Systems Thinking in Climate Education

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March 14, 2017 - CLEAN Network
4 ways to apply systems thinking

1. Improve our own thinking - DSRP in metacognition
2. Improve education and outreach - structure information using DSRP, MAC for design
3. Develop adaptive organizations - VMCL
4. Improve understanding of complex issues - mapping using DSRP
SYSTEMS

the study of how systems work
("systems science")

THINKING

the study of how we think
("cognition")
Keep calm just look harder dammit
Systems Thinking

Recognizing and applying our thinking and organizations as a complex adaptive systems...
3 things systems thinkers (you) can do
#1  Be Metacognitive
THINKING

- Events
- Patterns
- Underlying Structures
- Mental Models

React
Anticipate

You or your organization
Design
Transform

SYSTEMS THINKING
Mental model describes, predicts, and leads to behavior in the real world. Real-world consequences inform adaptation, viability, and competition among models.
WICKED PROBLEMS RESULT FROM THE MISMATCH BETWEEN HOW REAL-WORLD SYSTEMS WORK AND HOW WE THINK THEY WORK.
$K \neq I$

$K = I \cdot T$
#2 Use the 4 Building Blocks/Rules of Systems Thinking - DSRP
DISTINCTIONS RULE (D): Any idea or thing can be distinguished from the other ideas or things it is with

SYSTEMS RULE (S): Any idea or thing can be split into parts or lumped into a whole

RELATIONSHIP RULE (R): Any idea or thing can relate to other things or ideas

PERSPECTIVES RULE (P): Any thing or idea can be the point or the view of a perspective

DSRP are the ways information can be structured to make meaningful knowledge.
Making Distinctions (identity-other)
OUR BLESSED HOMELAND

OUR GLORIOUS LEADER

OUR GREAT RELIGION

OUR NOBLE POPULACE

OUR HEROIC ADVENTURERS

THEIR BARBAROUS WASTES

THEIR WICKED DESPOT

THEIR PRIMITIVE SUPERSTITION

THEIR BACKWARD SAVAGES

THEIR BRUTISH INVADERS

TOM GAULD
Organizing Systems
(part-whole)
Splitters

Lumpers
Recognizing Relationships
(action-reaction)
Taking Perspectives
(point-view)
“When you change the way you look at things, the things you look at change.”
#3 Repeatedly Apply Systems Thinking (DSRP) to Your Work
DON'T
complex

simple
Engage, Educate and Empower 400 million Systems Thinkers to solve wicked water problems.
MAC: Three Steps to Designing Better Learning Experiences

MAC: Map, Activate, Check

1. Map the Mental Model (M):
   - Map any content and thinking students need to learn (i.e., build a mental model).
   - Use a rubric (e.g., a metagram) that assesses student understanding of information and thinking. Are they building the mental model you mapped?
   - Embed multiple checks for understanding: pre-lesson (foreshadowing), within activities, and traditional post-lesson checks. Students should constantly check their own understanding through self-assessment and reflection.
   - Fractal—can be used at different scales—in a program, course, unit, lesson, teachable moment, or answering a question.

2. Activate the Mental Model (A):
   - Use an activity (see Activate a Concept) that best activates thinking by grounding to students’ prior information and experience.
   - The function of an activity is to activate learning of the lesson/mental model you are teaching.
   - Utilizes brain science and systems thinking to foster optimal learning and promote metacognition and transfer across subjects.
   - Based on the idea that our mental models (knowledge and skills) are made up of Information X Thinking.

3. Check the Mental Model (C):
   - Use checks for understanding to ensure student has built the knowledge mapped and activated by the teacher.
   - Requires correspondence between the lesson you map, the activity chosen to activate the lesson, and the method of checking it.

We perceive and understand the real world through mental models. Mental models include beliefs, biases, categories, preferences, theories, etc. Our mental models describe reality with varying degrees of accuracy. Learning is the process of incorporating feedback from the real world and using it to adjust our mental model as needed.
The purpose of an activity is to **ACTIVATE A CONCEPT**

The sole purpose of activities is to activate intentional learning of concepts on the part of students. Use activities as part of MAC: M=map the lesson/mental model A=activate student learning C=check for understanding

1. **Past experience, current mental model, semantic webs, etc.**

2. **Metaphors, Analogies, or Storytelling**

3. **Visualization (graphic organizers, metacognitive mapping or “MetaMaps”)**

4. **Tactile & Human Manipulatives (everyday items, 3D models, reifications, etc.)**

5. **Spontaneous, on the fly activities, initiative games, concrete activities, etc.**

6. **Structured activities, initiative games, lab work, field trips, etc.**

7. **Formal immersion experiences (Outward Bound, etc.)**

8. **Experiential Activities that are all based on Activation**
   - Project-based learning
   - Problem-based learning
   - Theatre-based education
   - Case-based learning
   - Experiential learning
   - Service learning
   - Expeditionary learning
   - Lab work
   - Field trips
   - Initiative Gaming
   - Gap programs
   - Maker Movement
   - Play

9. **Most Resource Intensive**
   - More complex concepts

**GROUNDING WITH EXPERIENTIAL ACTIVITIES**

**GROUNDING WITH NONLINGUISTIC REPRESENTATIONS (NLR)**

**GROUNDING TO PRIOR KNOWLEDGE**

**LEAST RESOURCE INTENSIVE** • Less complex concepts