TOOLBOX

Each Toolbox presents a different systems tool using relevant business examples. Readers are encouraged to practice using these tools by applying them to issues of personal interest. *See page 12 for a symbol key for the diagrams.*

Designing Effective Learning Environments

by Henry Frechette

Imagine you are part of a healthcare team that has developed a computer model to grapple with the complex and often conflicting factors involved in creating healthier communities. Although your team was skeptical of the model's counter-intuitive outcomes at first, over time you have developed confidence in the model's validity. Now you face the challenge of communicating these insights to others in your organization.

To extend the insights beyond the small group, your team has to do more than convey the outcomes of the modeling project—you must create a dynamic learning experience that will allow participants to test a wide variety of strategies in a way that promotes deeper exploration of the underlying issues. But how can this best be accomplished? What guidelines should you use when designing your learning environment?

Management Flight Simulators

Management Flight Simulators (MFS) provide a safe, cost-effective means for an individual or a group to explore their understanding of a problem or issue by simulating the results of different policies or decisions over time (see "Definitions"). The basic goal of many MFS's is to transfer a core modeling team's learning to larger groups of people throughout the company. But if the MFS is not embedded in a structured learning environment, it is likely to have little impact on the quality of thinking or decision-making in the company.

So how can you design an effective learning environment? A good design should do three things:

- Help users understand the underlying dynamics of an issue or problem.
- Surface deeply held beliefs and mental models through reflection and inquiry.
- Engage participants in an experimental learning cycle, in which they rigorously compare actual results to expected results.

Designing an effective learning environment can be broken down into four segments: pre-work, setting the context, running the simulation, and post-simulation debrief. For an example of the workshop design created by the healthcare team, see "Sample Learning Lab Design."

1. Pre-Work

One of the risks of using a management flight simulator in a workshop setting is that the simulator can be treated as a "black box" or video game. If that happens, the objective becomes beating the game rather than understanding the underlying structures of the model. A pre-work package is designed to begin creating a "transparent box"—a simulation where the users know and accept the assumptions underlying the design. Ideally, participants should receive the pre-work package several days before the workshop, so they can have time to look over the material. Having people read the same materials and consider some key questions creates a common vocabulary and gets them thinking about the situation being modeled.

The first element of the pre-work package should explain the purpose of the simulation—the rules or guidelines for playing the game, what type of decisions can be made, and any other important background material on the me-

Definitions

Management Flight Simulator (also called a simulator)—Similar to an airline pilot's flight simulator, an MFS allows managers to test the outcome of different policies and decisions without "crashing and burning" real companies. It is based on a system dynamics computer model that has been changed into an interactive decision-making simulator through the use of an interface.

Computer Simulation Model—A computer model that allows you to map the relationships that are important to a problem or issue and then simulate the interaction of those variables over time.

Learning Laboratory—A learning laboratory takes a management flight simulator and embeds it in a learning environment. Participants use a variety of systems thinking tools to explore the dynamics of a particular issue and to inquire into their own understanding of the issue.

Interface—A graphics-based software design that turns a computer model into an interactive simulator, allowing participants to enter decisions on a quarter-by-quarter basis and see the outcome of their strategies over time in the form of standard reports and charts.

chanics of the simulation. A second part of the package should help users become familiar with the simulation interface, by demonstrating the layouts of the various screens, explaining the symbols and abbreviations, and listing other information the users will need to navigate the model.

The users of the simulation should also have some minimal and common understanding of the situation being modeled—the feedback structure, dynamics, and assumptions built into the model, and how that fits with the user's own mental models and understanding of the situation. Finally, since an MFS is a team activity, it is very helpful to include some introductory materials on team learning—particularly around mental models, productive conversations, and team learning cycles. This will provide a foundation for more productive interactions in the actual workshop.

2. Setting the Context

Once the participants have come together for the workshop, it is best to some spend time setting the context for the simulation before turning on the computers. This context setting is designed to engage the team in the concepts that have been introduced in the pre-work and to deepen their understanding of them.

Mental Models and Team Learning. A well-designed MFS will increase the users' awareness of their assumptions, will challenge those mental models, and ultimately will enhance them. This can occur much more effectively in group settings if the climate encourages safe, open dialogue and the participants have the right tools and skills at their disposal. Two tools that can be very useful in this process are the "Ladder of Inference" (see *The Fifth Discipline Fieldbook*, p. 242) and the "Left-Hand Column Exercise" (p. 246). The Ladder of Inference is designed to increase our awareness of how we interpret the data we see through our mental models, while the Left-Hand Column exercise demonstrates how our individual mental models can interfere with our ability to have useful, productive conversations. Providing opportunities for the participants to practice using these tools in the workshop will greatly enhance the learning environment.

Enrollment Process. It is also critical to the success of the workshop that participants are "enrolled" in the model—that it makes sense to them. One way of achieving this is to engage participants in their own "facilitated

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Sample Learning Lab Design

This healthcare learning laboratory was designed around a microworld that contains three modules. In Module I, "Creating Integrated Care," participants attempt to maximize the strategic and financial position for a single provider (or group of providers). In Module II, "Improving Health," participants seek to improve the health status of a defined population by managing health risks. In Module III, "Integrating Care and Improving Health," participants can develop approaches that combine the best of their integrated delivery and health improvement strategies from the first two modules in order to create a sustainable competitive advantage and healthier communities.

Day 1

1. Welcome and Introductions
2. Setting the Context for the Learning Experience
   - Key Challenges Facing Healthcare Organizations and Professionals
   - Key Issues Facing the Organization
   - The Need for "Better Ways" to Meet the Challenges
3. Introduction to the Five Disciplines of the Learning Organization
   - Descriptions and Stories of Personal Mastery, Mental Models, Team Learning, Shared Vision, and Systems Thinking
   - Using the Five Disciplines for Managing Change, Integrating Care, and Improving Health
4. Introduction to the Microworld Learning Experience
   - What Is a Microworld?
   - Its Value as a "Practice Field"
   - The Developmental History of the Healthcare Microworld
   - Key Elements of the Healthcare Microworld
   - Benefits to Participants
5. Entering the Microworld: Module I for Integrated Care
   - Overview of the Module: Assumptions, Decisions, etc.
   - Developing and Testing Strategies
   - Debriefing on What Happened and Why
   - Learnings and Lessons

Day 2

6. Module II: Creating Healthier Communities
   - Overview of the Module: Assumptions, Decisions, etc.
   - Developing and Testing Strategies
   - Debriefing on What Happened and Why
   - Learnings and Lessons
7. Module III: Integrated Care and Creating Healthier Communities
   - How Successful Strategies from Modules I and II Might Work Together
   - Developing and Testing Strategies
   - Debriefing on What Happened and Why
   - Learnings and Lessons
8. Wrap-up and Reflections
9. Taking the Microworld Home: Next Steps

The "Creating Integrated Care and Healthier Communities Microworld Learning Experience" was developed by Innovation Associates and New England Healthcare Assembly.

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modeling" process. Participants are presented with the same issues that faced the model builders, and then asked to explore questions that will reveal the key variables in the model, as well as the underlying relationship of those variables. In many groups it will be possible to actually create some causal loop diagrams around the issue, and to surface the assumptions participants have about the situation.

This process provides a good practice field for productive conversations, and it makes participants aware of both the strengths and limitations of the model itself. Hopefully, after doing this exercise, participants will be less likely to view the simulation as either a "game" or an "answer generator."

Review the Mechanics of the Simulation. Finally, before beginning the simulation, it is helpful to review the mechanics of the simulator by walking the participants through the interface, showing them where the information is and how to find it. This allows them to focus on the issues when they are playing the game, and not get bogged down by the mechanics of the software.

3. Running the Simulation

For an MFS to have maximum impact, the workshop in which it is embedded should be structured around a learning cycle of gathering observations, making assessments about them, designing new actions, implementing those actions, and gathering new observations (Observe-Assess-Design-Implement).

The first step in this process is to have the teams (usually 2-3 people per station) design a strategy that they'd like to test in the MFS. It is *very* important that they write down that strategy and the expected outcomes from it, so they will have a reference point to compare with the actual results once they have run the simulation. The more specific the strategy, the more valuable the exploration of the differences between expected and actual outcomes will be.

It is helpful to start with a practice round in which all of the teams use the same strategy and walk through the simulation together. By actually instructing people about what decisions to make and when, the facilitator gives people an opportunity to become familiar with the mechanics of the simulation and begin seeing what happens.

After the practice round, each team is free to make their own strategies. The remainder of the workshop should be structured around a continual cycle of experimentation and reflection: (1) design a strategy and write it down; (2) implement the strategy and run the simulation; (3) compare the results to expectations; (4) discuss the results, and run it again. This completes one full learning cycle (Observe-Assess-Design-Implement).

The discussion that follows each round of the simulation is where the best opportunity for learning occurs. When the obtained results are different from the predicted results, the tendency is to say, "Well, the model was wrong," or "That's not what I really meant to do." This is where the work on mental models and team learning can help open up a conversation in which the participants ask, "What might account for the differences between what I expected and what actually happened?"

It is very useful at this point to keep the initial conversation contained to the small work teams rather than the larger group, in order to facilitate more open conversation. The shared reflection time then becomes a mini-practice session around productive conversations and exploring mental models.

In the best case, this cycle of reflection and action happens several times as the participants test different strategies and reflect on the outcomes. Each time, they learn more about the underlying dynamics of the issue, and their own mental models of the situation.

4. Post-Simulation Debrief

Once the teams have had time to simulate and discuss several strategies, the larger group should come together for a structured debrief of the whole process. At this point, the questions move from the insights gained in the simulation to how these insights can be brought back into the real world. What will be the barriers and the bridges? How can the group generalize the learning to the actual work setting?

This portion of the conversation may involve next steps, or perhaps some discussion of metrics that need to be monitored back in the workplace, to get a better sense for how these dynamics might be at work in that setting. It may be that other areas of the model need to be explored. Or perhaps the need for another model-building process (to explore an area in greater depth) might emerge.

Organization-Wide Learning

The larger question that needs to be addressed when designing any learning environment is, "Is a learning laboratory an effective way to get from individual learning to group learning to organizational learning?" The answer will probably be "No" if the learning laboratory is viewed as a one-shot deal. In order to widen and deepen the learning throughout the organization, the learning laboratory will be most effective if it is part of a larger initiative. Just as the learning laboratory design is composed of continual learning cycles, the whole workshop experience works best when it is part of a larger ongoing process of action and reflection.

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