



SYSTEMS THINKING: WHAT, WHY, WHEN, WHERE, AND HOW?

BY MICHAEL GOODMAN

If you're reading *The Systems Thinker®*, you probably have at least a general sense of the benefits of applying systems thinking in the workplace. But even if you're intrigued by the possibility of looking at business problems in new ways, you may not know how to go about actually using these principles and tools. The following tips are designed to get you started, whether you're trying to introduce systems thinking in your company or attempting to implement the tools in an organization that already supports this approach.

What Does Systems Thinking Involve?

It's important to remember that the term "systems thinking" can mean different things to different people. The discipline of systems thinking is more than just a collection of tools and methods—it's also an underlying philosophy. Many beginners are attracted to the tools, such as causal loop diagrams and management flight simulators, in hopes that these tools will help them deal with

persistent business problems. But systems thinking is also a sensitivity to the circular nature of the world we live in; an awareness of the role of structure in creating the conditions we face; a recognition that there are powerful laws of systems operating that we are unaware of; a realization that there are consequences to our actions that we are oblivious to.

Systems thinking is also a diagnostic tool. As in the medical field, effective treatment follows thorough diagnosis. In this sense, systems thinking is a disciplined approach for examining problems more completely and accurately before acting. It allows us to ask better questions before jumping to conclusions.

Systems thinking often involves moving from observing events or data, to identifying patterns of behavior over time, to surfacing the underlying structures that drive those events and patterns. By understanding and changing structures that are not serving us well (including our mental models and perceptions), we can expand the choices available to us and create more satisfying, long-term solutions to chronic problems.

In general, a systems thinking perspective requires curiosity, clarity, compassion, choice, and courage. This approach includes the willingness to see a situation more fully, to recognize that we are interrelated, to acknowledge that there are often multiple interventions to a problem, and to champion interventions that may not be popular (see "The Systems Orientation: From Curiosity to Courage," V5N9).

Why Use Systems Thinking?

Systems thinking expands the range of choices available for solving a problem by broadening our thinking and helping us articulate problems in new and dif-

ferent ways. At the same time, the principles of systems thinking make us aware that there are no perfect solutions; the choices we make will have an impact on other parts of the system. By anticipating the impact of each tradeoff, we can minimize its severity or even use it to our own advantage. Systems thinking therefore allows us to make informed choices.

Systems thinking is also valuable for telling compelling stories that describe how a system works. For example, the practice of drawing causal loop diagrams forces a team to develop shared pictures, or stories, of a situation. The tools are effective vehicles for identifying, describing, and communicating your understanding of systems, particularly in groups.

When Should We Use Systems Thinking?

Problems that are ideal for a systems thinking intervention have the following characteristics:

- The issue is important.
- The problem is chronic, not a one-time event.
- The problem is familiar and has a known history.
- People have unsuccessfully tried to solve the problem before.

Where Should We Start?

When you begin to address an issue, avoid assigning blame (which is a common place for teams to start a discussion!). Instead, focus on items that people seem to be glossing over and try to arouse the group's curiosity about the problem under discussion. To focus the conversation, ask, "What is it about this problem that we don't understand?"

In addition, to get the full story out, emphasize the iceberg framework. Have the group describe the problem

TIPS FOR BEGINNERS

- Study the archetypes.
- Practice frequently, using newspaper articles and the day's headlines.
- Use systems thinking both at work and at home.
- Use systems thinking to gain insight into how others may see a system differently.
- Accept the limitations of being inexperienced; it may take you a while to become skilled at using the tools. The more practice, the quicker the process!
- Recognize that systems thinking is a lifelong practice.

from all three angles: events, patterns, and structure (see “The Iceberg”).

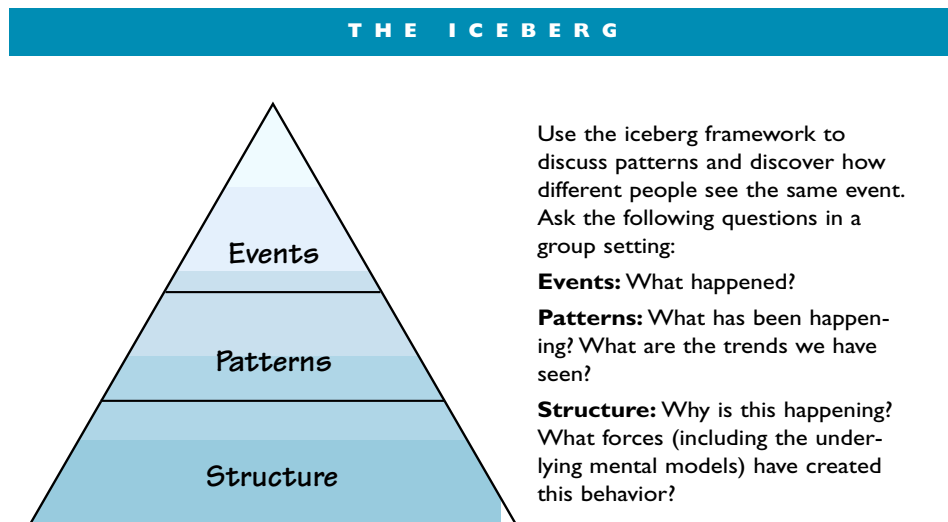
Finally, we often assume that everyone has the same picture of the past or knows the same information. It’s therefore important to get different perspectives in order to make sure that all viewpoints are represented and that solutions are accepted by the people who need to implement them. When investigating a problem, involve people from various departments or functional areas; you may be surprised to learn how different their mental models are from yours.

How Do We Use Systems Thinking Tools?

Causal Loop Diagrams. First, remember that less is better. Start small and simple; add more elements to the story as necessary. Show the story in parts. The number of elements in a loop should be determined by the needs of the story and of the people using the diagram. A simple description might be enough to stimulate dialogue and provide a new way to see a problem. In other situations, you may need more loops to clarify the causal relationships you are surfacing.

Also keep in mind that people often think that a diagram has to incorporate all possible variables from a story; this is not necessarily true. In some cases, there are external elements that don’t change, change very slowly, or whose changes are irrelevant to the problem at hand. You can unnecessarily complicate things by including such details, especially those over which you have little or no control. Some of the most effective loops reveal connections or relationships between parts of the organization or system that the group may not have noticed before.

And last, don’t worry about whether a loop is “right”; instead, ask



yourself whether the loop accurately reflects the story your group is trying to depict. Loops are shorthand descriptions of what we perceive as current reality; if they reflect that perspective, they are “right” enough.

The Archetypes. When using the archetypes, or the classic stories in systems thinking, keep it simple and general. If the group wants to learn more about an individual archetype, you can then go into more detail.

Don’t try to “sell” the archetypes; people will learn more if they see for themselves the parallels between the archetypes and their own problems. You can, however, try to demystify the archetypes by relating them to common experiences we all share.

How Do We Know That We’ve “Got It”?

Here’s how you can tell you’ve gotten a handle on systems thinking:

- You’re asking different kinds of questions than you asked before.
- You’re hearing “catch phrases” that raise cautionary flags. For example, you find yourself refocusing the discussion

when someone says, “The problem is we need more (sales staff, revenue).”

- You’re beginning to detect the archetypes and balancing and reinforcing processes in stories you hear or read.
- You’re surfacing mental models (both your own and those of others).
- You’re recognizing the leverage points for the classic systems stories.

Once you’ve started to use systems thinking for inquiry and diagnosis, you may want to move on to more complex ways to model systems—accumulator and flow diagrams, management flight simulators, or simulation software. Or you may find that adopting a systems thinking perspective and using causal loop diagrams provide enough insights to help you tackle problems. However you proceed, systems thinking will forever change the way you think about the world and approach issues. Keep in mind the tips we’ve listed here, and you’re on your way! ■

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What Is Systems Thinking in Education? Understanding Functions and Interactions in School Systems

July 28, 2020

<https://soeonline.american.edu/blog/systems-thinking-in-education/>

Schools, districts, and classrooms are dynamic environments, full of energy and talent. Managing them calls for creative leadership and teaching approaches. Leaders in education need to anticipate how interconnected aspects of schools interact and affect each other.

Systems thinking in education offers a valuable approach for teachers working to build student engagement. The approach also helps leaders organize schools by harnessing their assets. American University's [EdD in Education Policy and Leadership](#) trains educators to apply systems thinking and other effective leadership approaches to transforming schools for the better.



The Systems Thinking Model

An education system is composed of many interdependent components working together. How well these components operate and interact determines the system's health.

Education systems at the national, state, and local levels consist of interacting parts, including:

- Laws and regulations
- Funding and funding policies
- Schools and administrative offices
- Teachers and staff
- Books, computers, and instructional materials
- Students, parents, and communities

Those seeking to improve an education system might choose to analyze the system's parts. In this way, they can identify individual characteristics of each part and evaluate how it functions. While this approach can offer some benefits, it has limitations. It stops short of examining the relationships between the parts.

For example, limited school funding might result in high student-teacher ratios and inadequate supplies for students. These factors then lead to lower levels of student achievement which, in turn, puts further strain on teachers to help their students meet achievement benchmarks, and so on.

Responding to the growing demands placed on US education, solving problems such as achievement gaps, and dealing with shrinking school budgets are significant challenges. To face them effectively, educators need to value their system's high level of interconnectivity and interdependency.

Applying Systems Thinking in Education

Systems thinking is a mindset that helps educators understand the complex education system in a more holistic way. Teachers and administrators using systems thinking might ask questions such as:

- How might cuts to arts education impact student performance in math?
- How can policies linking teacher salaries to standardized test scores affect a low-achieving school's ability to attract accomplished teachers?

The goal is to consider several possible scenarios to find solutions to interconnected challenges.

Helping teachers solve classroom management issues, for instance, may involve addressing missing support structures in classrooms, such as a need for special education teachers, or adjusting student schedules to give time and space for children to unwind and release their energy.

As a mindset, systems thinking guides educators to deliver thought-provoking, engaging lessons. It encourages school leaders to coordinate districts and manage schools with improved efficiency. It can also replace piecemeal approaches to implementing policies with organized and systematic approaches that bring success across the board.

Specifically, educators can use systems thinking as a framework to structure classrooms and deliver instruction, while school and district leaders can apply it to their management and organizational styles. Additionally, administrators can use systems thinking as an approach to restructuring educational systems or schools.

Systems Thinking in the Classroom

Systems thinking can be a powerful classroom tool, giving students a participatory role in the learning process. By viewing teaching through a systems thinking lens, educators can help students recognize how seemingly disparate systems interact, identifying meaningful connections in the world around them. This not only deepens students' understanding of specific subjects, but also strengthens their critical thinking abilities.

For example, teachers at Orange Grove Middle School in Tucson, Arizona, used a systems thinking approach to develop a project that strengthened their students' abilities to analyze and problem solve. They tasked students with developing plans for a new national park that met specific design requirements: parks needed to be attractive to users, inflict limited environmental harm, and respect an Indian burial ground on the chartered land.

During the process of developing their designs, students discovered connections between the social, ecological, and economic components of the project.

Leadership and Systems Thinking

Systems thinking in education empowers education leaders to align school initiatives, improve instruction, increase efficiency, eliminate waste, and strengthen student outcomes.

For example, by closely monitoring student data, administrators can adjust budgets to allow for the purchase of the instructional materials they need most.

A systems thinking approach lets administrators build systems that do the following:

- Recognize and adapt to changes (technological advances, policy reforms), coordinating with other parts of the system fluidly
- Include mechanisms that allow for self-reflection and self-correction
- Process information quickly and make it available to all parts of the system
- Distinguish between situations that need adjustments and those that need overhauls

<https://www.edutopia.org/article/teaching-k-12-students-systems-thinking/>

Teaching Students About Systems Thinking

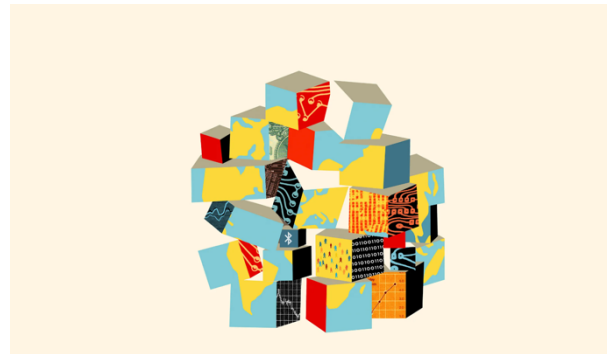
These strategies guide students to explore the interconnected parts of complex systems like the human body, governments, and ecosystems.

By [Carla Marschall](#)

January 12, 2024

Our world is interconnected and complex. As a result, our students need to move beyond fragmented ways of thinking, which look at problems in isolation or focus on short-term solutions. By developing our students to be systems thinkers, we can enable them to see patterns and organize their learning both inside and outside of school.

Otto Steininger / Ikon Images



Let's break this idea down by first describing what we mean by a system. Generally speaking, a system is a group of interconnected elements that are organized for a function or a purpose. System elements, or parts, may be physical or intangible things.

Importantly, system parts are interdependent. A change in one element can produce change within the entire system. This means systems are nonlinear. When consequences occur, they're not isolated. They ripple through a system. Systems we encounter daily include the human body, cities, governments, social networks, and the Earth's climate.

To give a narrative example, in Dr. Seuss's well-known book *The Lorax*, the parts of the system are things like the water, air, Truffula Fruits, Brown Bar-ba-loots, and Humming-Fish, as well as the Once-ler's greed and desire for economic growth above all else. Imagine if the Once-ler had truly understood how his behaviors impacted the Truffula Tree ecosystem, including the sustainability of his own Thneed production. His inability to think holistically led not only to a range of negative environmental consequences, but also to the collapse of his own business.

In a global issue such as plastic pollution, system parts may include crude oil production, plastic manufacturing, companies, consumers, wastewater, and greenhouse gas emissions.

SYSTEMS THINKING HELPS STUDENTS MANAGE COMPLEXITY

Systems thinking is a mindset as well as a set of tools that enables students to recognize and understand relationships and interconnectedness. It's an ability to toggle between the parts and the whole of a system to understand how interactions produce negative or positive behaviors.

Systems thinking supports our students to understand the complexity of the world and manage its uncertainty, especially in a time of increased globalization; it is an essential component of critical thinking that teachers can apply across the curriculum. For example, using systems thinking, students can do the following:

- Chart character development in a piece of literature with [behavior-over-time graphs](#)
- Map nonlinear causes and consequences of historical or political conflicts
- Understand the relationships between parts of a cell, as well as between cells, organs, and body systems
- Analyze and take action on real-world issues, such as global warming, poverty, or overfishing

Teachers, curriculum coordinators, and school leaders can also use systems thinking tools, such as Agency by Design's [Mapping Systems protocol](#), to better understand the way parts of our educational system connect to produce positive or negative outcomes for students, such as lower attendance, higher referrals to learning interventions, or increased mental health issues.

FOSTERING SYSTEMS THINKING AS CRITICAL THINKING

There are a number of ways teachers can facilitate systems thinking in the classroom. By slightly shifting how we interact with students—our questions or thinking prompts—we can promote “thinking in systems.”

Question with intention: Knowing we want to move away from “A leads to B” linear thinking, we can intentionally ask questions that encourage students to reflect on multiple parts of a system and how they connect. Instead of asking, “What caused this?” which communicates that there is a single cause, we can instead ask, “What factors contributed to this?” allowing students to search for multiple causes and nonlinear relationships.

Take a helicopter view: Toggling between the details and the big picture is an important systems thinking skill and one of the [habits of a systems thinker](#). When looking at a situation, event, or particular issue, encourage students to discuss systems as a whole. For example, in the classroom we may create a circle, where each student represents a system part and makes connections with a ball of string. Students name how they connect to another system part as they toss the

ball of string to one another, with each student retaining some of the string as they pass the ball around. At the end, students can see the interconnectedness of parts by gently tugging on the yarn and seeing who is affected.

Encourage pattern recognition: We want students to see the web of interconnections within systems and recognize how systems connect to other systems. During the Covid-19 pandemic, for instance, we saw how health systems impacted transportation and the economy, leading to certain goods being unavailable. By asking, “What’s this got to do with that?” we nudge students to go both deep and wide in an investigation.

STRATEGIES FOR TEACHING SYSTEMS THINKING

Many strategies for systems thinking encourage students to visualize and create “system pictures.” Because of the high degree of interaction within systems, many strategies invite students to map connections in nonlinear ways. Here are some concrete strategies we can use in the classroom.

Connected circles: In this strategy, a circle represents a particular system, and the parts of the system are written around the outside. Using a case study such as an article, video, or real-life experience, students chart connections across the parts of the circle, writing the relationship between parts on the connector line. A [connected circles template](#) can be modified for any system that students will explore.

Systems models: After researching a system such as a tropical rainforest or coral reef, students create a systems model using divergent physical materials, e.g. Lego, magnetic tiles, wooden blocks, paper, cotton balls, shells, stones, etc. After making representations of the system and its parts, students annotate the model with sticky notes, arrows, etc. to show relationships between them. This may also include inputs and outputs of the system. For example, sunlight and carbon dioxide go into the rainforest (inputs), and oxygen and water vapor come out (outputs).

Games and simulations: Matthew Farber has written extensively about [the use of constructionist gaming](#) to promote thinking about complex systems. He shows how making and thinking come together to allow students to play with systems. The Joan Ganz Cooney Center at Sesame Workshop also writes about the [role of digital learning](#) to promote understanding of systemic causes in young children.

By inviting students to play with and explore systems thinking tools, we enable them to see structures and patterns within and across the content areas. Such engagements can empower students to find solutions to local, global, and intercultural issues that may have previously seemed unsolvable.