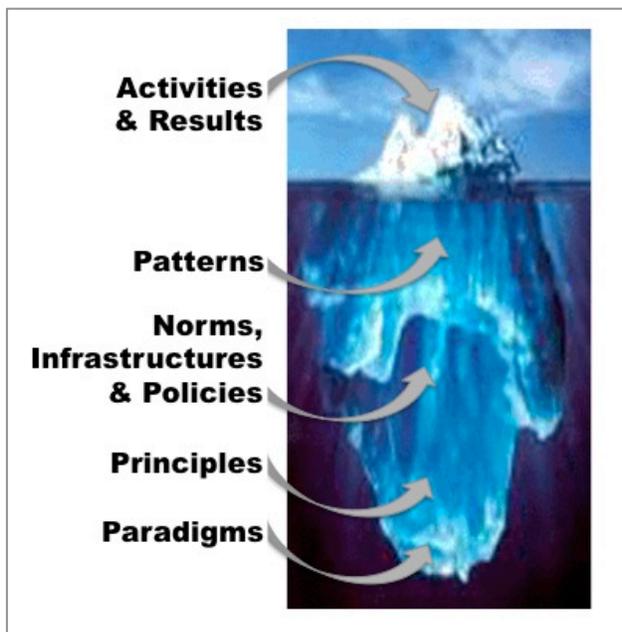


Using the Visibility and Depth Iceberg Diagram to Understand Complex Systems

This document describes the iceberg diagram we are using to frame our thinking about change in complex systems. The diagram encourages us to look below the visible activities and results of a given project/initiative to deeper and less visible features of system that influence the visible activities and results.

The purpose of looking below the surface is to determine leverage points—places in the system where a small change can lead to a large shift in behavior. By identifying potential leverage points, the evaluator can assist the STEM¹ education initiative in how to take action to efficiently move toward their desired outcomes. The deeper you go in the iceberg, the more effective the shift is likely to be. However, those deeper changes often are more difficult to accomplish.



*Illustration of Visibility and Depth in
Complex Systems*

Determining the Link between Activities and Results: STEM project evaluations often begin by looking at the connections between the activities of a project (the intervention) and the results for students and/or teachers/faculty. Many methods exist for doing this that are common practice including experimental and quasi-experimental designs and case studies.

Determining Patterns: To understand why the results are occurring in a particular situation, look more deeply into the systems that are influence the project. One way to do it, using a systems thinking approach, is to look for patterns across time and/or locations that help deeper your understanding of the situation. To look for patterns, ask questions and conduct analyses of your qualitative or quantitative data about activities and results

and their links to other parts of the systems. They reveal patterns—similarities, differences, and interconnections across time and/or locations.

Identifying Norms, Infrastructures, and Policies: This is a rich area for understanding which systems and how they may be affecting the patterns, activities, and results. We'll address this

¹ STEM stands for science, technology, engineering, and mathematics.

topic in a later paper. Just a hint. First map the various systems that are affecting the STEM education initiative you are evaluating. Seek to identify norms (typical ways of behaving), infrastructure (basic features of an organization such as information flow, ways of organizing, hiring practices, accountability and such), and policies (established guidelines/rules, requirements for how operations are carried out). The norms, infrastructures, and policies may be within specific organizations or social systems. They also may be within a community or partnership and be informal.

Paradigms: the mind-set out which shapes the nature of a system, e.g., its goals, structure, rules, and other features.

System Dimensions to Consider

Cabrara, Colosi, and Lobdell (2009); Capra (1997); Olson and Eoyang (2001); and Williams and Imam (2007) have identified closely related models of system conditions or dimensions to consider when looking for leverage points in systems. We have chosen to use Williams and Imam’s terminology—boundaries, relationships, and perspectives—with the following definitions (Parsons & Jessup, 2011):

"Boundaries" refers to demarcations that create a region or entity. Boundaries can refer to such demarcations as physical entities, organizational identities, social systems, and rules of conduct. Boundaries may be permeable—an open system—allowing exchange with the environment while still distinguishing the system or other entity from its environment.

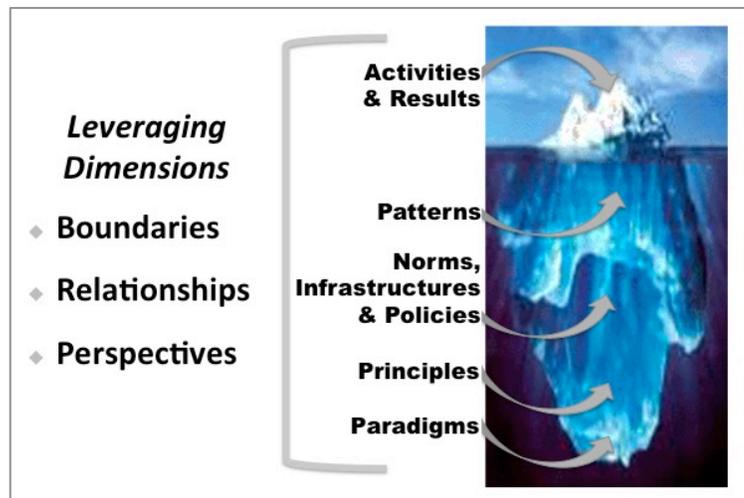


Illustration of Visibility and Depth in Complex Systems with Leveraging Dimensions

"Relationships" refers to the connections and exchanges that exist among bounded parts of a system, agents, or elements. Interconnections/relationships are as, or more, important than the entities making up a system. Relationship patterns help identify types of systems such as hierarchical systems, networks, families, communities, and social groups. Cause-and-effect relationships are another type of relationship.

"Perspectives" refers to mental models, world views, and purposes. Perspectives bring forth differences. Different stakeholders may have different perspectives on a given situation, even if they are part of the same stakeholder group.

A norm, infrastructure, or policy can be understood in terms of these dimensions.

Further Information

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