

SPN 1022

Learning Science and Mathematics

# ALTERNATIVE FRAMEWORK

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# ALTERNATIVE FRAMEWORK

- Several terminology related to alternative framework:
  - Children's science
  - Misconception
  - Alternative conception
  - Mini science
  - Naive theory
  - Children believe
  - Pre-conception

# Alternative framework

- Children have beliefs about things happen and expectations which enable them to predict future events
  - On the basis of their everyday experiences of the world, hold these beliefs and expectations very strongly
  - Children have clear meanings for words which are used both in everyday language and also in formal science
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# Alternative framework

- Children's view of the world are part of conceptual structures – provide a sensible and coherent understanding of the world from the child's point of view.

# Nature of alternative framework

- From a young age, and prior to any teaching and learning of formal science, children develop meaning for many words used in science teaching and views of the world which relate to ideas taught in science.
- Children's ideas are usually strongly held.
- These ideas are sensible and coherent views from the children's point of view, and they often remain uninfluenced or can be influenced in anticipated ways by science teaching.

# Example of alternative framework

- Earth Science

- Phillips, W.C. 1991, Earth Science Misconceptions, *Science Teacher* Feb'91 pp 21-23.
  1. The Earth is sitting on something.
  2. The Earth is larger than the Sun.
  3. The Earth is round like a pancake
  4. We live on the flat middle of a sphere.
  5. Astrology is able to predict the future.
  6. Gravity increases with height.
  7. Gravity cannot exist without air.

# Example of alternative framework

- Physical Science

- Hapkiewicz, A. (1999). Naïve Ideas in Earth Science. *MSTA Journal*, 44(2) (Fall'99), pp.26-30. <http://www.msta-mich.org>
  1. When things dissolve they “disappear.”
  2. Materials can only exhibit properties of one state of matter.
  3. Melting and dissolving are confused.
  4. Dew formed on the outside of glass comes from the inside of the glass.
  5. Expansion of matter is due to the expansion of particles rather than the increased particle spacing.
  6. Molecules of a gas “just float” rather than being kept in the gaseous state by their motion.

# Example of alternative framework

- Chemistry

- Hapkiewicz, A. (1992). Finding a List of Science Misconceptions. *MSTA Newsletter*, 38 (Winter'92), pp. 11-14.
  1. Gases are not matter because most are invisible.
  2. Gases do not have mass.
  3. A "thick" liquid has a higher density than water.
  4. Mass and volume, which both describes an "amount of matter," are the same property.
  5. Air and oxygen are the same gas.
  6. Helium and hot air are the same gas.
  7. Expansion of matter is due to the expansion of particles, rather than the increased particle spacing.



# Example of alternative framework

- Physic

- Hapkiewicz, A. (1992). Finding a List of Science Misconceptions. MSTANewsletter, 38 (Winter'92), pp. 11-14.
  1. Energy is truly lost in many energy transformations.
  2. There is no relationship between matter and energy.
  3. If energy is conserved, why are we running out of it?
  4. Energy can be changed completely from one form to another (no energy losses).
  5. Things "use up" energy.
  6. Energy is confined to some particular origin, such as what we get from food or what the electric company sells.
  7. An object at rest has no energy.

# Example of alternative framework

- Biology

- Berthelsen, B. (1999). Students Naïve Conceptions in Life Science. MSTA Journal, 44(1) (Spring'99), pp. 13-19. <http://www.msta-mich.org>
  1. Stronger organisms have more energy.
  2. There are more herbivores because they have more offspring.
  3. A species high on the food web is a predator to everything below it.
  4. Energy accumulates in an ecosystem so that a top predator has all the energy from the organisms below it.
  5. Carnivores can exist in a plant free world if their prey reproduce enough.
  6. The food that is eaten and used as a source of energy is part of the food chain; food that is synthesized into the body of the eater is now food for the next level.

# Patterns in alternative framework

## 1. Everyday language

- Many words in science are used in an alternative way in everyday language. Examples: work, force, energy, atom, particle...

## 2. Self-centered and human-centered viewpoints

- Young children have egocentric views of the world.





## 3. Non observables do not exist

- A physical quantity is not present in a given situation unless the effects of that quantity or the quantity itself is observable

# Patterns in alternative framework

4. Endowing objects with the characteristics of humans and animals
  - Children often endow objects with a feeling, a will or a purpose. Example: 'cold' is thought to move towards the outside of the jar under the effect of an implied will.
5. Endowing objects with a certain amount of a physical quantity
  - Children often endow an object with a certain amount of a physical quantity and for this quantity (e.g: force, momentum, energy) to be given an unwarranted physical reality.

# The implications of alternative framework for teaching

The undisturbed alternative framework outcome	
The two perspectives outcome	
The reinforced outcome	
The mixed outcome	
The unified scientific outcome	