Social System Design Lab   Brown School

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Mental Models

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METHODS BRIEF SERIES **1.03**

A central principle of the systems thinking perspective is that system structures are supported and held in place by our underlying beliefs, mindsets, and goals (See Brief 1.01 - Systems Thinking Iceberg). Therefore, in order to transform and redesign systems we must also transform our mindsets. The purpose of this brief is to introduce the concept of mental models, and to discuss how system dynamics tools can be used to elicit, negotiate, and transform them.

+ CONCEPT

To illustrate the importance of mental models, let's review the famous parable of the blindfolded people and the elephant. Six blindfolded people approach an elephant in the wild. Without knowing what this creature is, they each touch a different part of the elephant. When asked, the one holding onto the trunk confidently says that an elephant is a snake! The one holding on onto the tail defiantly says, no, an elephant is a type of rope!. Each of these blindfolded folks are right from where they sit, but none have a complete understanding of the whole elephant. It's only when the people share their experiences of the *parts* with one another that they can come to understand the elephant as a *whole*.

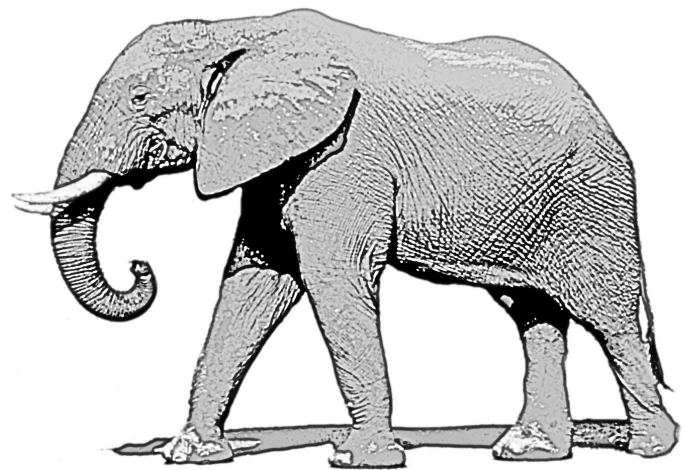*Figure 1: The parable of the elephant*

Image Credit: Felix Andrews CC BY-SA 3.0

Complex systems in which we work are like this elephant. Each of us has our own, valid mental picture of the parts, but our understanding of the whole is limited by our own unique vantage point.

Specific contributions for each author are as follows:
a: conceptualizing; b: writing; c: providing feedback; d: revising

+MENTAL MODELS

Mental models are our internalized pictures that help us make sense of "the elephant" – the messy, wicked problems that we encounter. In education, "the elephant" may be teacher turnover, school discipline, school mental health, chronic absenteeism, etc. Mental models are the cognitive "maps" that help us each, individually, understand the world around us. They are how we imagine in our minds that complex systems work. Whether or not we are aware of them, mental models help us navigate the systems we encounter in everyday life[1-2]. Our mental models influence how we define a problem, the language we use to describe it, and the actions we take to solve it.

Our mental models influence the actions we take to solve problems, but they are incomplete. None of us have complete knowledge of systems. Our understanding is informed by our lived experiences, values, assumptions, power, and biases. Just like the blindfolded people in the parable, students, families, administrators, teachers, and policymakers each have distinct views of the nature of a problem and how to act to change the problem. Because our mental models are inherently incomplete, our efforts to solve problems risk being ineffective, counterproductive, or even harmful.

Let's illustrate this idea through an example: A district wants to improve school lunches. Students, parents, school nurses, janitors, environmentalists, dieticians, and researchers each have a distinct view of what the problem with the lunches is, from cost, to packaging, to nutritional value, to taste. How should the district solve the problem if there isn't agreement on the problem in the first place?

> *"The only strategy people can act on is the one in their heads."*
> **—Laura Black**
> [4]

+SYSTEM DYNAMICS MODELING TO IMPROVE MENTAL MODELS

Luckily, Mental Models can be improved. The role of system dynamics is to improve our individual and collective mental models so our actions are more effective. When we create system dynamics maps and models, we get our mental models out of our minds and onto the paper. By making our mental models explicit, we can challenge them, negotiate them, and make them more complete.

Figure 2: System Dynamics to improve mental models
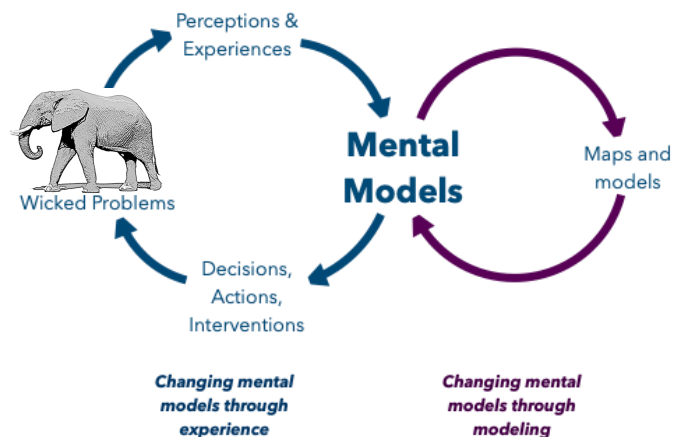
Group model building (GMB) is a process for bringing people together to develop a model of the system, to create shared insights and common language, and to build consensus for implementing change. While such processes may incite difficult conversations and disagreement, the they can help us to build a more complete picture of systems and, ultimately, create shared mental models for change. To build equitable and sustainable solutions to complex problems, we must uncover the whole "elephant," which requires amplifying the perspectives and voices of groups with differing vantage points.

Figure 1: Systems mapping at a group model building workshop as part of the Systems Thinking for Education Equity Partnership in St. Louis, MO

+ GETTING STARTED

- Think of a problem you care about and reflect: How have your experiences shaped your understanding of this problem? What assumptions, biases, roles or identities do you have that might be influencing this understanding?
- Think about the individuals or groups experiencing other parts of this "elephant". What are their experiences of the same problem?
- Think about the group with whom you will be working to solve this problem – What experiences or unique perspectives does each member of the group bring with them? What perspectives are missing? How will power dynamics impact the negotiation of mental models within this group?

+CONSIDERATIONS

Mental models are very **sticky.** While it is valuable to unpack our mental models and the experiences, biases, or positions that may inform them, we cannot assume that just by sharing assumptions, alone, broadens one's mental model or set of values and beliefs. In fact, mental models are resistant to change, especially among individuals who aren't personally experiencing any negative system effects.

Mental models are a key concept of systems thinking and, as such, most effective when utilized alongside other system thinking tools and approaches. By bringing our mental models "into the light of day," as Donella Meadows explains, through the iterative practice of systems thinking, we are able to test them against other evidence.

+ACKNOWLEDGEMENTS

- The ideas in this brief reflect current practice and teaching at the Social System Design Lab, and build on the shoulders of many ideas and concepts which are referenced in sources.
- The elephant visual in *Figure 2: System dynamics to improve mental models* was developed by Ellis Ballard, adapting visuals presented by Dr. Peter Hovmand, who built on concepts described by Philip Johnson-Laird.
- The school lunch example comes from the Social Justice Club – a systems thinking and service learning project in Jennings School District led by Carmen Stayton, Sarah Tolch, and Allie Farrell. .

+ SOURCES

1. Andrews, F. (2005). Elephant side-view Kruger [Photograph]. Wikimedia. https://commons.wikimedia.org/wiki/File:Elephant_side-view_Kruger.jpg CC BY-SA 3.0
2. Black, L. J. (2016). From Situated Action to Model Abstraction—And Back Again. Presented at the 2016 International System Dynamics Conference.
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5. Johnson-Laird, P. (1983). Mental models: Towards a cognitive science of language, inference and consciousness. Cambridge, MA: Harvard University Press.
6. Meadows, D. H. (2008). Thinking in systems: A primer. Chelsea Green Publishing.

+ SUGGESTED CITATION

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"Remember, always, that everything you know, and everything everyone knows, is only a model. Get your model our there where it can be viewed. Invite others to challenge your assumptions and add their own. Instead of becoming a champion for one possible explanation or hypothesis or model, collect as many as possible."

– Donella Meadows, Thinking in Systems

+ ABOUT THE SERIES

Social System Design Lab Methods Briefs are short, digestible notes on applications of system dynamics and systems thinking in community settings. They are meant to capture and share out our current thinking on core ideas.

"Series 1: Systems Thinking Foundations" focuses on introducing core concepts of systems thinking and system dynamics as they relate to issues of education equity. This series draws from community-based modeling work with educators and students over the last ten years. Other briefs in this series include:

- Systems Thinking Iceberg | **1.01**
- Characteristics of Complex Problems | **1.02**
- Framing Dynamic Problems | **1.04**
- Understanding Systems from a Feedback Perspective | **1.05**
- Accumulations | **1.06**
- System Archetypes | **1.07**

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