitated by the model into its educational leadership program, which has taken place over the summers of 2002-2003. Blandin is a Minnesota-based foundation tightly focused on the economic viability of rural Minnesota

communities, as part of its mission to help strengthen rural Minnesota and its home city of Grand Rapids. Since its inception in 1986, the Blandin Community Leadership Program has received national and international acclaim for training 3,800 leaders in 244 Minnesota communities.

The Blandin experience taught us how to introduce System Dynamics to audiences who had little familiarity even with systems thinking. We also created a variety of facilitation techniques and tools, many of them borrowed from a successful strategic planning process used by the Transforming Schools Consortium. These included materials on mental models, goal setting, and assessing alternatives. We even created a series of “cheat sheets” that allowed users to run the model in small groups.

By now you can probably see that the assumptions behind the process radically reframe much of the policy discussion about schools. It is especially relevant to answering the major question that plagues us today: why are some schools with high per pupil expenditures doing well and others are not? Why are schools spending less money doing well while others are in trouble? Currently the debate focuses on dollars and test scores without any attention paid to the issue of supply of AND demand for resources.

We have come to believe that the lens of student demand is an especially powerful way for everyone in education to reevaluate the ways they are thinking about school performance. Much as Emerson and the Concord Transcendentalists challenged their generation to adopt a new perspective for seeing and experiencing their world, so we need to better understand the interconnected power exercised through student demand upon the world of education. Policy decisions that penalize districts with low scores may set into motion a variety of unintended consequences.

Examples include the flight of high performing students to other schools, thereby leading to further declines in overall performance. Alternatively, penalties may undermine morale in administrative and teaching staffs, thereby triggering departures and reducing overall capacity. Given, in both illustrations, that the full consequences of the penalty may in fact not be evident

until long after the decision has been rendered, it is imperative that the feedback implications be fully understood before such decisions for improving student performance are made. So, too, it is equally important to factor current demand levels into any decision. A school with low test scores may in fact be doing quite well with the limited resources it has. To call such a district “low-performing” may not only be inaccurate but also dangerous

A few examples from work we have been doing with schools in the last few years shows how this reframing can provide significant insights and raise better questions. In one district where we ran the historical analysis, teachers and administrators had been puzzled by why test scores had continued to stay high, even though their budgets had been decreasing. What the process told us was that their performance largely stemmed from a development program they had put in place several years ago, yet that staff development program was under consideration as a possible budget cut. Now they are pondering the role of staff development in their system and how it relates to other elements. In another district, teachers in an elementary school explored policy options for how to cope with increasing enrollment and flat or decreasing budgets. At the end of the day, one teacher exclaimed that process was the only one she knew that could have brought everyone together without rancor. In both cases the most powerful result was the degree of inclusive and productively open dialog that the process produced. Perhaps most striking in this regard is the Blandin program, where teams are now asking questions about which goals have the most promise and why.

In all these instances, it was not so much the particular decision that mattered, but the larger insights the process provided. In the district with the staff development process, their Director of Research, Evaluation and Assessment is now trying to get teachers and administrators to think of their system in terms of demand units. In the elementary school they have seen the value of System Dynamics in teasing out mental models and facilitating discussions that move from who to why. In the Blandin program, perhaps the most gratifying evaluation came from a Native American district, which said that the process was the first one

they had seen that was congruent with the decision-making traditions of their culture. They felt that the process was nonjudgmental, that it not only allowed for, but benefited from, the input of all, and more closely mirrored a world view that is circular rather than linear.

As much as anything, this response confirmed for us the power of the process to engage a diverse group of audiences. In the Blandin training, teams included teachers, school administrators, staff members, school board members and community leaders. We have also worked with city, suburban, and rural schools, as well as the tribal school mentioned above. System Dynamics appears to have a unique ability to engage diverse participants and to move people away from who to why, from blaming to analysis.

While there has been much pressure on us to regress to seeing the model as a decision-making tool—including an offer from a software vendor shortly after our presentation—we have firmly resisted. When we mentioned the pressure we were experiencing to Jay Forrester, he provided the insight that frames all our presentations. As is so often the case, Jay has the last word. He said, “The value of system dynamics must be understood as addressing the issue of understanding general policies rather than in guiding particular decisions.” We continue to learn the value of this truth.

In the coming year, we look forward to sharing and discussing these insights with those of you who will again be attending the CLE conference. We want to link with others who also share the goals we have for both education and System Dynamics. System Dynamics is probably the only process we know that allows mental models to be knit together for the common good. System Dynamics speaks a language of inclusion and of the common good that is appreciated by all who have been through the process. In this it evokes the power of those earlier Concord revolutions.