



# Complexity Thinking for Early Childhood Leaders

## A Terra Rossa Learning Resource Series

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### Systems and Their Parts

A system is greater than the sum of its parts.

Or so we've been told.

Is it true? Maybe.

Before we know if a system is greater than the sum of its parts, we've got to know what type of system it is: Is *complicated* or *complex*? Or both? If you wondered why I differentiated *complicated* and *complex*, congratulations. You have joined a growing number of early childhood leaders who are questioning how we think about systems.

Historically, early learning leaders (including me) thought of systems as having pretty similar elements and behaviors, without considering that there might be different *types* of systems or different types of system phenomena.

Or that different types of systems might behave differently or play different roles in helping or hindering the outcomes we want. But science is clear: complication is very, very different from complexity. We use complication to design and create systems, but tipping points, emergence, systems learning, and large-scale social change *happen in complexity*.

Complicated systems are comprised of well-defined parts that interact in primarily fixed and predictable ways with other well-defined parts, governed by a set of complicated rules.

So, are systems greater than the sum of their parts? The short and too simple answer is *complex* systems are *more than* the sum of their parts; complicated systems *are* the sum (and usually several other calculations) of their parts. This answer is too simple because there are few completely complicated or completely complex systems. Most systems are comprised of complicated and complex dynamics. I separate them here to help clarify each, but in real life, they co-exist and interact, often in ways that are hard to tease apart. Effective system leaders need to see both complication and complexity, shifting focus between them and observing how they affect each other. To do so, it is helpful to first understand each as distinct. Let's start with complication.

Complication is the prevailing system paradigm. It's what we automatically think of when we think "system." When we see systems as gears, pulleys, structures, and assembly lines, we're thinking in complication. Complicated systems are comprised of well-defined parts that interact in primarily fixed and predictable ways with other well-defined parts, governed by a set of complicated rules.

Often layers and layers of rules.

This is the stuff of machines, engineering, logic

models, government regulations, and statistical analysis. It is, pun intended, *complicated*.

We tend to think of systems in these terms because it helps us see how we might control inputs and outputs. Given certain inputs, complicated systems are expected to produce a predetermined outcome. The more fixed and predictable the interactions, the more specific and predictable the outcome. Deviations from fixed and expected behaviors and outcomes are considered mistakes; indeed, we call them “error.” The less system error, the more the system is seen as “succeeding.” (Spoiler alert: the creative, innovation solutions we so desperately need are often lurking in the error.)

To create a complicated system, we figure out what components we need for the system to “work” and then create or improve each component, link them together through communication or funding, identify rules and expectations (such as standards, quality rating rubrics, educator competencies), and set things in motion. The vast majority of early learning systems leaders hold this mental model of systems as something we design and implement; then tweak and improve, hoping systems function as designed and produce the outcome we want them to produce. This is how complicated systems (are supposed to) work.

We like complicated systems because fixing them seems straight forward. One of the handiest characteristics of complicated systems is that we can break them into and analyze their component parts. The parts can then be reconstituted back into the whole system. One can troubleshoot problems by isolating the problem to a component part. A car that won’t start, might have a bad battery or starter. An educator scholarship program that falls short of recruitment numbers needs a better communication plan. There is a traceable, cause and effect or procedural link between the system parts and the

system output, with each part performing a specific role that adds up to the expected outcome. Thus, complicated systems are the sum of their parts (or their parts’ outputs).

If you’re at all involved in early childhood systems work, this should sound familiar. Whenever we troubleshoot a failure in an early childhood system (such as an unexpected funding cliff, low participation in a well-funded scholarship program, or parents continuing to choose “low quality” care even when “better” choices for their children are available (I could go on, so could you), we are operating from a complicated system paradigm.

But if we only see and design for complicated phenomena, our systems are destined to produce unwanted unintended consequences or fail to produce sustainable change. When that happens, the answers to what went wrong live in the complexity we aren’t seeing. Further, learning, and the conditions that foster learning (for both people and systems), also live in complexity. To create effective learning systems we need leaders to shake loose complicated mental models and see how complexity works in the complicated systems we create.

To understand complexity, let’s start at the beginning. *Complicated* systems are designed, engineered, and built (most often by humans) but *complex* systems have a very different start. Complex systems are neither designed nor built. *They emerge* through a process of *self-organizing*. This emergent process is what makes complex systems “more than the sum of their parts.” They can be nurtured, prompted, nudged, coddled, and surfed, but they cannot be engineered or constructed.

To build effective complicated systems (for those are the only kind we can create), we must structure them to create conditions that encourages complex activity

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to move in ways that supports mutual thriving, knowing all along complexity has a mind of its own. Engineers creating a dam don't control weather or earthquakes. But they design the dam to influence the way water flows when complex unpredictable events occur. To do that well, engineers understand the properties of the components used to build the dam and also the patterns of complexity that are present in the environment that the dam operates in.

The same is true for early childhood systems. Sure, we need to study and evaluate the system structures we create. But we must also curate in-depth and growing knowledge of the complexities of how families and communities raise children, such as how and when moms re-enter the workforce, the dramatic changes in work brought about by the gig economy and the COVID pandemic, the child-rearing priorities of all cultures and communities, and so much more.

Because complex systems are entangled layered networks, they cannot be understood by pulling them apart and analyzing individual parts. Complexity is exasperatingly irreducible. When we talk about a system as more than the sum of its parts, we're talking

about its irreducibility. Complicated systems are reducible, complex systems are not.

### So what?

Well, if the reasons behind unintended consequences and failed scale up are complex, trying to tease apart the system and fix it simply won't work. *When we try to fix an early childhood system by figuring out what regulatory thread to pull or what model legislation to craft, those are the times we're using complicated approaches to deal with complex irreducibility. And it doesn't work – at least not for long or without unwanted unintended consequences.*

We urgently need early childhood leaders who see and understand complexity because the tipping points we need are complex phenomena brought about by complex processes. This article is first in a series of resources to help early learning leaders understand complexity in early education. To receive future publications in the series, sign up for the Terra Rossa Newsletter by visiting the website. Coming up: Emergence as a Real Thing, The Myth of School Readiness, and much more!