

Developing Systems Thinking Workshop

Earth Educators Rendezvous 2015

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Systems Basics Glossary (modified from Meadows, 2008)

System- a set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviors

Boundaries (open vs. closed systems)- boundaries are defined by the elements that are included and excluded from the system. Closed systems are those that include all elements within the boundary with no influence outside the boundary. Open systems have some extended element or effect that is not contained within the boundary.

Stock (Reservoir)- an accumulation of material or information that has built up over time

Flow (flux)- material or information that enters or leaves a stock over a period of time

Feedback loops- the mechanism (rule or information flow or signal) that allows a change in a stock to affect a flow into or out of the stock

Reinforcing (positive) feedback loop- an amplifying or enhancing feedback loop that reinforces the direction of change

Balancing (negative) feedback loop- a stabilizing, goal-seeking, regulating feedback loop that reverses whatever direction of change is imposed on the system

Linear and Non-linear relationships- the relationship between two elements in a system has either a constant proportion between cause and effect (a linear, additive effect) or does not produce a proportional effect (non-linear).

Resilience- the ability of a system to recover from perturbation; the ability to restore or repair or bounce back after a change due to an outside force

Some systems thinking principles (modified from Meadows, 2008)

- A system is more than a sum of its parts.
- System structure is the source of system behavior and is revealed as a series of events over time.
- Boundaries of a system depend on the purpose of the discussion.
- A system is at dynamic equilibrium when the sum of the outflows equal the sum of the inflows and therefore the stock levels do not change.
- Stocks can act as delays or buffers or shock absorbers in a system.
- Perturbations can impact other parts of system.
- Multiple causal factors can influence one outcome.

Reference

Meadows, D. H. (2008). *Thinking in Systems: A primer* (D. Wright Ed.). White River Junction, VT: Chelsea Green Publishing.