Introduction to Systems Thinking for Early Childhood Leaders

CEELO Leadership Academy
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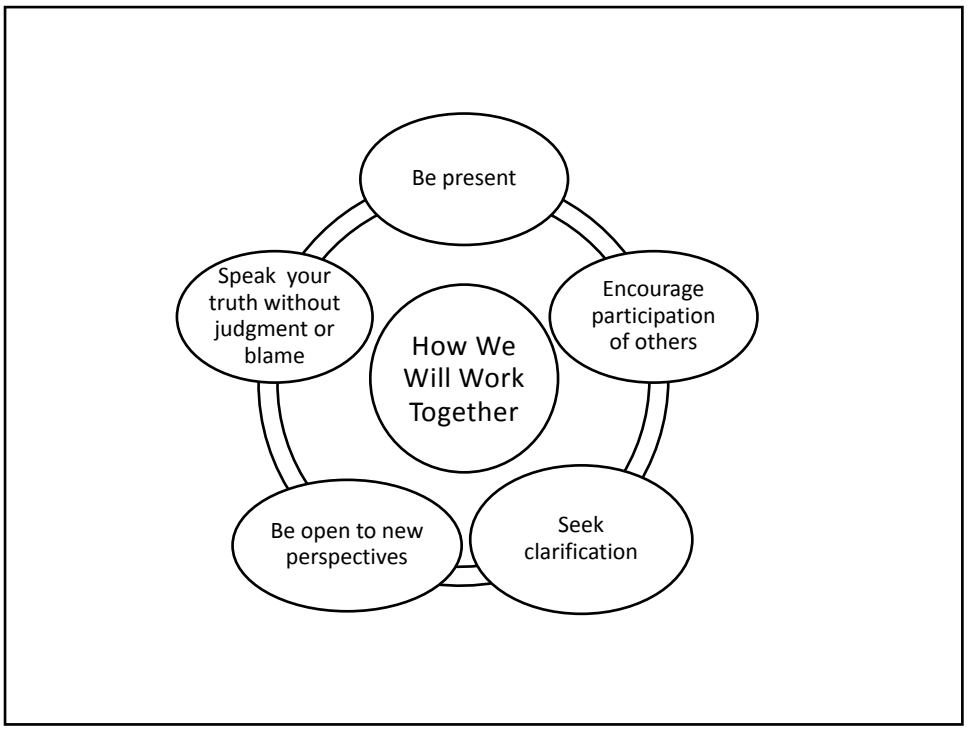
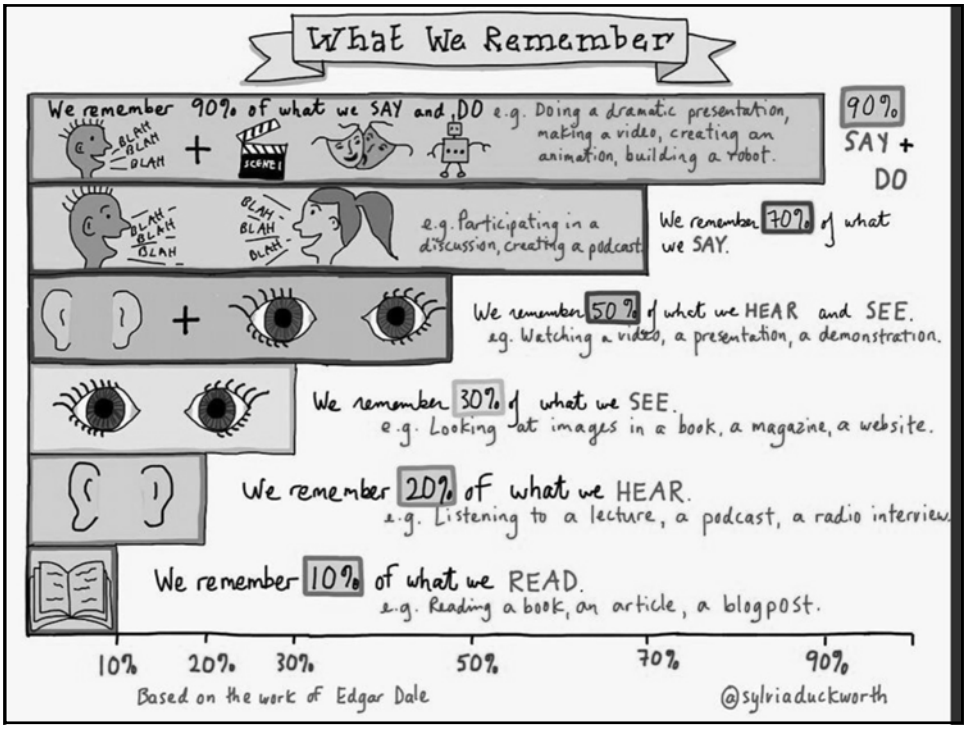

Be present
Speak your truth without judgment or blame
How We Will Work Together
Encourage participation of others
Be open to new perspectives
Seek clarification


What We Remember
We remember 90% of what we SAY and DO e.g. Doing a dramatic presentation, making a video, creating an animation, building a robot.
90% SAY + DO
BLAH BLAH BLAH
SCENE 1
e.g. Participating in a discussion, creating a podcast.
We remember 70% of what we SAY.
We remember 50% of what we HEAR and SEE. e.g. Watching a video, a presentation, a demonstration.
We remember 30% of what we SEE. e.g. Looking at images in a book, a magazine, a website.
We remember 20% of what we HEAR. e.g. Listening to a lecture, a podcast, a radio interview.
We remember 10% of what we READ. e.g. Reading a book, an article, a blogpost.
10% 20% 30% 50% 70% 90%
Based on the work of Edgar Dale
@sylviaduckworth

Systems Simulation Debreif

Observers:

What did you observe during the simulation?

What rules or policies were in place to generate the dynamics you observed?

What theories do you have about the organizational structure of this system?

How challenging was it to understand the system just by observing it?

Participants:

What did you notice during the simulation?

What was your experience like as a participant in this activity?

How was this activity like a system?

Who in the simulation had the most influence? Why?

Adapted from The Systems Thinking Playbook, by Linda Booth Sweeney and Dennis Meadows

Characteristics of Complex Systems

All systems have boundaries.
System boundaries include:

spatial (size of the system) and temporal (time frame)

Most systems have subsystems that are nested and interconnected.
For example, schools are subsystems of school districts and classrooms are subsystems of schools.

Systems also have:

Elements or Parts
Examples include people, policies and resources

Interconnections or Relationships among the Parts
A system consists of interconnected parts. The word "interdependence" is sometimes used to describe system relationships.

Dynamics
Systems tend not to stand still and continually change and adjust over time.

Goal or Purpose
All systems have goals or purposes. Some goals are explicit and others are implicit.

My Organization:_____ as a System

(Be prepared to share your responses with others at your table)

Name 4 important elements/parts of your system.

1.

2.

3.

4.

What are 2 changes your system is currently experiencing?

1.

2.

What are 3 other systems that interact with your organization system?

1.

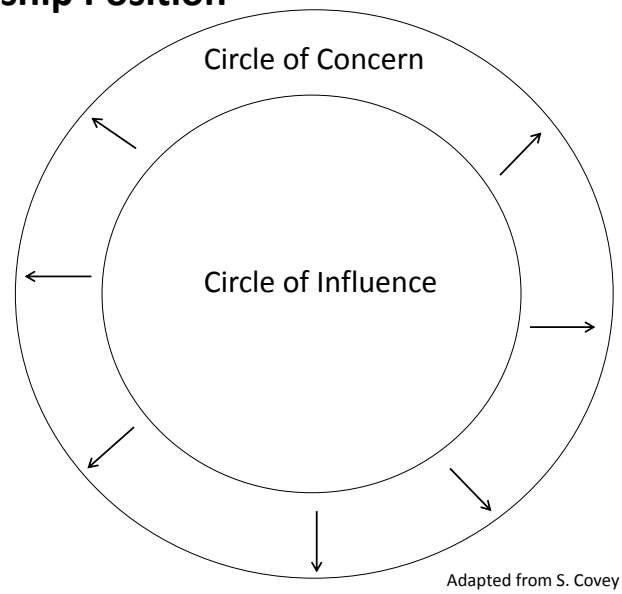
2.

3.

Describe 1 goal or purpose of your system.

1.

Influential Leadership Position

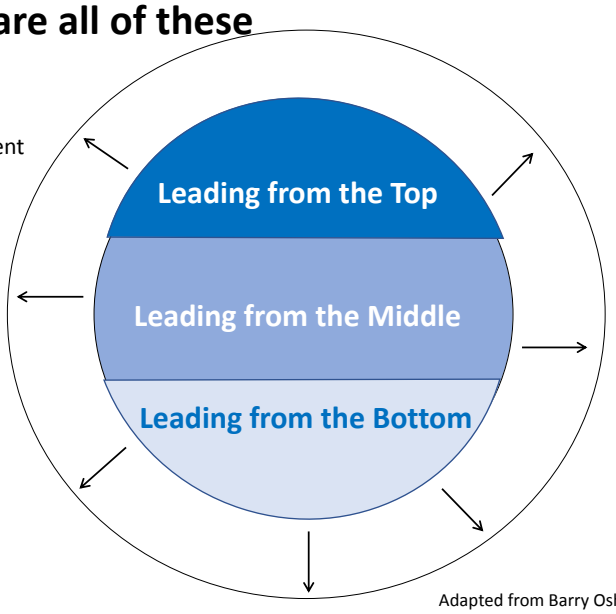


Adapted from S. Covey
The 7 Habits of Highly Effective People

Most likely you are all of these

Top Leaders have overall responsibility for some segment of the organization or some organizational function, whether as division head, project manager, team leader, instructor, and so on.

Bottom Leaders have limited control over the resources needed to move projects or initiatives forward.



Middle Leaders attempt to function between the conflicting needs, demands, and priorities of others.

Adapted from Barry Oshry and David DeVane

What is systems thinking?

Systems thinking offers you a powerful new perspective, a specialized language, and a set of tools that can be used in your everyday life and work. Systems thinking is a way of understanding reality that emphasizes the relationships among a system's parts, rather than the parts themselves.

Why Is Systems Thinking Important?

Systems Thinking can help you

- design smart, enduring solutions to problems
- achieve meaningful outcomes
- create desired futures

In its simplest sense, systems thinking gives you a more accurate picture of reality, so that you can work with a system's natural forces in order to achieve the results you desire. It also encourages you to think with an eye toward the long view—for example, how might a particular solution you're considering play out over the long run? And what unintended consequences might it have? Finally, systems thinking is founded on some basic, universal principles that you will begin to detect in all areas of life once you learn to recognize them (see Habits of a Systems Thinker).

What Are Systems?

A system is a group of interacting, interrelated, and interdependent components that form a complex and unified whole. Systems are everywhere—for example, the R&D department in your organization, the circulatory system in your body, the predator/prey relationships in nature, the ignition system in your car, and so on. Ecological systems and human social systems are living systems; human-made systems such as cars and washing machines are nonliving systems. Most systems thinkers focus their attention on living systems, especially human social systems. However, many systems thinkers are also interested in how human social systems affect the larger ecological systems in our planet.

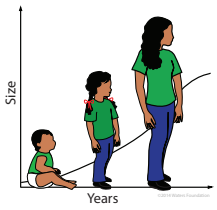
Systems Thinking as a Perspective: Events, Patterns, or System?

Systems thinking is a perspective because it helps us see the events and patterns in our lives in a new light—and respond to them in higher leverage ways. For example, suppose a fire breaks out in your town. This is an **event**. If you respond to it simply by putting the fire out, you're reacting. (That is, you have done nothing to prevent new fires.) If you respond by putting out the fire and studying where fires tend to break out in your town, you'd be paying attention to **patterns**. For example, you might notice that certain neighborhoods seem to suffer more fires than others. If you locate more fire stations in those areas, you're adapting. (You still haven't done anything to prevent new fires.) Now suppose you look for the **systems**—such as smoke-detector distribution and building materials used—that influence the patterns of neighborhood-fire outbreaks. If you build new fire-alarm systems and establish fire and safety codes, you're creating change. Finally, you're doing something to prevent new fires!

This is why looking at the world through a systems thinking "lens" is so powerful: It lets you actually make the world a better place.

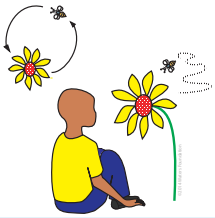
Seeks to understand the big picture

Observes how elements within systems change over time, generating patterns and trends



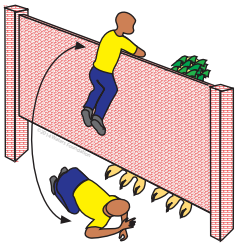
Recognizes that a system's structure generates its behavior

Identifies the circular nature of complex cause and effect relationships

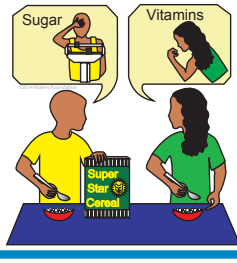


Makes meaningful connections within and between systems

Changes perspectives to increase understanding

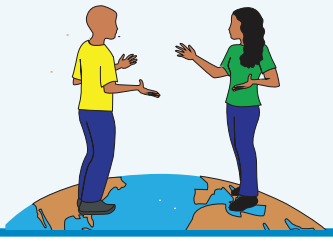


Surfaces and tests assumptions



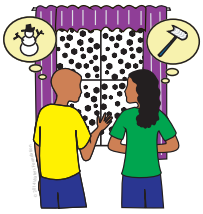
Habits of a Systems Thinker

Second Edition ©2014, 2010



Considers an issue fully and resists the urge to come to a quick conclusion

Considers how mental models affect current reality and the future



Uses understanding of system structure to identify possible leverage actions

Considers short-term, long-term and unintended consequences of actions

Pays attention to accumulations and their rates of change

Recognizes the impact of time delays when exploring cause and effect relationships

Checks results and changes actions if needed: "successive approximation"

Habits of a Systems Thinker Exercises

Review each of the 14 Habits of a Systems Thinker cards.

Habits Shuffle

Make 3 piles of cards:

1. Habits of a systems thinker that you see as your **personal strengths**
2. Habits of a systems thinker that you see as **personal growth areas**
3. Habits of a systems thinker that you **do not yet understand**.

Choose 2 of your **strengths** from pile #1. Think of a story or example that you would be willing to share, that illustrates how you have put each of those 2 habits into action.

Pair up with a person not at your table who has chosen different habits and take turns sharing one of your stories.

Repeat the process focusing on your 2nd habit with another person.

Which habits of a systems thinker do you see as most important to your work as a site leader?

Leaders We Know

Think of a leader you hold as a role model. This person could be famous or one you know personally or one with whom you have worked.

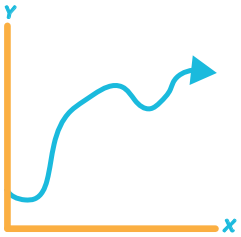
Write his or name here_____

Go through your habits cards and choose one habit that you see this person consistently practicing. This leader could serve as a model for your chosen Habit of a Systems Thinker. Be prepared to explain why you chose the habit for your leader.

Write your chosen habit here_____

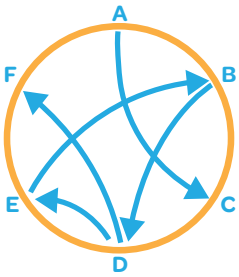
_____

The Visual Tools of Systems Thinking



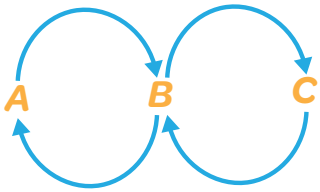
Behavior-Over-Time Graph

Tool that illustrates patterns & trends. Demonstrates how something changes over time.



Connection Circle

Tool that helps you see causal connections within & between systems.

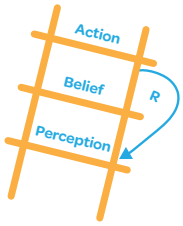


Causal Loop Diagram or *Feedback Loop*

Tool to show the casual relationships that exist between elements or variables. Arrows are used to illustrate causality.

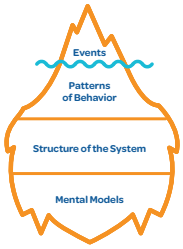
Stock and Flow Map

Tool to map out and draw attention to accumulations and their rates of change. Assists with understanding changing elements and the identification of leverage in a system.



Ladder of Inference

Tool that is helpful in recognizing behavior in systems – surfacing and testing assumptions.



Iceberg Model

A framework that applies systems thinking tools and habits to the understanding of complex systems.

Iceberg... Seeing What's Below the Surface

Deeper Learning

What happened?

Events

What is Seen

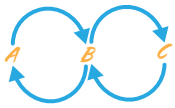
Behavior-Over-Time Graphs

What has been happening?
What are the trends?
What changes have occurred?

Patterns of Behavior

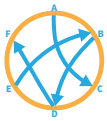
What is Unseen

Leverage



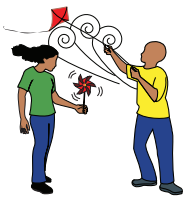
Causal Loops

Stock-Flow Maps and Computer Models

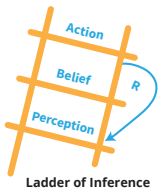


Connection Circles

What has influenced the patterns?
(e.g. policies, laws, physical structures)
What are the relationships among the parts?

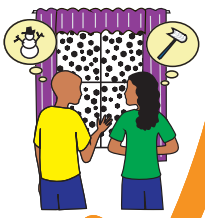


Structure of the System



Ladder of Inference

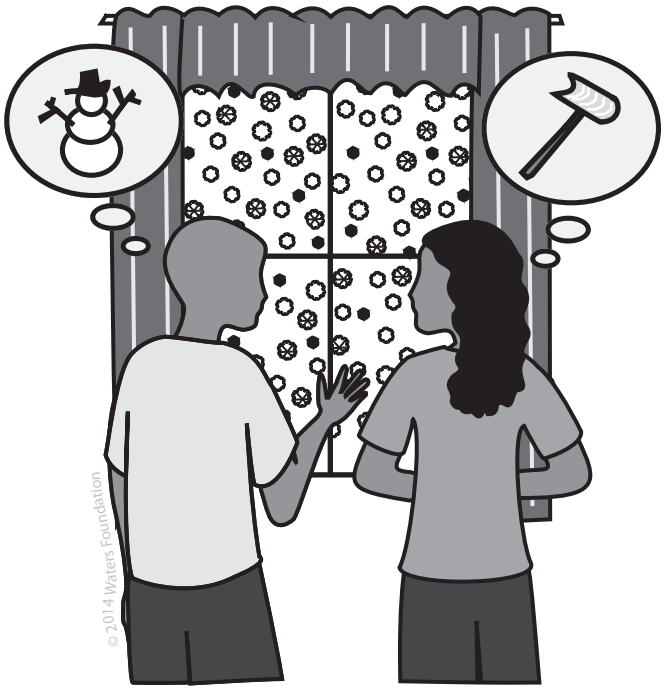
What assumptions, beliefs, and values
do people hold about the system?



Mental Models

Mental Models

Mental models are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action.



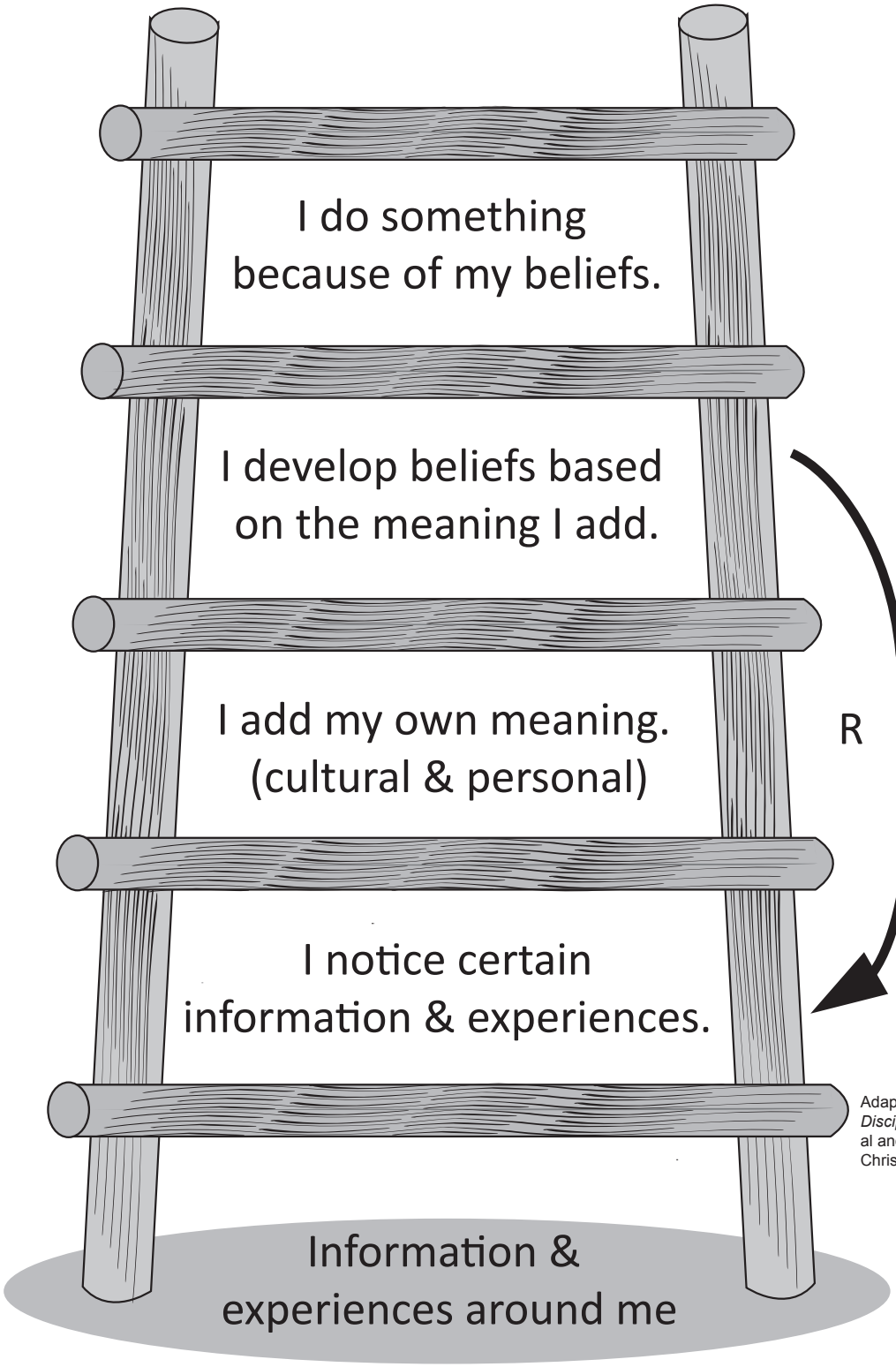
A systems thinker considers how mental models affect current reality and the future.

Exercise: "Have I ever?"
Each person reads a question on a slip of paper that begins with "Have I ever…?" Take turns responding either "yes" or "no" based on what you believe about that person's experience.

What are you choosing to pay attention to as you answer "yes" or "no" for each person in your group?

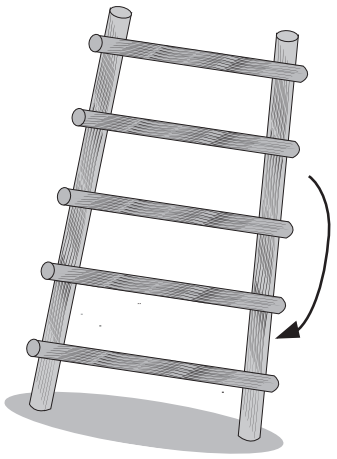
How do our mental models about those we work with develop over time?

Ladder of Inference



Adapted from *The Fifth Discipline Fieldbook*, Senge et al and originally created by Chris Argyris.

Practices that Help You Use the Ladder of Inference



Reflection

- Suspend judgment.
- Become more aware of your own thinking and broaden your observations.

Inquiry

- Inquire into others' thinking and reasoning.
- Ask open-ended questions that seek clarification.

Advocacy

- Make your thinking and reasoning more visible to others by describing what influenced your thinking and your actions.

Notes

Ladder of Inference Practice Scenarios

1. **With a partner, select a scenario** that most closely relates to your work situation. Discuss the fictitious scenario and add context to increase the relevancy.

2. **Consider the problem.**
   - What might contribute to the different perspectives of all people involved with the scenario?

3. Which **Habits of a Systems Thinker** will be important in addressing the challenge in your scenario?

4. **Use the Ladder of Inference.**
   - How could *reflection, inquiry and/or advocacy* be used to manage movement up and down the ladder of inference as you think through your challenge?

5. **Consider unintended consequences of possible solutions/responses**.
   - What unintended consequences should be considered before taking action or responding?

CEELO Leadership Academy Practice Scenarios

1. Various stakeholders have been meeting over the past few months to discuss accountability measures for infant/toddler care and preschools. A good number of individuals would like to see a transition from QRIS to CLASS. While others see the value of ECERS-R/ITERS-R because of their own past experience. You are facilitating the process and are unsure how to bridge the divide as there are so many strong opinions.

2. You are meeting with a group of Head Start Directors and want to encourage them to join a network you are initiating with District and School administrators to help bridge the transitional gap between preschool and kindergarten. Many of the Head Start Directors have voiced reluctance because, "We've tried that before and nothing came of it."

3. One of your goals as a state affiliate is to increase the quality of early childhood learning environments. Your data indicates many early childhood teachers and directors in the field with low skills, very little if any post-high school education and very low compensation. Despite your efforts to provide excellent professional development opportunities, very few take advantage and lack motivation to build new skills.

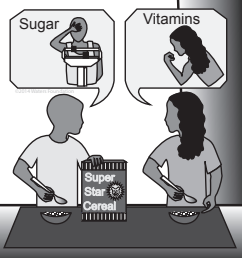
4. You were just promoted to your position as a state level director/chief. You have inherited a team that has very strong and long-held opinions about policy and accountability systems that differ from your own. Members of your new team have been working at the state level for many years and seem to be holding on to outdated practices. You are among the youngest member of the team and as the new leader sense some tension. You are very knowledgeable about current research and were hired to bring the department to more up-to-date, research-based practices to influence policy.

5. You are in the middle of two camps of thought in PreK state standards development. One side believes strongly in developmentally appropriate play-based PreK. The other side is concerned about kindergarten readiness and believes that PreK needs to be more academically structured so that 5-year-olds will come to kindergarten as readers who can also demonstrate basic math fluencies.

Ladder of Inference

I do something based on my beliefs

I develop beliefs based on the meaning I add.

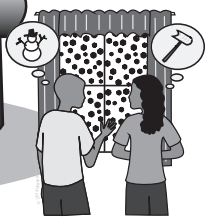


I add my own meaning (cultural & personal).

I notice certain information & experiences.

R

My beliefs affect what I choose to notice in the future.



Information & experiences around me

Adapted by Waters Foundation from *The Fifth Discipline Fieldbook*, Senge et al and originally created by Chris Argyris.

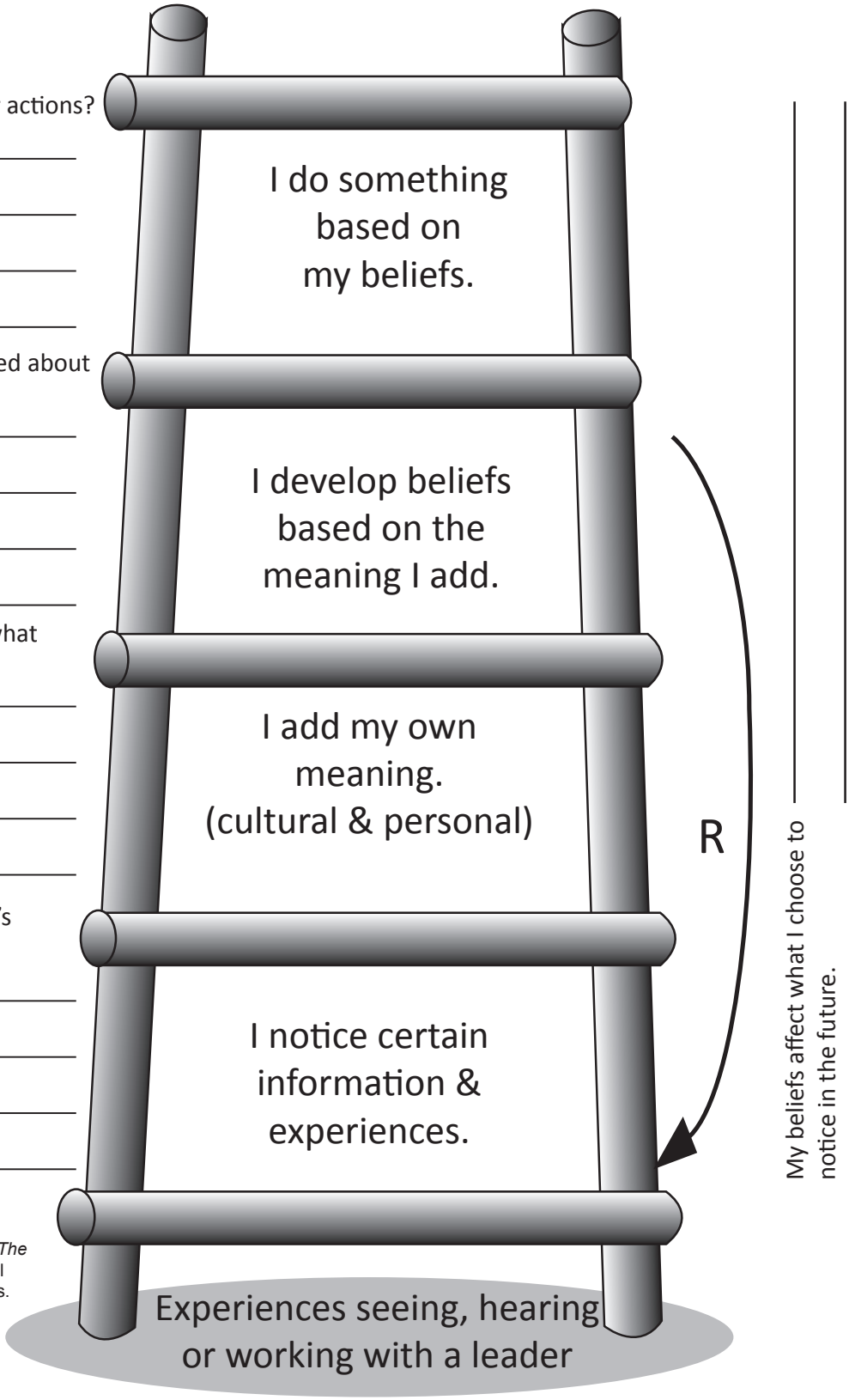
Ladder of Inference – What is Successful Leadership?

How do your beliefs affect your actions?

What beliefs have you developed about leadership?

What meaning do you add to what you notice?

What do you notice in a leader's behavior?



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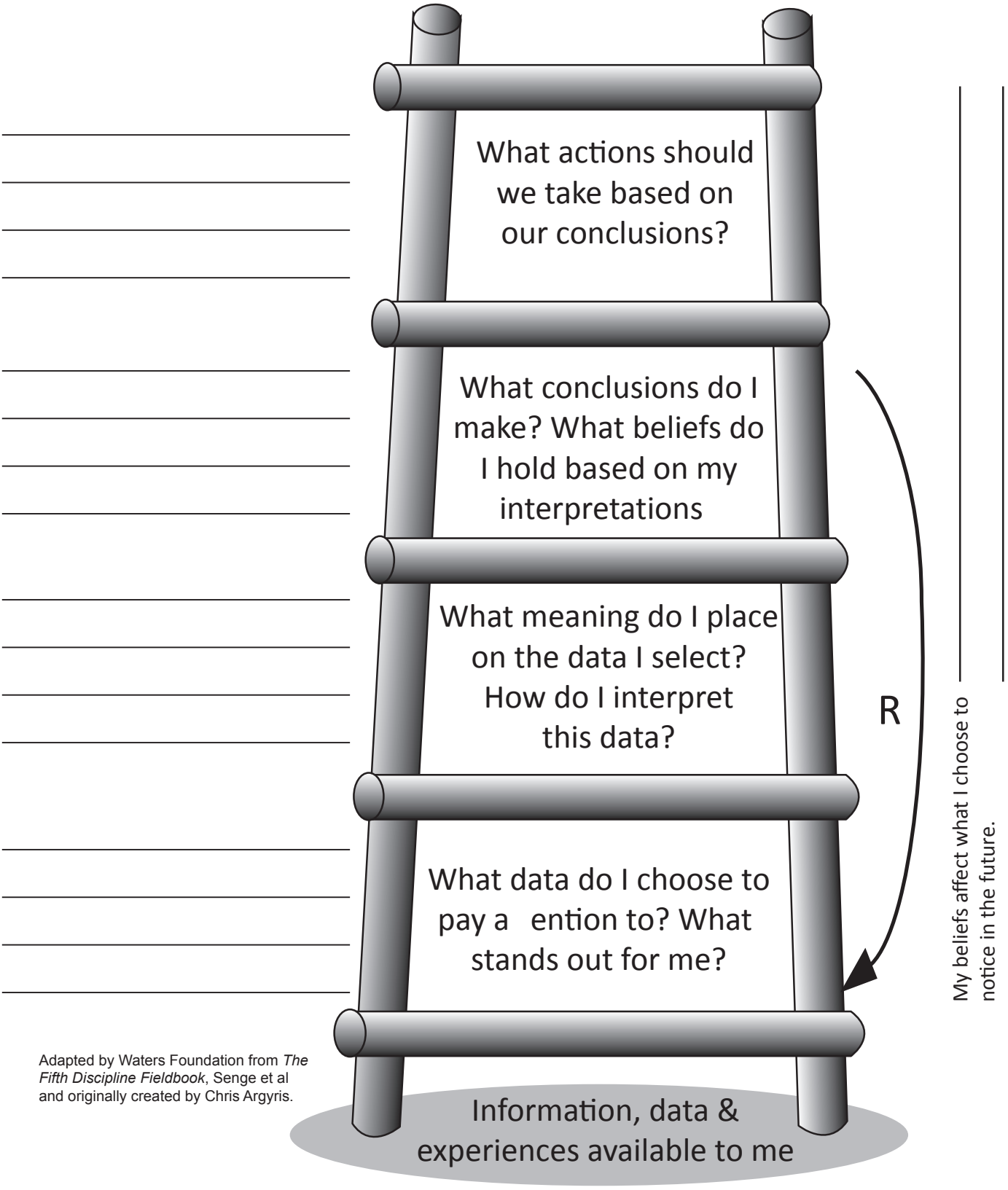
Applying the Ladder of Inference to State Early Childhood Data



Adapted by Waters Foundation from *The Fifth Discipline Fieldbook*, Senge et al and originally created by Chris Argyris.

Ladder of Inference as Tool for Debrief or Reflection

Information & Experiences:

- Based on my previous experiences what am I expecting?
- How will my mental models influence what I notice, hear and see? Thinking about the event – was it what I expected?
- Was I aware of my perceptions / mental models?
- What did I notice? What did I pay attention to?

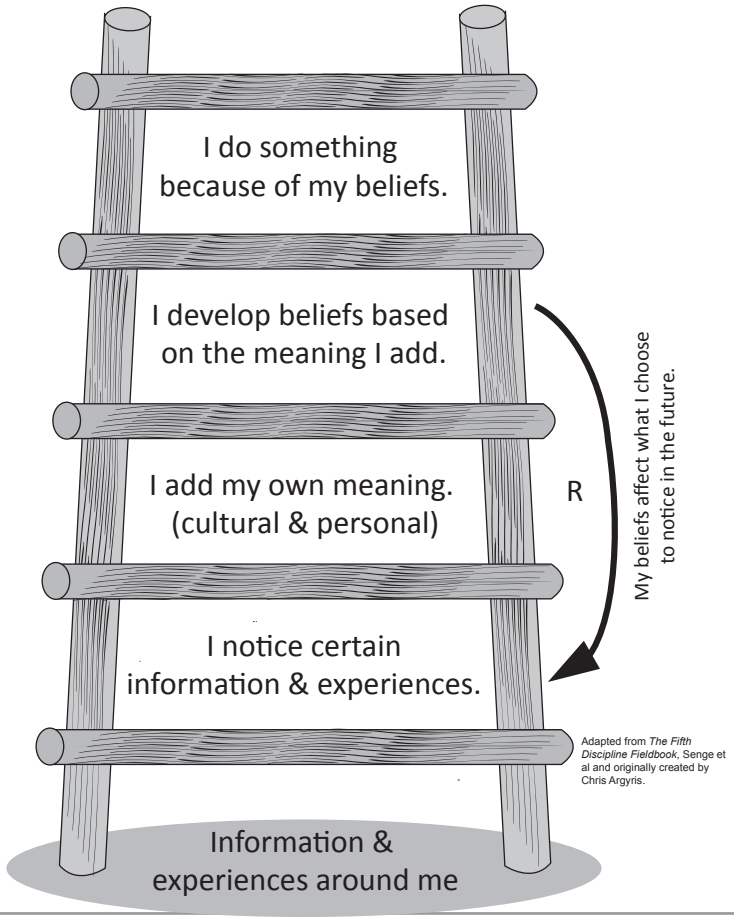
Personal & Cultural Perspective:

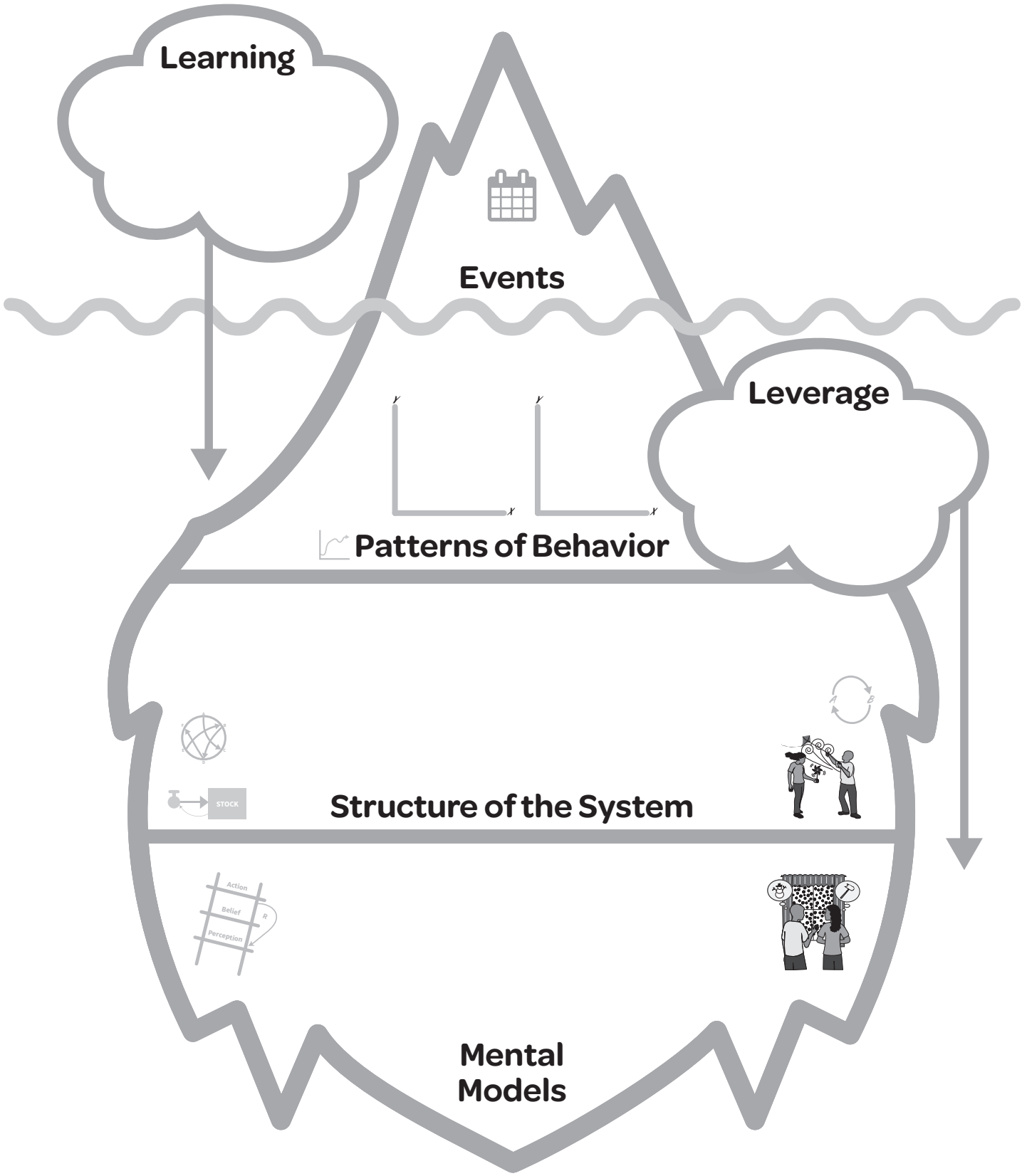
- How did I interpret this experience – what are my assumptions? What influenced my experience of this event?
- Do others share my perceptions?
- What questions do I have?

Beliefs:

- What do I believe based on my interpretation of my experience? What information led me to develop my beliefs?
- Did my beliefs affect what I noticed?
- Have I any of my perceptions or beliefs changed?
- What actions will I take?

NOTES:





Iceberg...
Seeing What's Below the Surface

Events

Deep Learning

What is seen

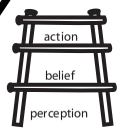
Patterns of Behavior

What is generally unseen

Leverage

Structure of the System

Mental Models



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Iceberg...
Seeing What's Below the Surface

What is seen

What is generally unseen

Events

Patterns of Behavior

Structure of the System

Mental Models

Current Reality

Desired Results

Deep Learning

action

belief

perception

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Waters Center
For Systems Thinking

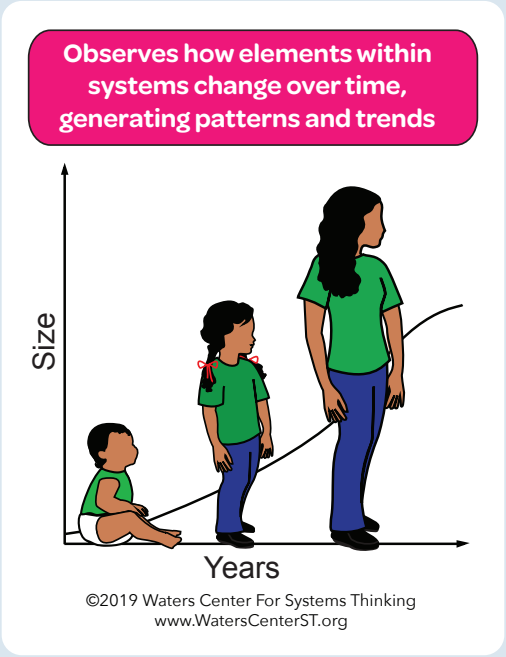
Change Over Time

Overview

The ability to observe how elements within systems change over time, and the means to represent that change, are important practices of a systems thinker. Systems thinkers focus on the nature of change over time. Behavior-over-time graphs (BOTGs) are simple tools that illustrate patterns and trends and demonstrate how something changes over time. Systems thinkers' ability to observe change and make those observations visible helps people communicate viewpoints about how and why things change.

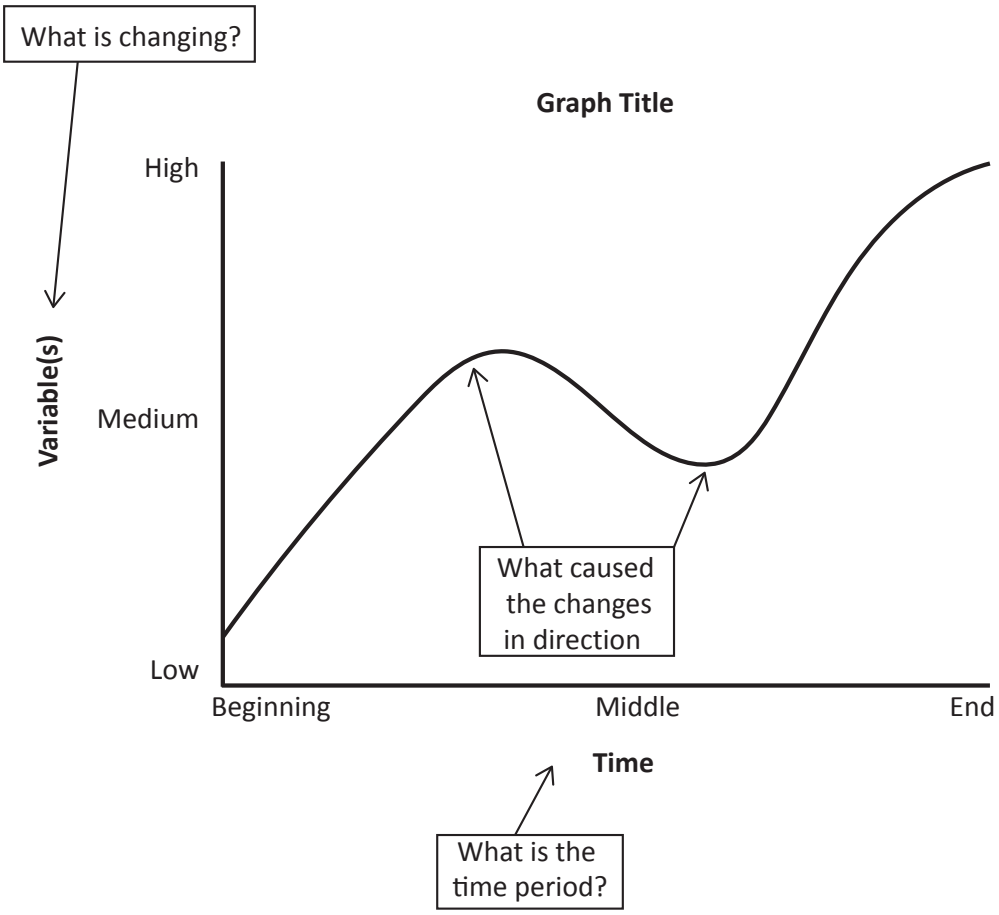
Observing how elements within systems change over time, generating patterns and trends will provide answers to:

- What important elements have changed in the system?
- How have the elements changed over time?
- What patterns or trends have emerged over time?
- How fast or slowly are things changing?
- How does the rate of change influence my next steps?

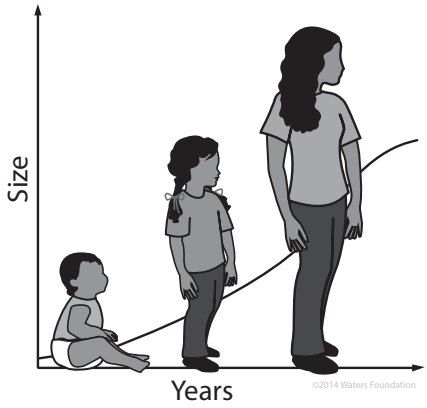


Behavior-Over-Time Graph (BOTG) Basics

BOTGs show trends and patterns of behavior in a system, rather than discrete events. They measure change over time and show "what" happened in the system as represented by the graphed component.



One Habit of a Systems Thinker Related to BOTGs



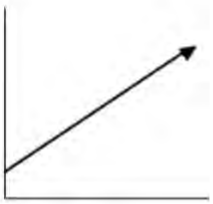
A Systems Thinker observes how elements within systems change over time, generating patterns and trends.

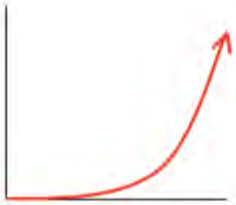
Systems think

Make a list of key variables (elements that change over time) that are important to your early childhood system.

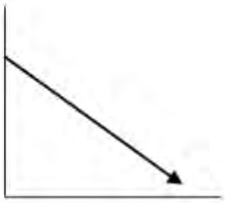
Think about those variables as Patterns and Trends.
How are they changing over time?

Growth

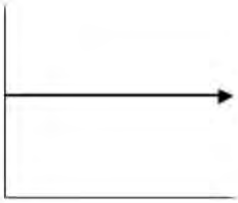




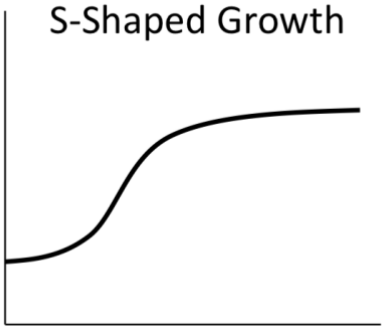
Decline



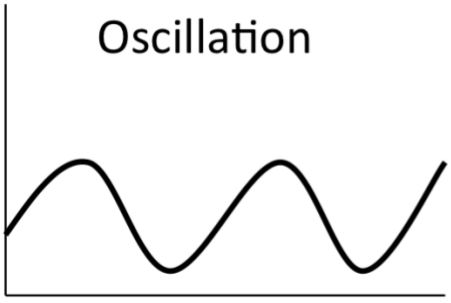
Stasis



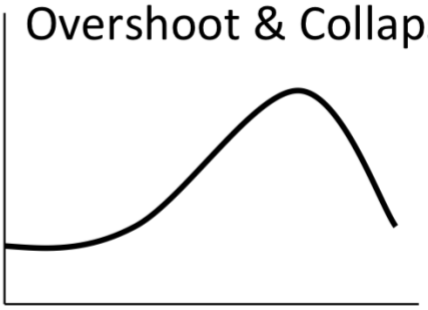
S-Shaped Growth



Oscillation



Overshoot & Collapse



Balloon Dynamics

Draw your behavior-over-time graph (BOTG).

Don't forget to...

_____Title the graph
_____Identify the x & y-axes
_____Label the x-axis
_____Label the y-axis
_____Use a line to graph the changes in "y"
_____Use appropriate scale

Scale for self-assessment

4 – Accurate
3 – Mostly Accurate
2 – Significant Errors
1 – Completely Incorrect
0 – Not Done
NA – Not Applicable

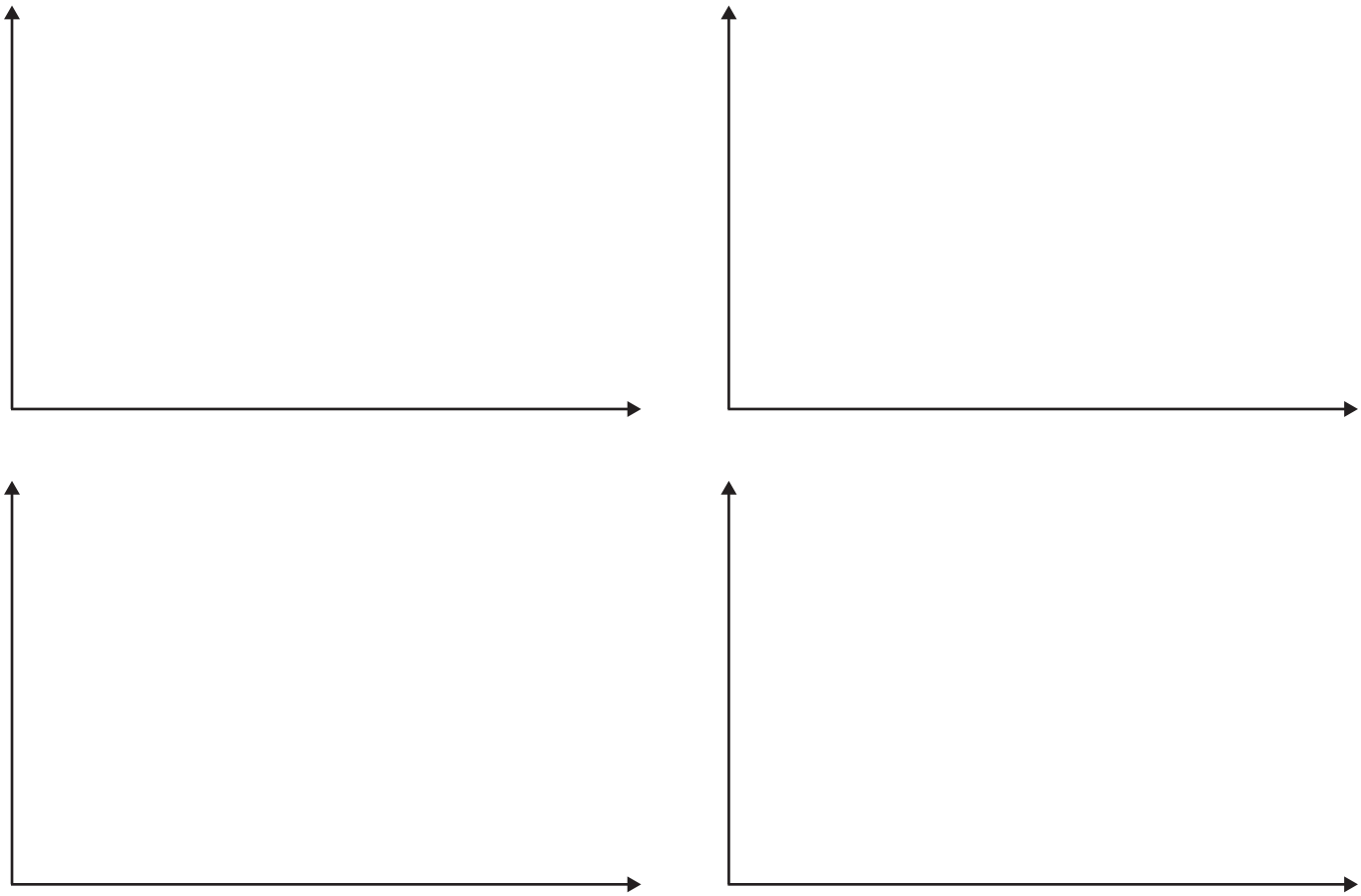
_____**TOTAL/24** **Average** _____

Example Benchmarks

- Demonstrate different ways to represent numbers using graphs, sketches, diagrams, and manipulatives.
- Select and use relevant information in the problem to solve it.

Behavior-Over-Time Graphs

What is changing in your system of interest?
How are the elements changing?



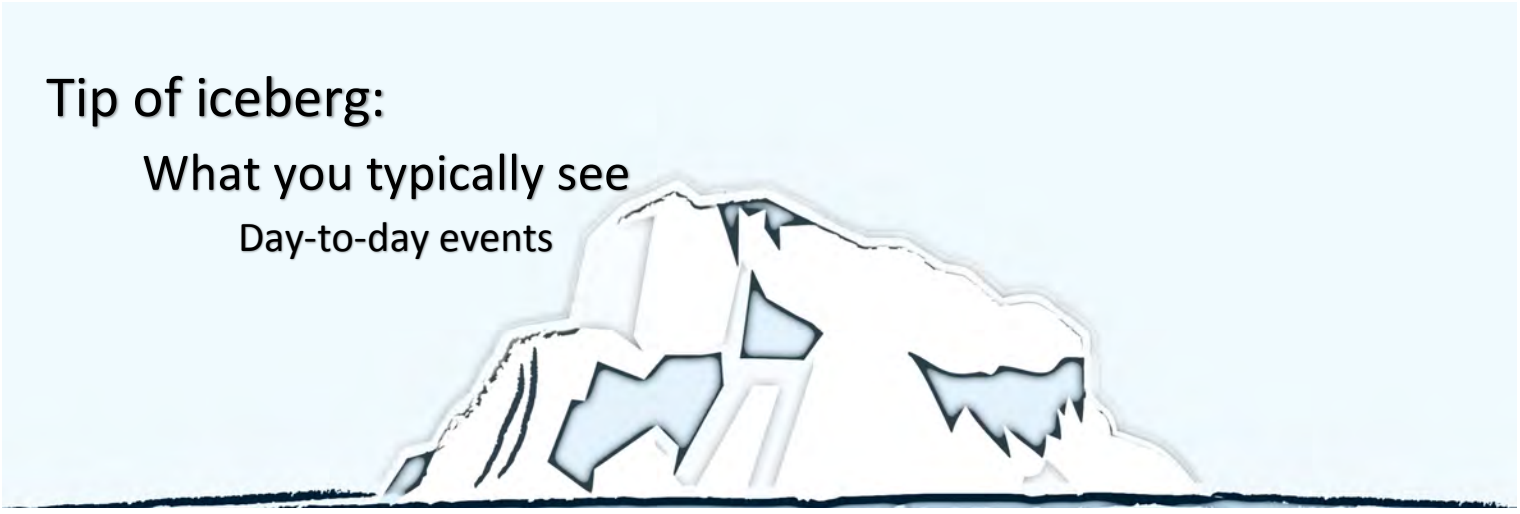
Some sample questions to ask when identifying parts of a system that change over time:

- What important elements have changed over time?
- How has _____ changed over time?
- During what period of time have the changes occurred?
- Where on the y-axis should the graph start and why?
- How would you label the bottom/middle/top of the y-axis?
- What evidence supports the graph being created?

Questions to consider once BOTGs have been created:

- What caused any changes in direction or slope?
- How are interpretations of a graphed element the same or different?
- What changes may happen in the future based on what has been happening? Show these inferred changes/that trend with a dotted line.
- Do you see any connections (interdependencies or causal relationships) between/among graphs?

Based on what you see in your system, what are some of the key variables that are changing over time?



What's been happening? What are the trends? What changes have occurred?
Draw behavior-over-time graphs to show how key variables are changing over time.

Waters Center
For Systems Thinking

Feedback Loops

Overview

Cause and effect relationships are all around us. A systems thinker sees the interdependencies in a system and uncovers circular causal connections. Systems thinkers use causal loop diagrams and maps to show the causal relationships that exist between elements.

Identifying the circular nature of complex cause and effect relationships will provide answers to:

- How do various parts of the system affect one another?
- Does one part cause a change in another?
- Is one feedback loop more influential over time than another? If yes, how?
- Why would it be important to understand the feedback loops of a system as you make decisions and try to solve problems?

Drawing Causal Links[1]

Guidelines
Draw cause ? effect linkages between the variables. The arrow shows the direction of causality. The arrowhead is labeled to
show the relationship between the variables.

HINT: To create your labels, always start with the assumption that the first variable goes up. So, if sugar intake goes up, then what happens to cavities (all else being equal)? They also go up, so the link is labeled with a "+" or "s" sign.

KEY:
A "+" or "s" indicates that the variables change in the same direction (both go up or both go down) or a change in a variable adds to the following variable.

A "–" or "o" indicates that the variables change in opposite directions or a change in a variable subtracts from the following variable.

Examples

Sugar intake —(s or +)→ New cavities

Brushing teeth —(o or –)→ New cavities

Practice
Draw and label causal links between the pairs below and add some of your own.

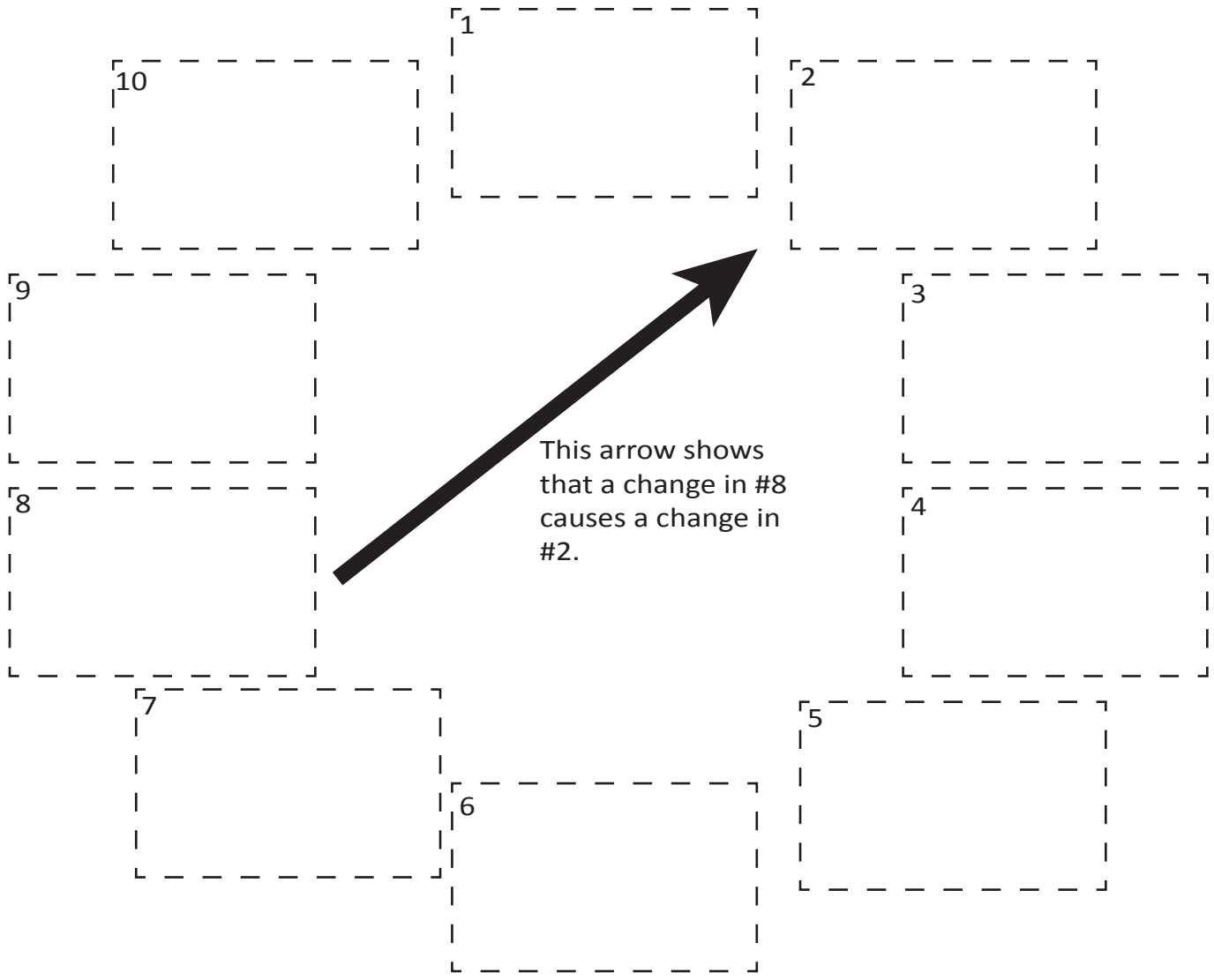
Family fun	Quality of relationships
Team effectivness	Professional satisfaction
Relaxation	Stress
Emails in inbox	Time needed to respond to emails
Student enrollment	Budget allotment
FTE	Class size
Student engagement	Achievement gap

1 Adapted from materials provided by the Social System Design Lab at Washington University, St. Louis.

From Causal Links to Connection Circles (Practice 1 continued)

Choose 10 essential elements from your table group. Be sure that each of the chosen elements can change over time. Write each element (one element per sticky note) and label the notes 1 through 10. Arrange them in a circle on the table. The numbers do not represent priorities and the notes do not need to follow in any particular order.

Use arrows to make connections between essential elements, showing how a change in one element causes a change in another element. Make as many connections as you can. Be prepared to explain and justify each causal connection.



Reflections

How to Make Connection Circles[1]

1. Draw a circle of behavior-over-time graphs (BOTGs). Limit the number to 5 – 10.

2. Elements graphed on the BOTGs should be
   - relevant to the main idea of the story/text.
   - dynamic, i.e., their values change.
   - nouns or noun phrases, preferably.

3. Identify causality: elements that cause other elements to change (increase or decrease).
   - Find a direct cause and effect relationship.
   - Draw an arrow from the "cause" element to the "effect" element.
   - Label the arrowhead.
     - Use a "+" or an "s" to indicate that the variables change in the same direction (both go up or both go down) or a change in a variable adds to the following variable.
     - Use a "–" or an "o" to indicate that the variables change in opposite directions or a change in a variable subtracts from the following variable.

4. Continue this process until you have added all of your causal arrows.

5. Identify and analyze feedback[2] relationships in the circle. These feedback relationships can be shown as causal loop diagrams (CLDs).

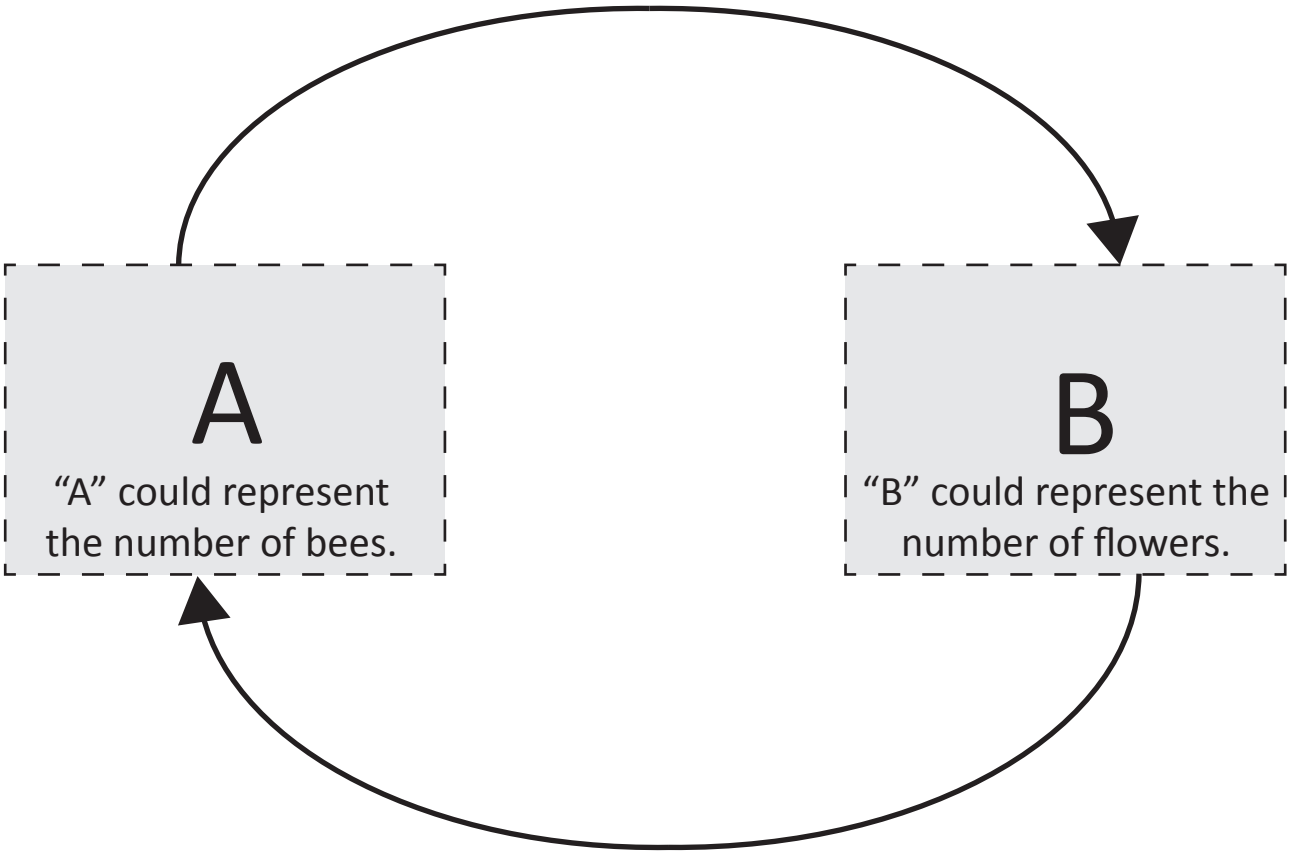
6. Mentally simulate your "model" (tell/retell the story).

7. Consider leverage points in the system.
   - What elements have the greatest number of arrows coming out from them?
   - How might feedback loops you identified influence the system as a whole?

1 Adapted from *The Shape of Change,* Al Ticotsky, Rob Quaden and Deb Lyneis
2 For additional information about feedback, see the section on creating causal loop diagrams starting on page 66.

Causal Loop Diagrams (CLDs)
aka Feedback Loops

Feedback
As different parts of a system affect each other, causes become effects, which in turn become cause

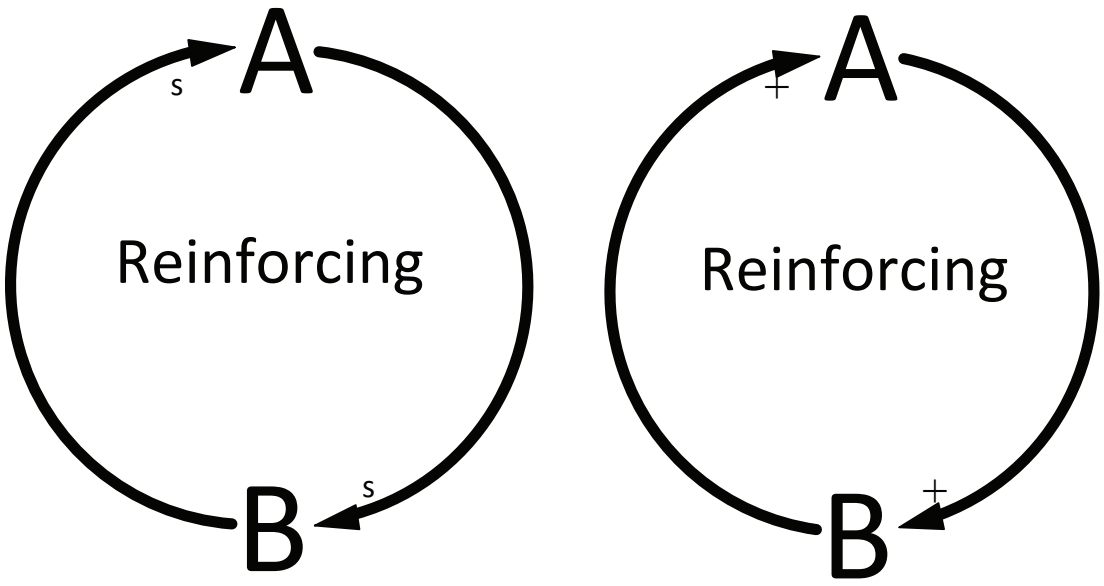


One Habit of a Systems Thinker Related to Causal Loops

A Systems Thinker identifies the circular nature of complex cause and effect relationships.

Reinforcing Causal Loops

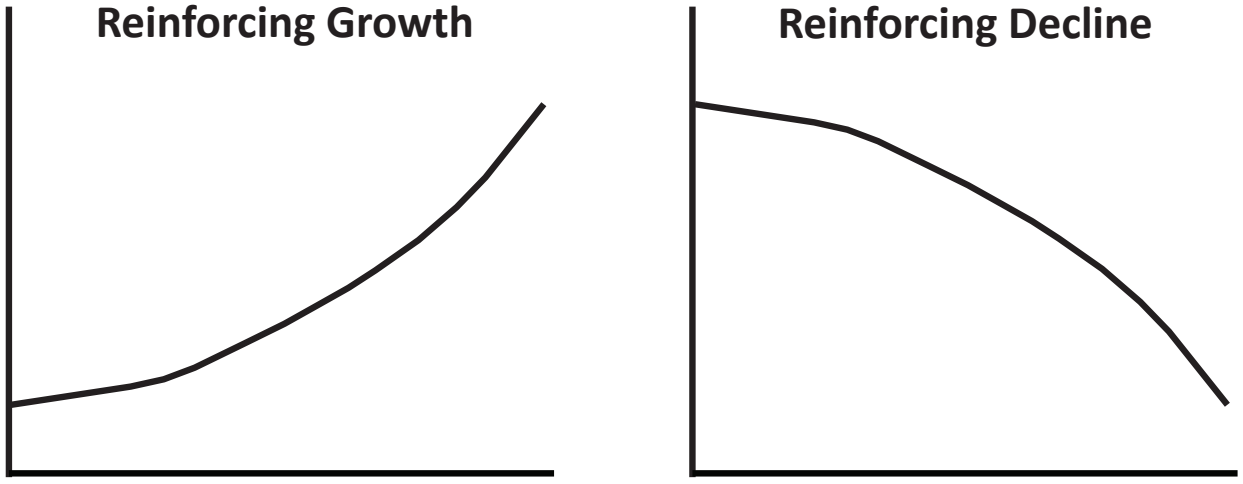
Like a snowball that gets bigger with each rotation as it rolls down a hill, reinforcing loops represent escalating, compounding growth or decline.



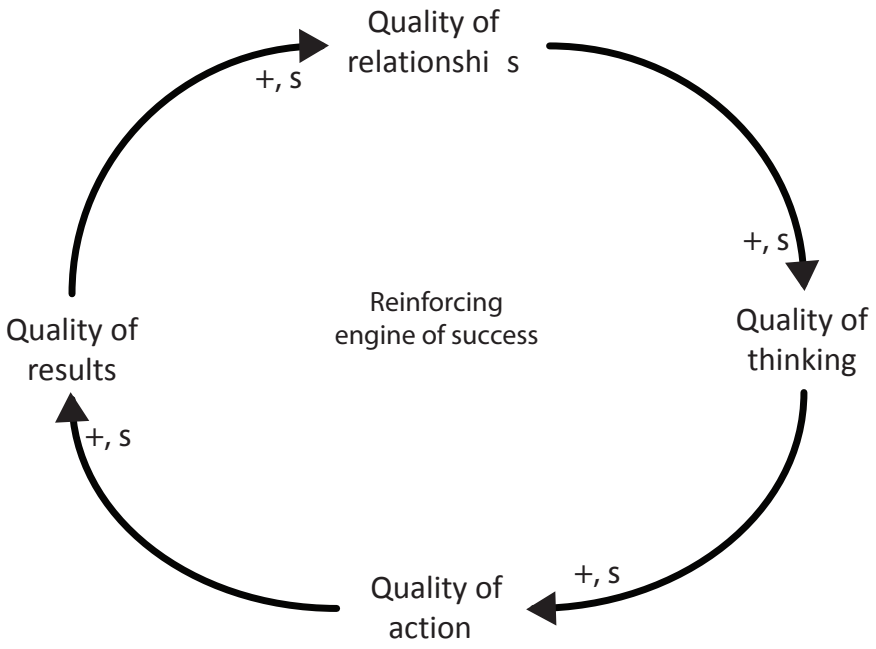
Language one might hear when reinforcing feedback is present:

"Things are getting out of control!"
"I can't keep up!"
"We are really on a roll now!"
"The change seems to be doubling."

Examples of behavior-over-time graphs that show reinforcing feedback:



A Core Theory of Success[1]



Examples of Quality of relationships:

- Capacity to work together
- Change perspectives to increase understanding
- Recognize the importance of interdependence
- Team learning, mutual respect and trust

Examples of Quality of thinking:

- Consider short and long-term consequences
- Consider unintended consequences
- Surface and test assumptions
- Consider how mental models influence the ways people interpret situations

Examples of Quality of actions:

- Informed decision-maker
- Consider impact of results
- Check results and change actions if needed: successive approximation

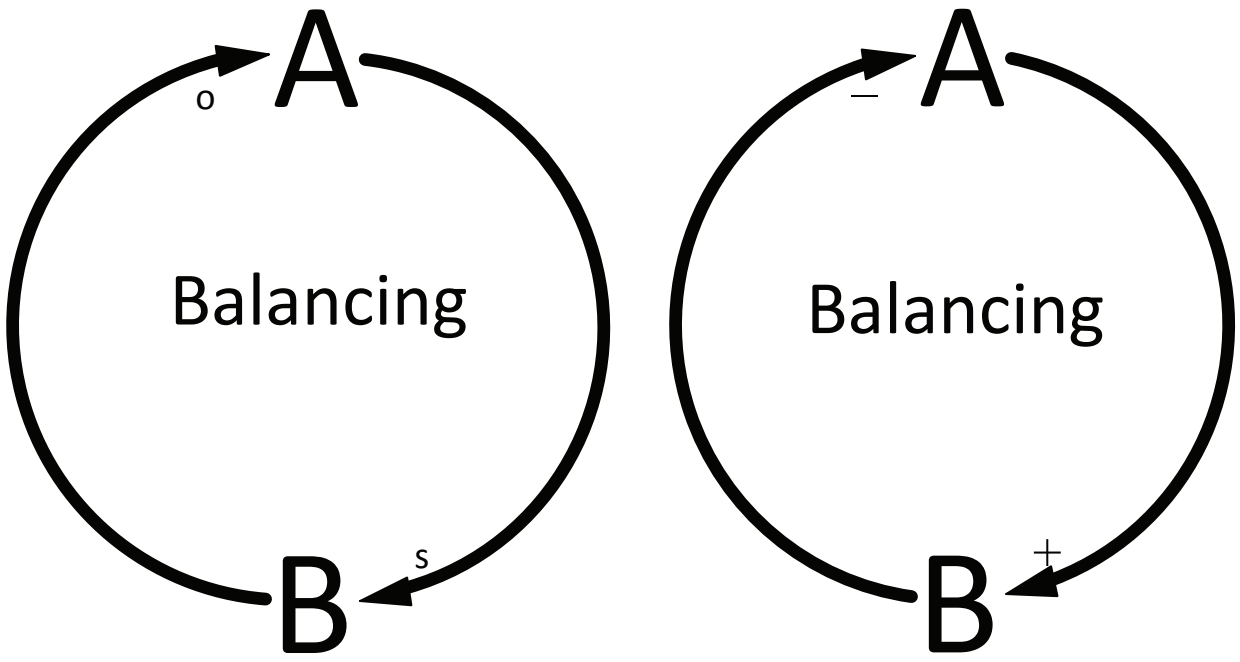
Examples of Quality of results:

- Serving the needs of students, staff and community
- Increased efficiency and effectiveness of work teams
- Ability to manage change
- Healthy, engaging environment, e.g., joy in the workplace

1 Adapted from *The Systems Thinker*, Daniel Kim

Balancing Causal Loops

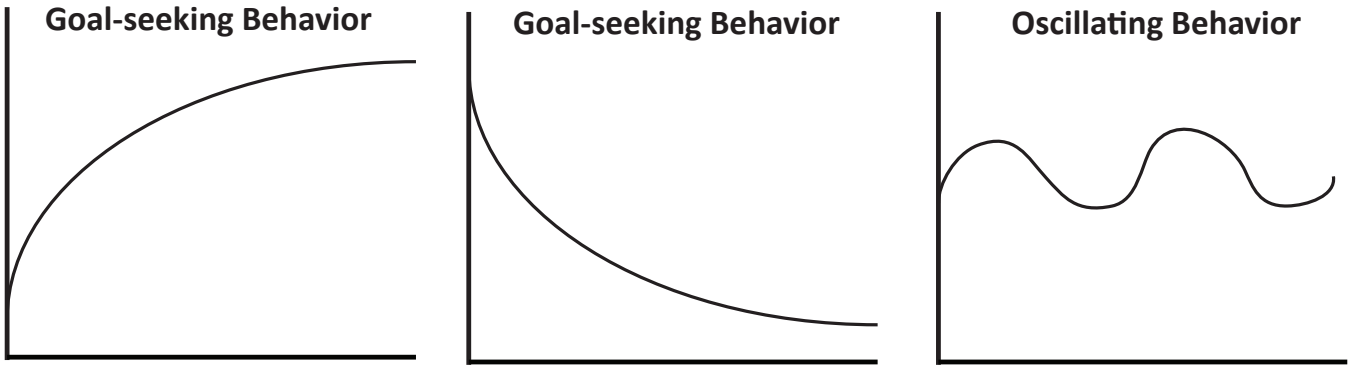
Balancing situations strive to achieve system goals or reach equilibrium.

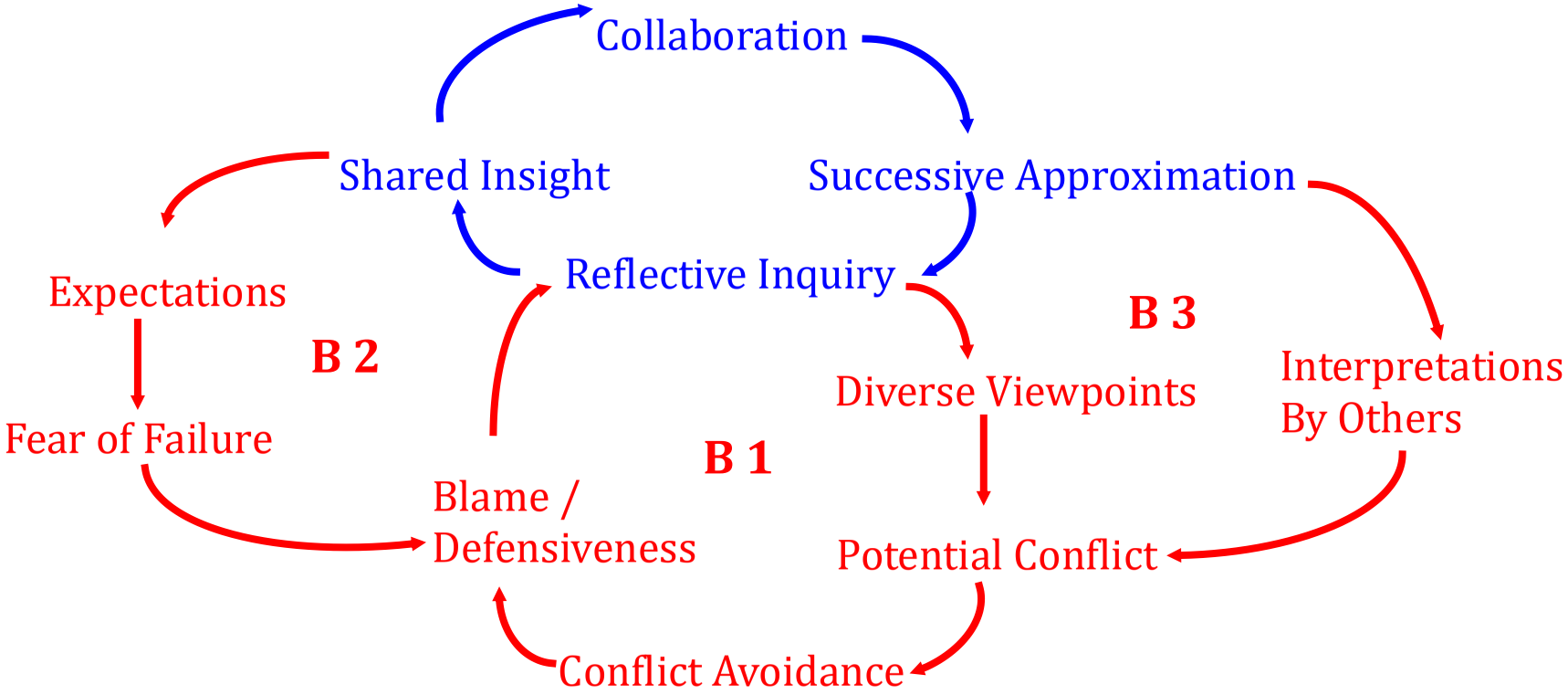


Language one might hear when balancing feedback is present:

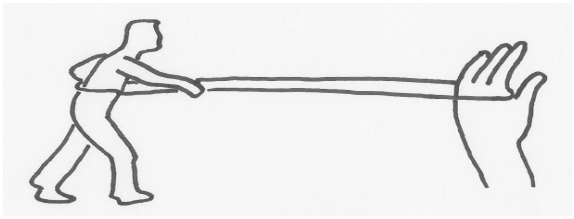
"We are experiencing some subtle ups and downs."
"I can sense that things are beginning to settle down."
"We seem to be achieving balance and stability."
"The system is reaching our goal; we're closing the gap."

Examples of behavior-over-time graphs that show balancing feedback:





Creative (Structural) Tension

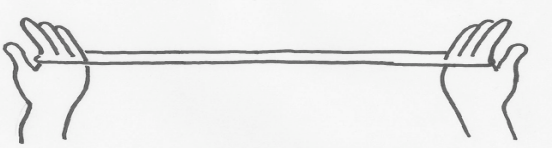


The gap between vision and current reality can be a source of energy. If there is not a gap, there would be no need for any action to move toward the vision.

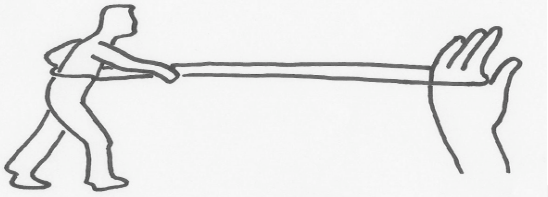
The gap is the source of creative energy.

Which view of structural tension is most prominent in your work setting?

1.



2.



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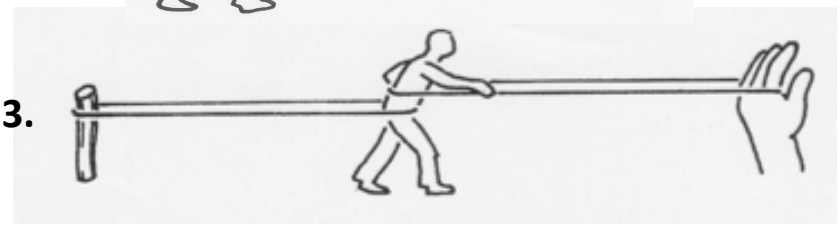
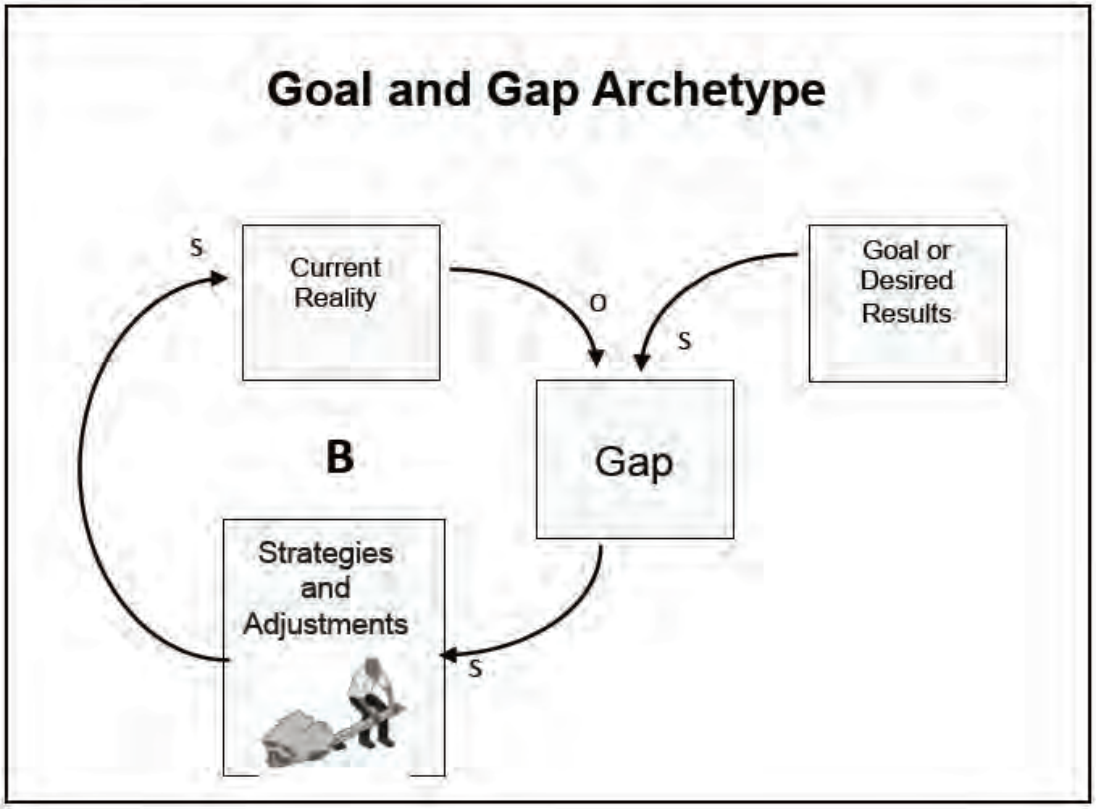
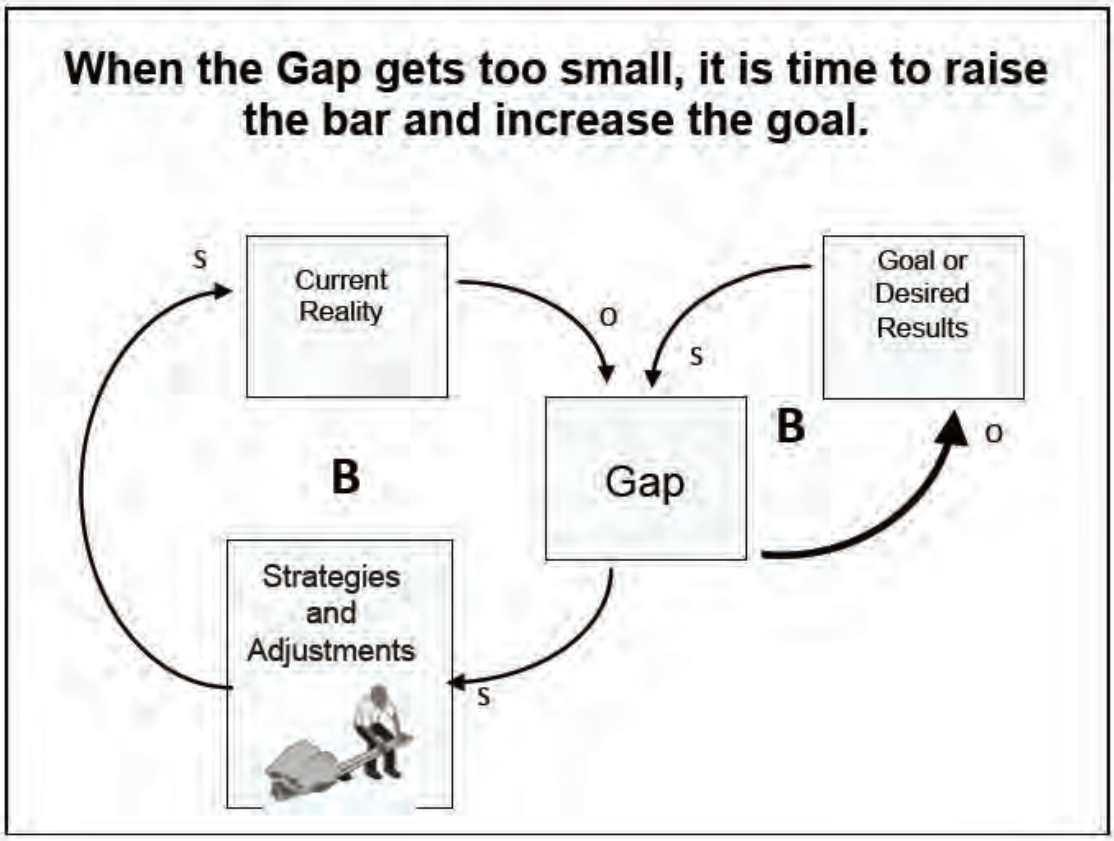
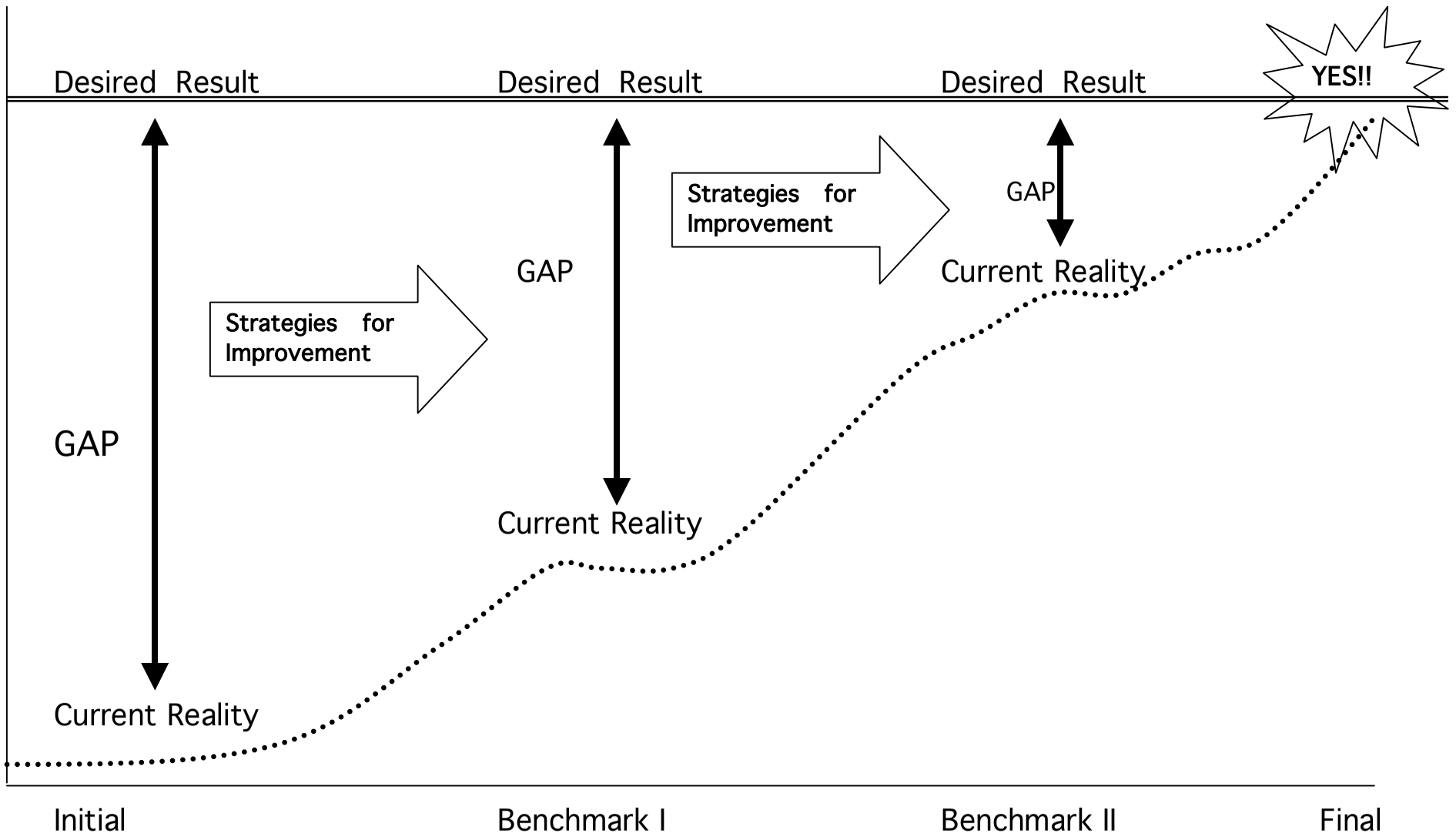


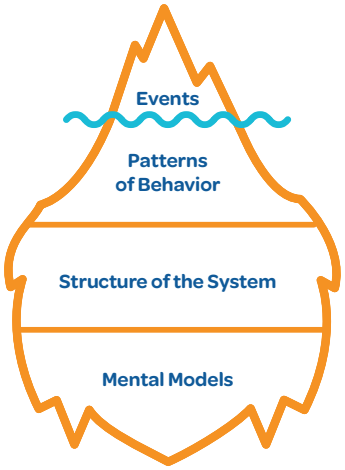
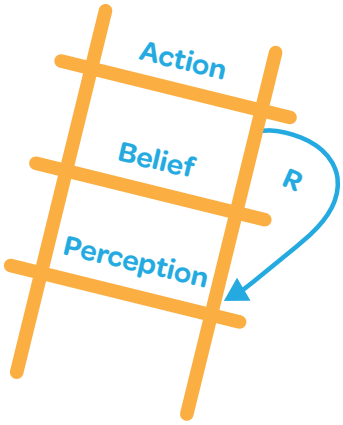




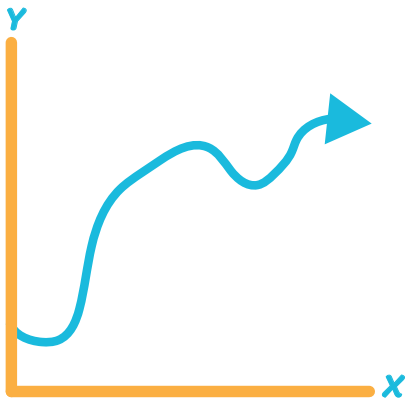
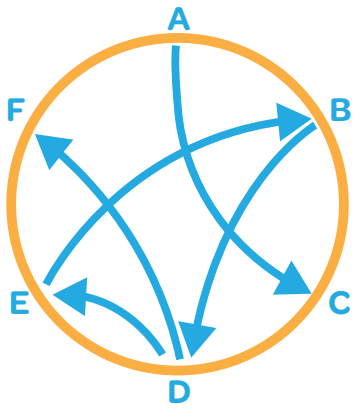
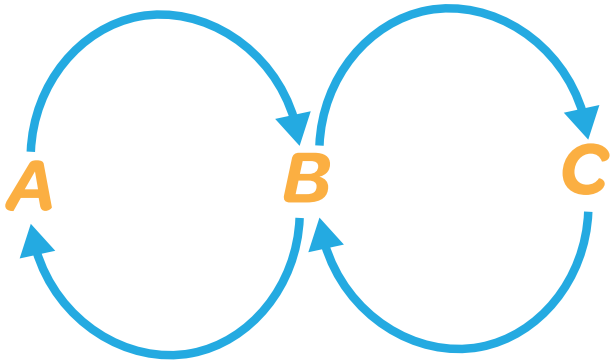


Realizing a vision: Continuous improvement over time as illustrated by a diminishing gap

Connections

Strategy	Connections/Ideas
Habits of a Systems Thinker 	
Iceberg Visual 	
Ladder of Inference 	

Connections

Strategy	Connections/Ideas
eha viorvv er-Time Graphs 	
Connection Circles 	
Causal Loops 	

Habits of a Systems Thinker