Energy Metaphors for Knowledge Dynamics

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A new perspective on thinking

“The mind is inherently embodied. Thought is mostly unconscious. Abstract concepts are largely metaphorical.”

(George Lakoff & Mark Johnson (1999) Philosophy in the flesh. The embodied mind and its challenge to Western thought, Basic Books, new York)
Metaphor

• A metaphor is a semantic extension from a known object toward a new concept in order to make it comprehensible.

• The extension is not of the whole initial domain; it is only for what can be mapped onto the new semantic domain. Thus, the semantic extension can be subjective.

• Through the metaphor the new object receives characteristics from the initial domain.
Mapping from source to target

Source Domain

TARGET

What is not transferred

What the metaphor transfer to the new domain

SPACE

metaphorical entailments

TIME

What is specific only for the new domain
The observer is moving

I shall come to you next week.
Time observer metaphor

- Past
- Event 1
- Event 2
- Event 3
- Future

Time is moving

Time flies by

Time for action has arrived
Mapping from source to target

Source Domain

metaphorical entailments

Target Domain

ENERGY

KNOWLEDGE
KNOWLEDGE

Knowledge structure

Rational mind

Non-rational mind

Explicit knowledge

Tacit knowledge

Knowledge transfer process

Direct experience
Mapping for tacit and explicit knowledge

ENERGY

KINETIC

POTENTIAL

EXPLICIT

TACIT

KNOWLEDGE
Mapping relations

• The ENERGY domain
  The transformation law: \( E = EP + EK \) (Quantitative)
  \( E \) – total energy
  \( EP \) – potential energy
  \( EK \) – kinetic energy

• The KNOWLEDGE domain
  The transformation law: \( K = KT + KE \) (Qualitative)
  \( K \) – total knowledge
  \( KT \) – tacit knowledge
  \( KE \) – explicit knowledge
Mapping for cognitive and emotional knowledge

ENERGY

KNOWLEDGE

Mechanical

Thermal

Cognitive

Emotional
Knowledge structure

- Mind
- Heart

Knowledge transfer process

Sensory system

Cognitive knowledge

Emotional knowledge
Mapping relations

• The ENERGY domain
  The transformation law: $\Delta E = W + Q$
  $\Delta E$ – variation of energy
  $W$ – mechanical work done
  $Q$ – heat exchanged

• The KNOWLEDGE domain
  The transformation law: $\Delta K = KW + KQ$
  $\Delta K$ – variation of knowledge
  $KW$ – cognitive work
  $KQ$ – emotional heat
KNOWLEDGE DYNAMICS

• Thermodynamics:
  work – extensive dimension/ quantity
  heat – 2 dimensions:
    - intensive dimension/ temperature
    - extensive dimension/ quantity of heat

• Knowledge dynamics:
  cognition – extensive dimension/quantity
  emotion  - intensive dimension/”temperature”
    - extensive dimension/ quantity
KNOWLEDGE ENTROPY

• The ENERGY domain

Entropy = introduced by Clausius in 1865
Entropy change = amount of energy dispersed reversibly at a specific temperature

\[ \text{Entropy} = k \log D \]

- \( k \) – Boltzmann constant
- \( D \) – a quantitative measure of disorder

• The KNOWLEDGE domain

Entropy = \( k \log D \)
Mapping not possible for conservation of energy

**ENERGY**
- Conservation laws
- Energy-Mass
- Linearity
- Carnot cycle

**KNOWLEDGE**
- Knowledge creation
- Knowledge destruction
- Nonlinearity
- Nonaka cycle
INTEGRATORS

An **integrator** is a powerful field of forces capable of combining two or more elements into a new entity, based on **interdependence** and **synergy**. These elements may have a physical or virtual nature, and they must possess the capacity of interacting in a controlled way.
Thank you for your attention!