AST 2:Interest,Conceptual Change in Science Education

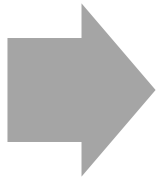
Educating Science Teachers for All

ESTA-PHIL-PNU

Dr. Leah Amor S. Cortez

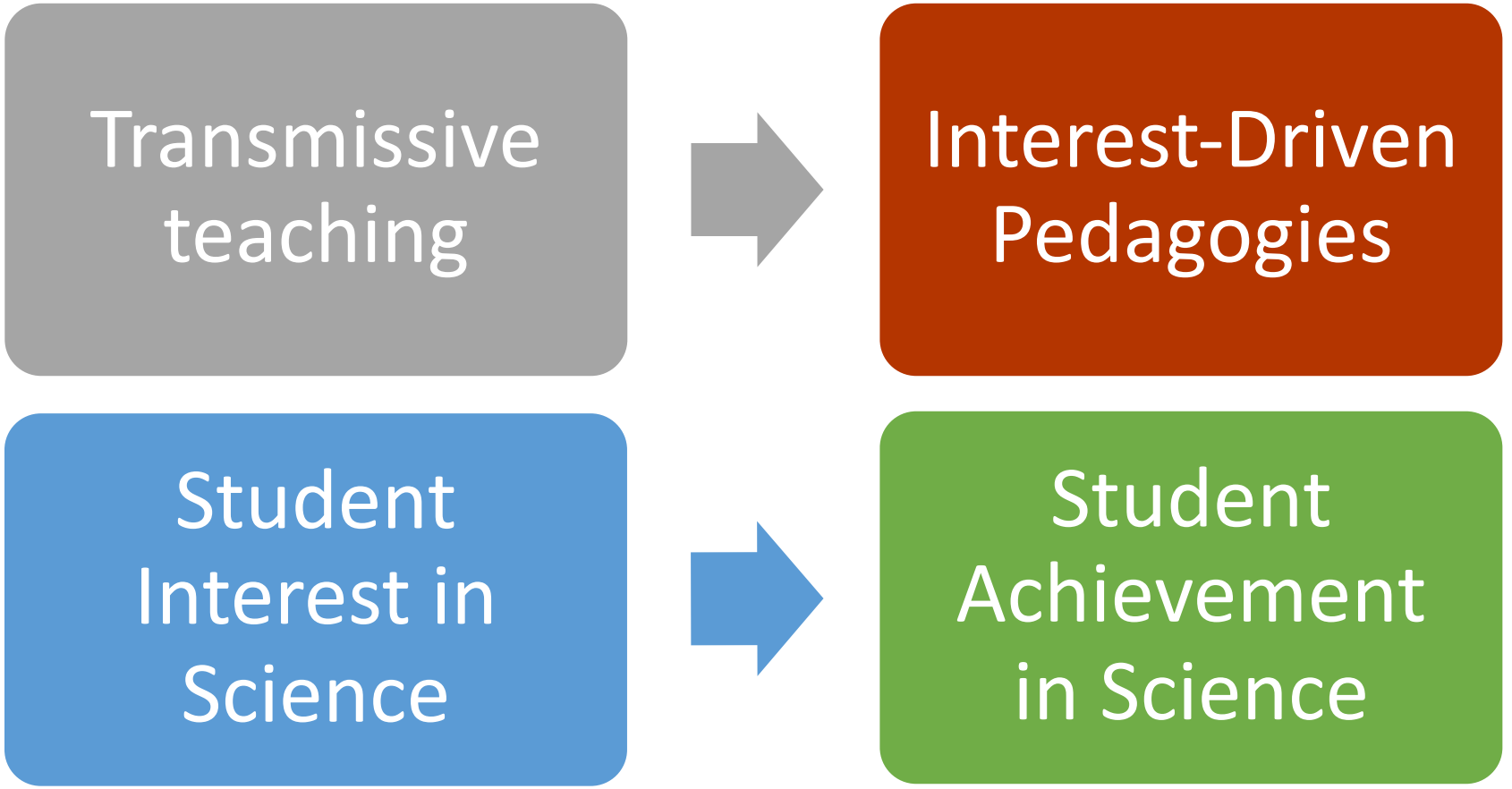
Paradigm Shift

Transmissive teaching



Interest-Driven Pedagogies

Paradigm Shift



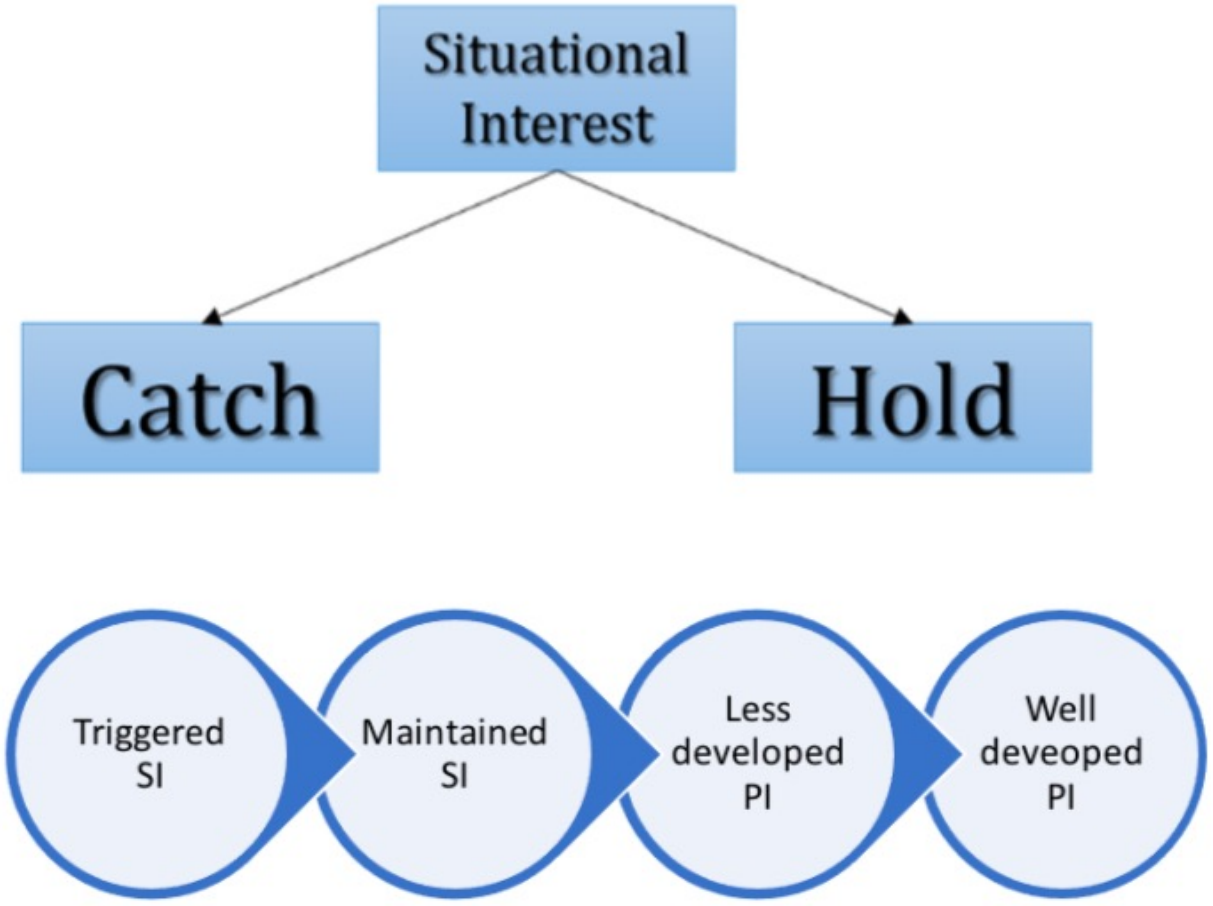
What behaviors or traits might be observed when learners are interested in a science Lesson?

Interest and Science Education

- Interest
  - Multidimensional psychological construct that incorporates elements such as
    - Engagement
    - Attention
    - Motivation
    - Curiosity

Components of Interest

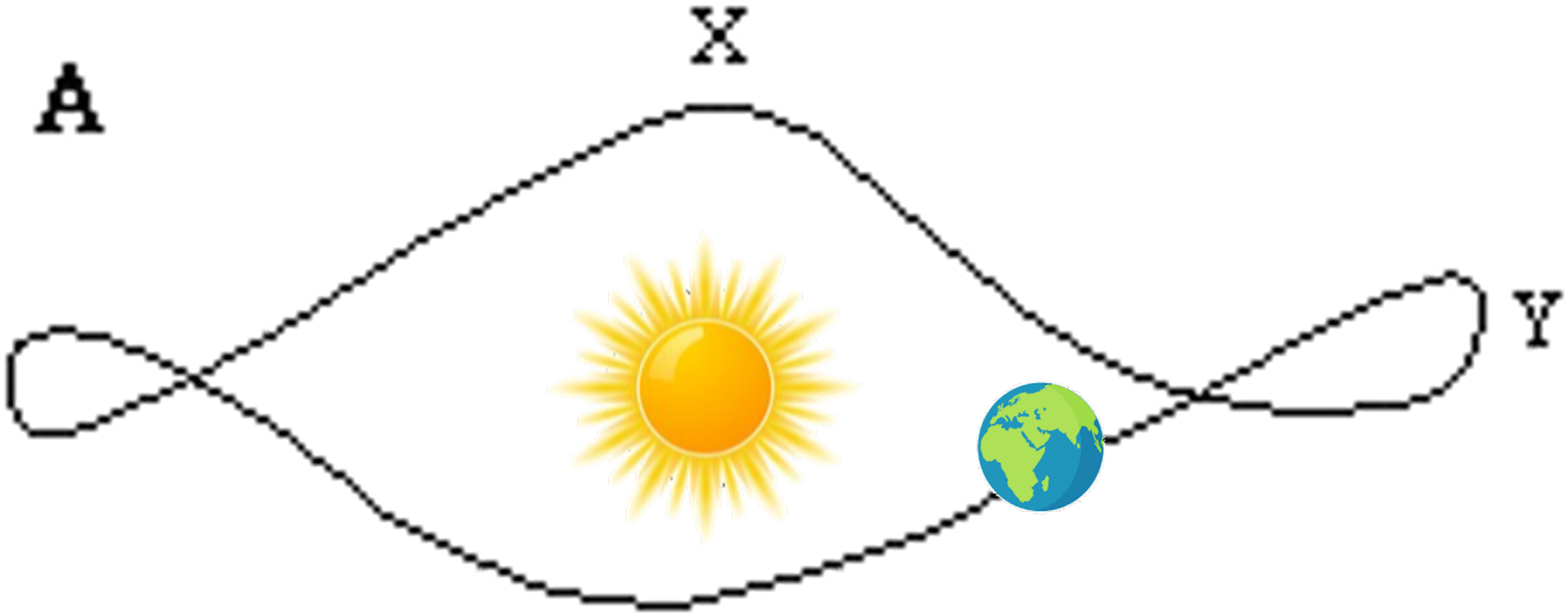
- Interest
  - Situational Interest (SI)
  - Personal Interest (PI)

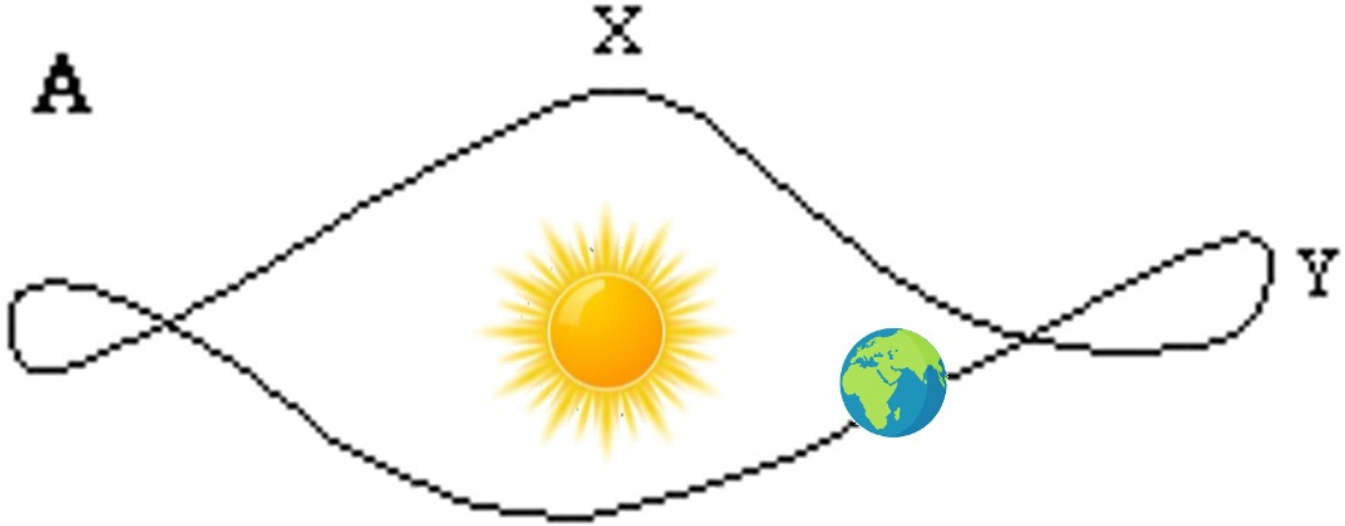


- MARIA, a very bright ninth grader, is asked to explain the mechanisms causing the seasons and the phases of the moon.
- She has received no formal instruction on these topics in her ninth-grade earth science class although these topics were covered in science lessons from earlier grades.

This is her belief…

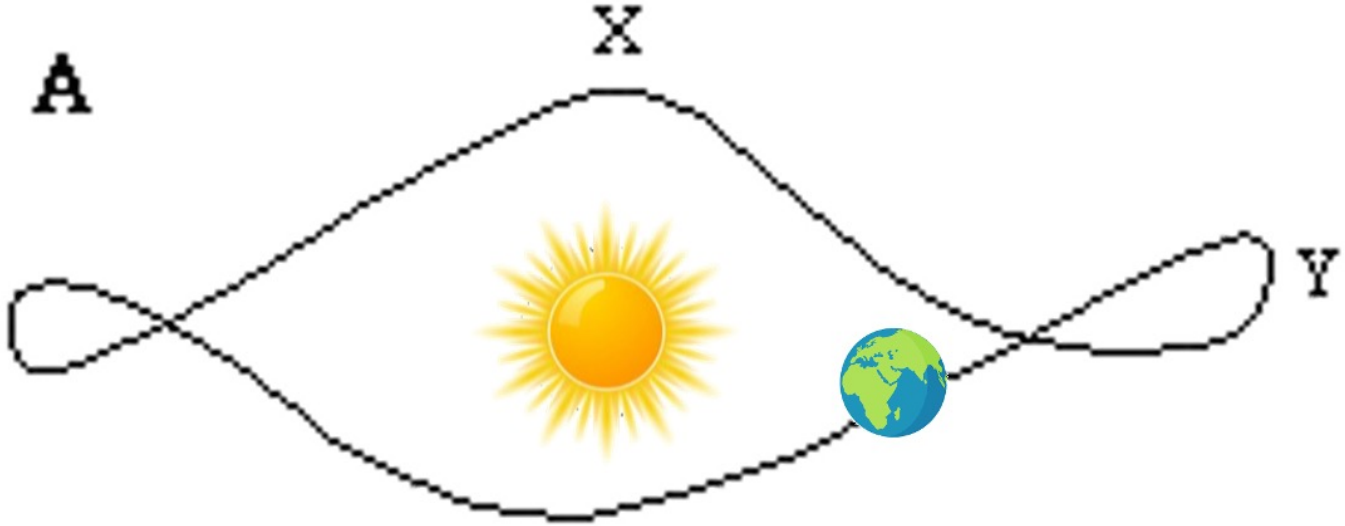
The earth orbits the sun in a bizarre curly pattern and that the seasons are caused by the proximity of the earth to the sun at different points along the orbit.





- She explains that when the earth is closest to the sun at point X, it is winter in the northern hemisphere because the light rays from the sun hitting the earth are “indirect.”
- She says that when the earth is at point Y, it is summer because the light rays hitting the northern hemisphere are “direct.”

(adapted from Mestre, 1994).



- She goes on to explain that direct rays are those that originate from the sun and travel in a straight line to the earth, and that indirect rays are rays that “bounce off” somewhere in space before reaching earth.
- To explain the phases of the moon, Maria explains that the shadow of the earth on the moon is the cause.

(adapted from Mestre, 1994).

What can you say about Maria's concept/idea?

When teachers provide instruction on concepts in various subjects, they are teaching students who already have some pre-instructional knowledge about the topic.

Student knowledge, however, can be erroneous, illogical or misinformed. These erroneous understandings are termed **alternative conceptions or misconceptions** (or intuitive theories).

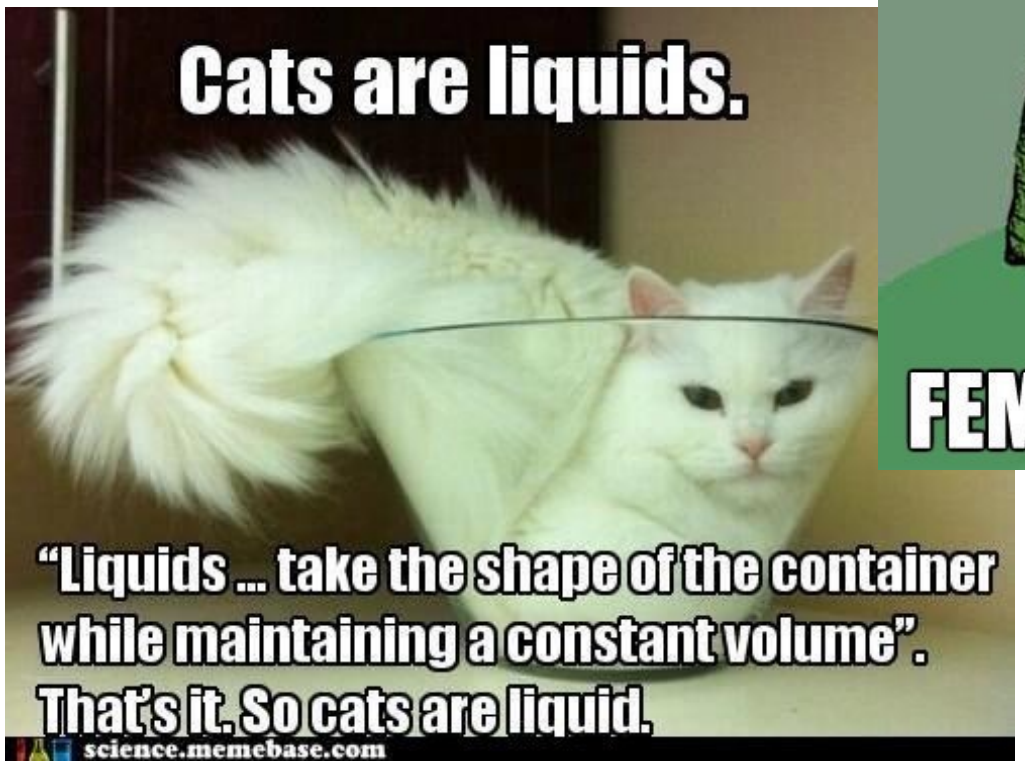
Joan Lucariello, PhD, City University of New York
with David Naff, Virginia Commonwealth University

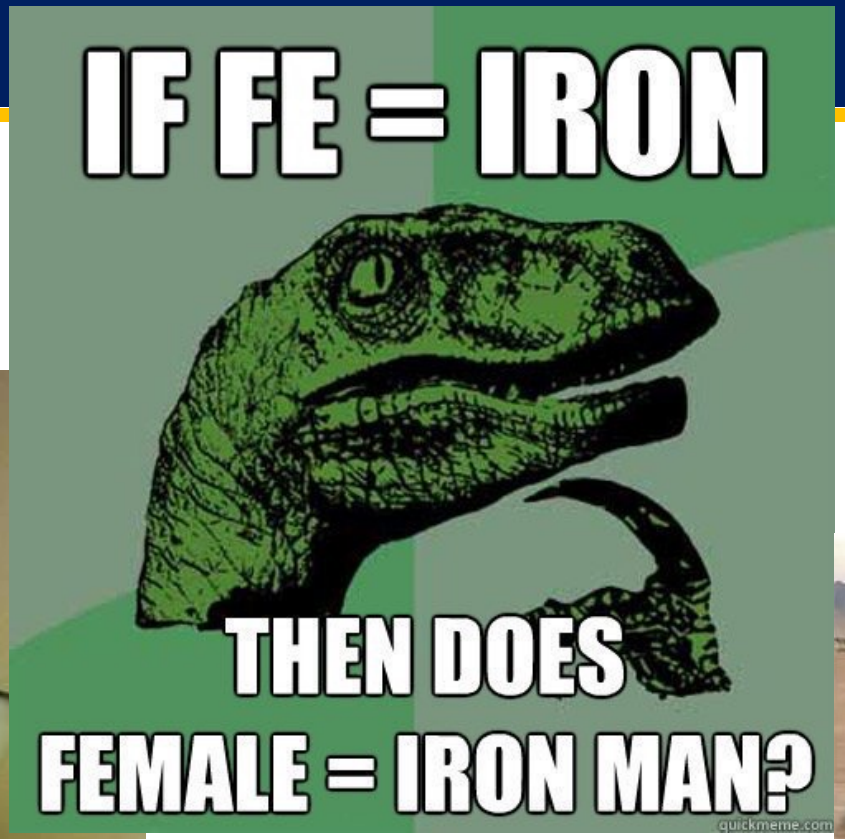
Students may bring to the class…

- Social and cultural beliefs
- Misconceptions
- Alternative conceptions
- Some correct understanding

NEWTON'S 1ST LAW

A BODY AT REST
WANTS TO STAY AT REST.


Cats are liquids.
"Liquids ... take the shape of the container while maintaining a constant volume".
That's it. So cats are liquid.
science.memebase.com


IF FE = IRON
THEN DOES
FEMALE = IRON MAN?
quickmeme.com


sunlight
prism
LIVE
THE BIG STORY
prism
rainbow
LIVE
THE BIG STORY
GETTING READY FOR ALIENSTOCK

What is conceptual change?

Conceptual change is a process that changes or replaces an existing conception with a new conception. It could be an idea, a belief, or a way of thinking.

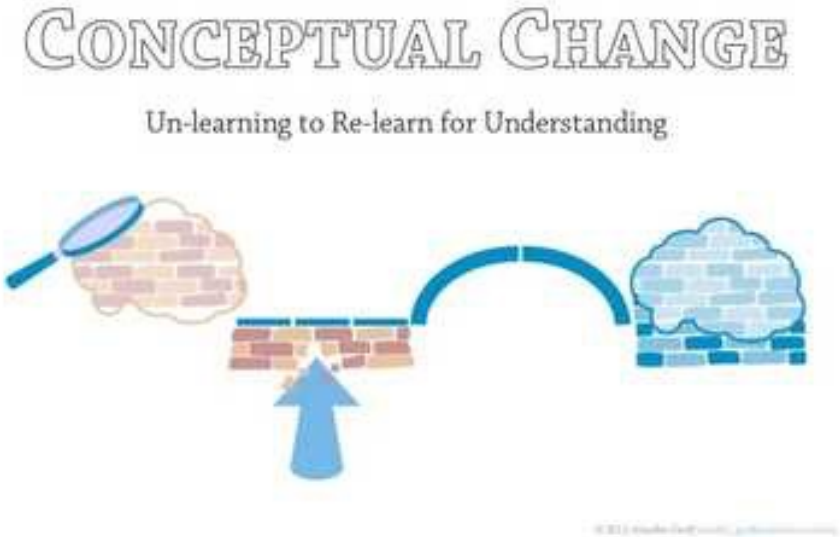
Kuhn T. S. (1970) “The Structure of Scientific Revolutions”, Chicago, Chicago University Press, 1970.

- Conceptual change is defined as learning that changes an existing conception. It is a process that results in a paradigm shift, revolutionizing one's prior thinking.

- Conceptual change takes time…time to determine one's current beliefs, to be open to new ideas, to accommodate new thinking into one's current understanding, and time to put the new learning into practice.

- In one conceptual change model, students use their existing knowledge, which is their conceptual ecology, to determine whether the different conditions are met. The new conception must be intelligible (the meaning is understood), plausible (the concept is true), and fruitful (the concept is useful).
- If the new conception fulfills all three conditions, conceptual change occurs and learning proceeds without difficulty. (Hewson, P., & Hennessey, M. G, 1992)

- New concepts that are not fully compatible with prior knowledge can, thus, only be learned when the network of prior knowledge is restructured. This process of knowledge restructuring is also referred to as *conceptual change*.
- Conceptual change can be gradual as well as abrupt and can take various forms.



Schneider M., Vamvakoussi X., Van Dooren W. (2012) Conceptual Change. In: Seel N.M. (eds) Encyclopedia of the Sciences of Learning. Springer, Boston, MA. https://doi.org/10.1007/978-1-4419-1428-6_352

Conceptual Change Teaching Strategy Nussbaum and Novick (1982):

1. Reveal student preconceptions
2. Discuss and evaluate preconceptions
3. Create conceptual conflict with those preconceptions
4. Encourage and guide conceptual restructuring

- # Conceptual Change Phases
  - The student recognizes an anomaly in her instruction.
  - The student expresses some form of interest in the anomaly.
  - The student becomes anxious and wants to resolve her cognitive conflict.
  - The student engages with a cognitive reappraisal of the situation by thinking about the problem for a longer period of time or actively seeking out an explanation.

For successful Conceptual Change

1. Supportive Environment
2. Adequate Time for inquiry
3. Planning for instruction
4. Students are asked to evaluate and reflect
5. Teacher knowledge

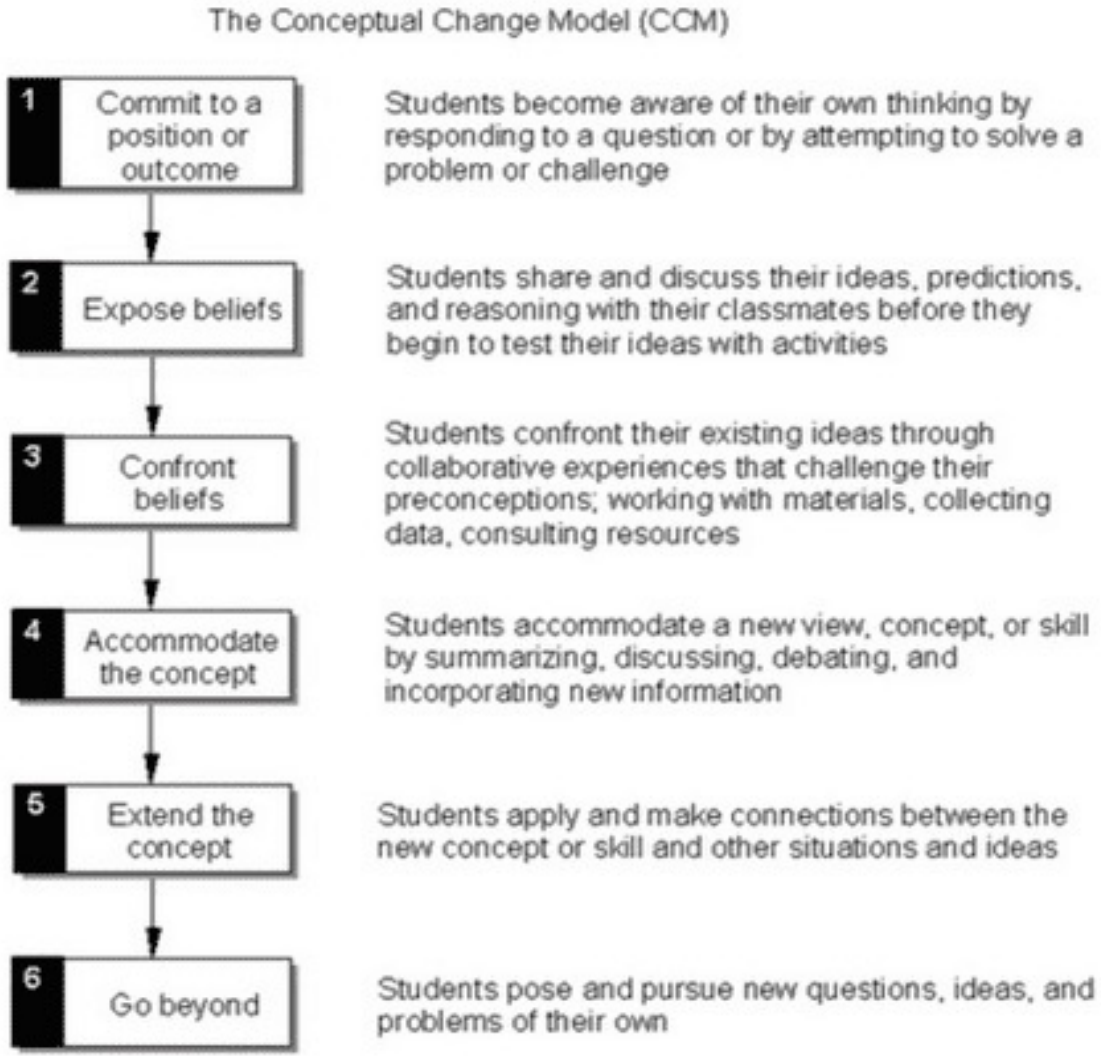
Geoff. (2012). *Conceptual Change - Unlearn to Relearn*. Retrieved from http://www.slideshare.net/jsgroff/conceptual-change-groff-1437614

In education, **CCM** is a model that explicitly sets out to help students shift their frameworks of understanding.

In practice, **this model includes**:

- Systematically uncovering and addressing student misconceptions
- Providing an opportunity for students to confront and evaluate new knowledge
- Facilitating students' conceptual framework shifting
- Providing opportunities for students to expand upon and apply their new knowledge

http://tssedumap.weebly.com/conceptual-change-model.html#:~:text=In%20education%2C%20CCM%20is%20a,confront%20and%20evaluate%20new%20knowledge



Are you ready to learn Something new today?