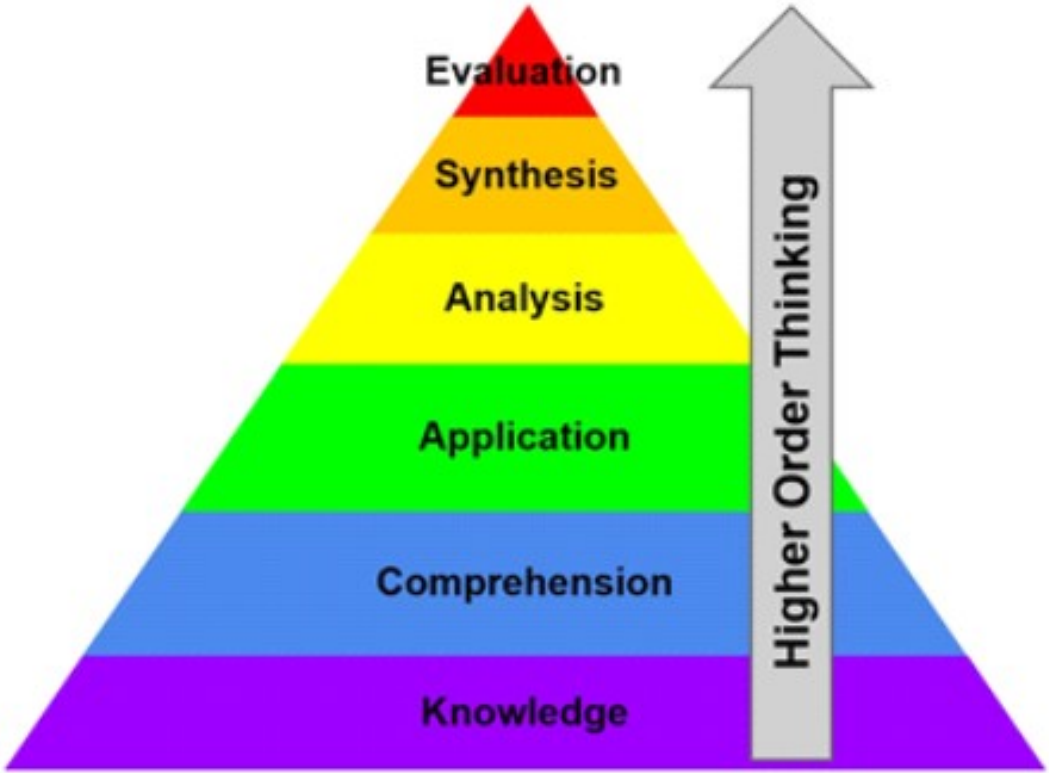
Critical Thinking

"The careful, deliberate determination of whether one should accept, reject, or suspend judgment about a claim and the degree of confidence with which one accepts or rejects it."

(*Critical Thinking.* B. Moore and R. Parker, 2007)

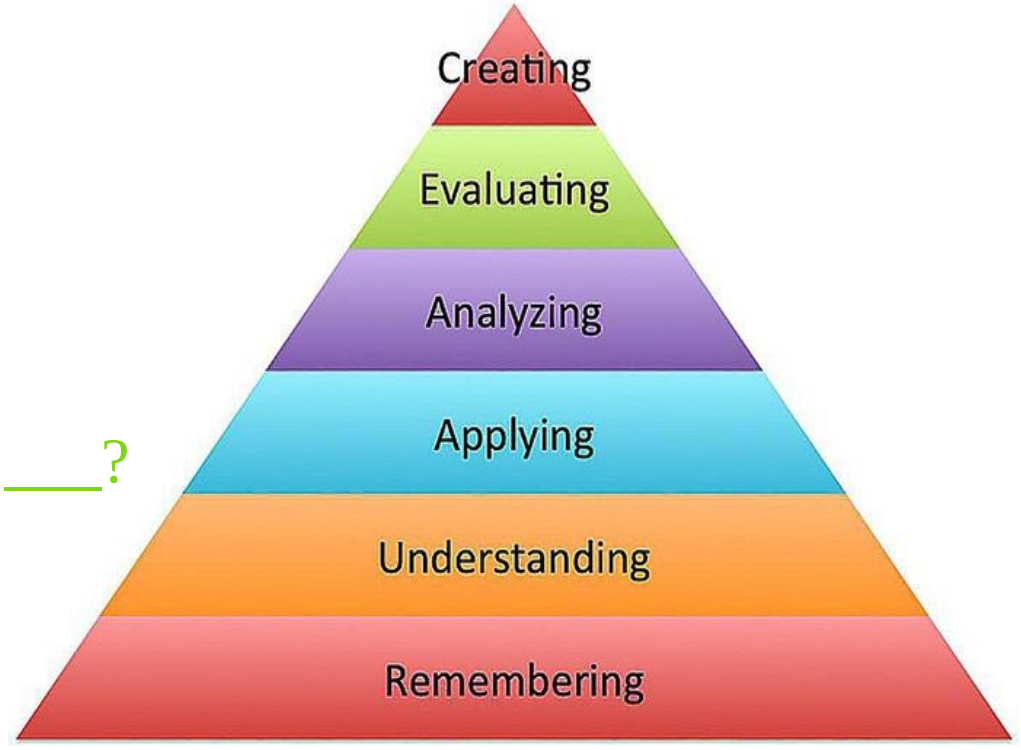


What are examples of different levels of higher order thinking?

Bloom's Taxonomy
Cognitive Domain

New Version of Bloom's Taxonomy

- Analyzing:
  - How can you sort the parts ___?
  - What can you infer___?
  - What ideas validate ___?
- Evaluating:
  - What criteria would you use to assess ___?
  - What data were used to evaluate ___?
  - How could you verify ___?
- Creating:
  - What alternative would you suggest for ___?
  - What changes would you make to revise___?
  - How would you generate a plan to ___?

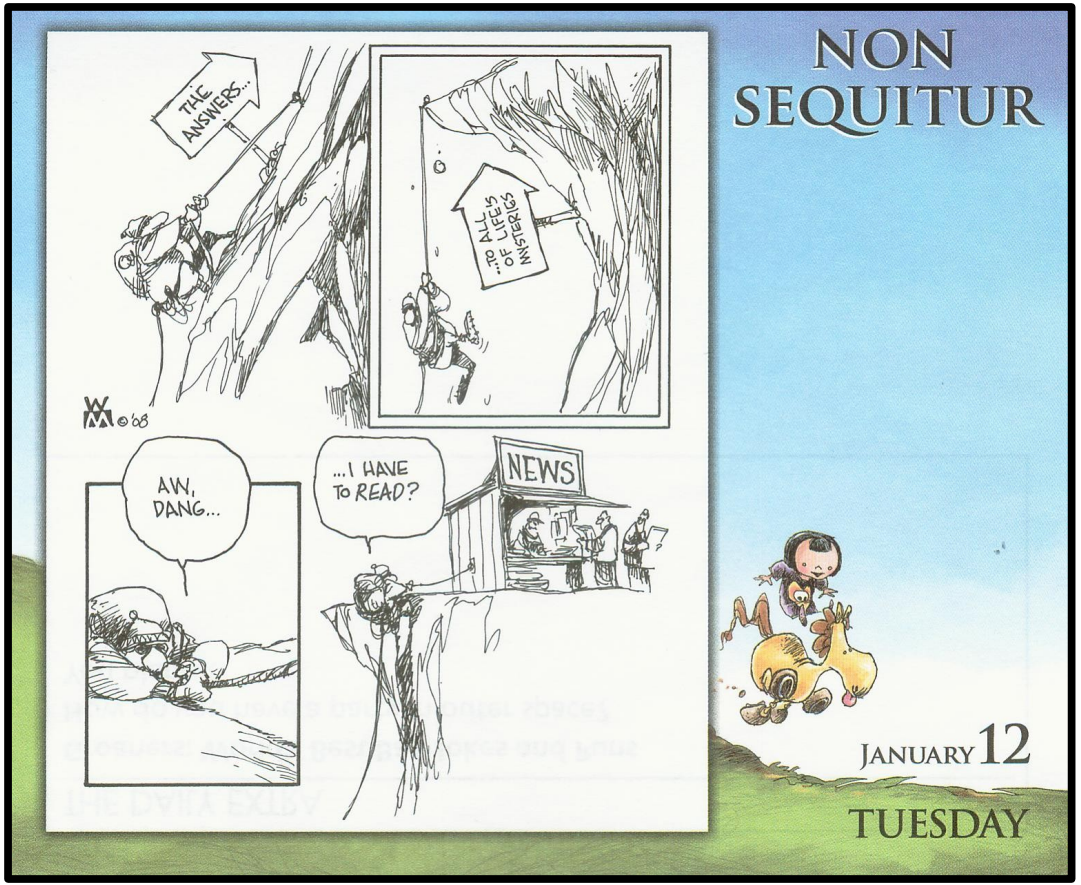


What can you create working at a University?

Examples of using Critical Thinking

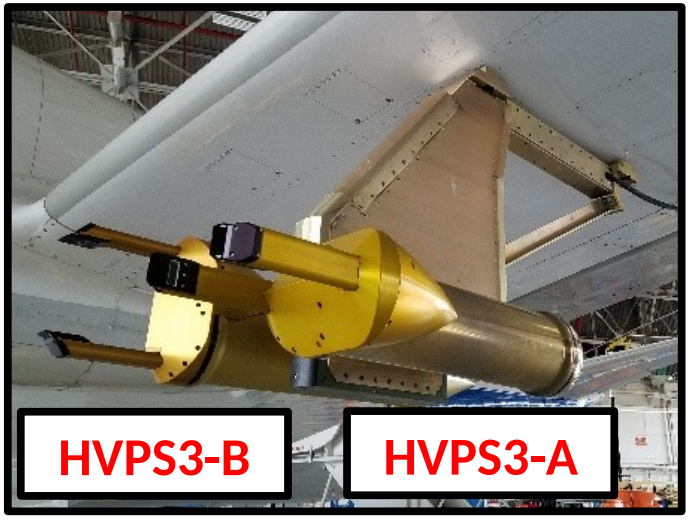
- To Approach Questions to Find an Answer
- To Solving Problems
- To Taking Action

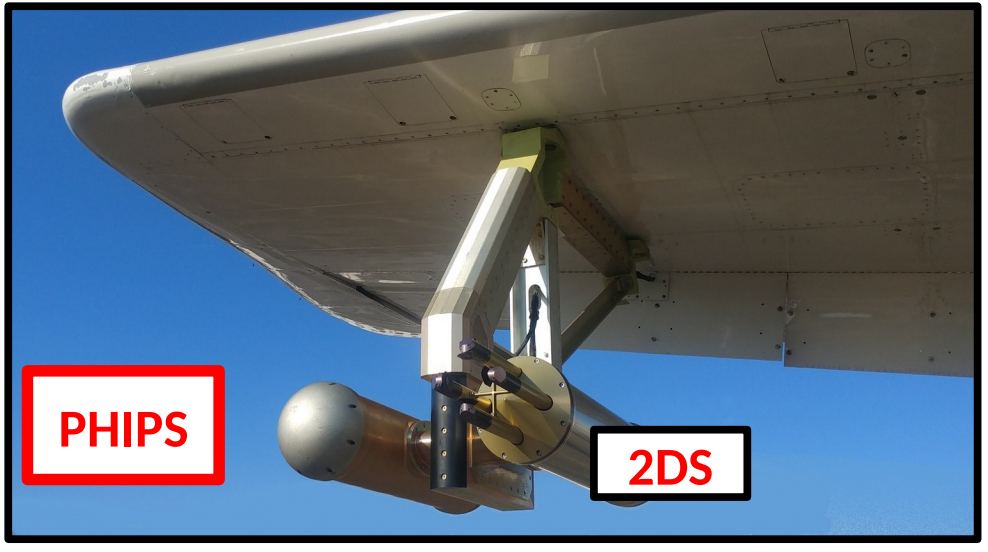
Requires active thinking, the use of reason, and an open mind.

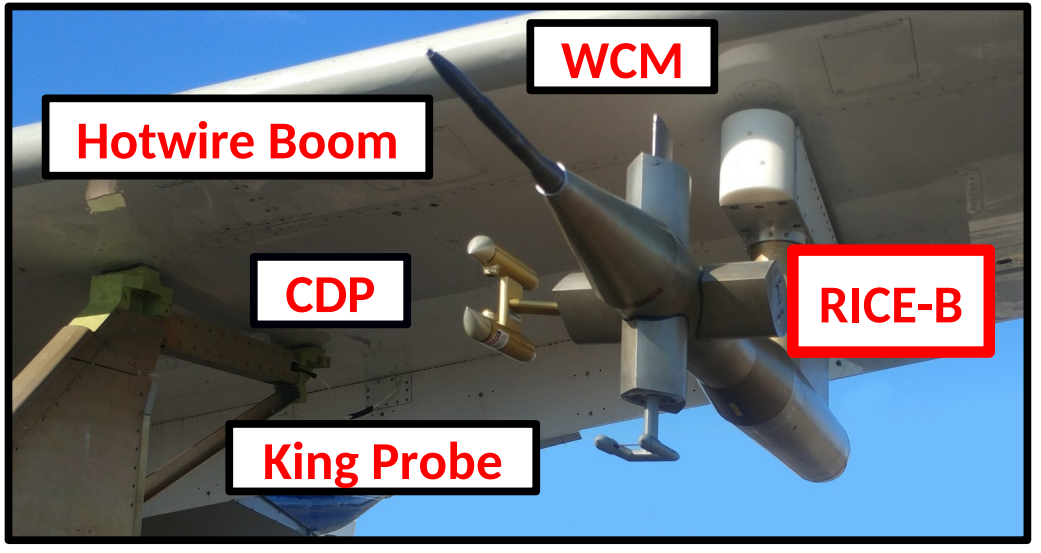


What is an example of how you used critical thinking?

How Does Critical Thinking Apply to Research?







Application of Critical Thinking

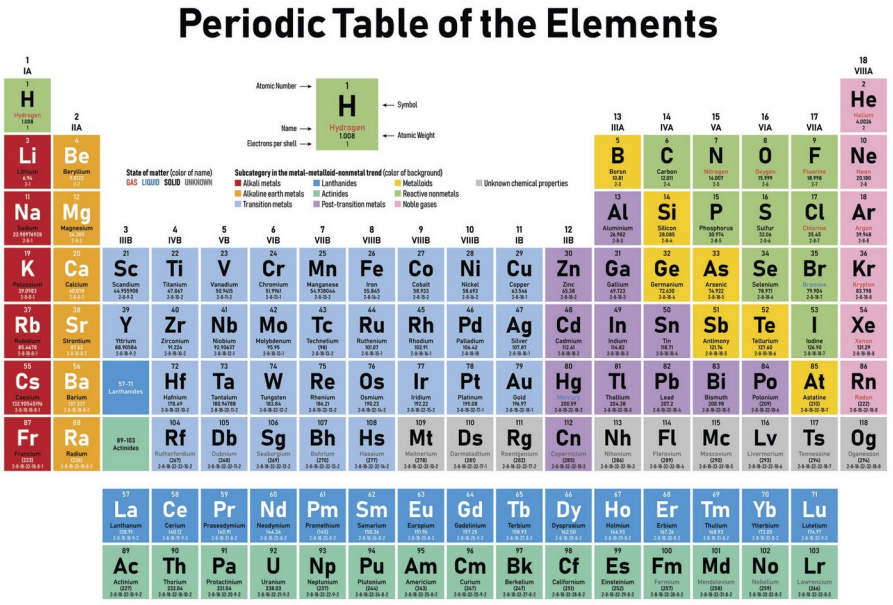
Critical thinking should be applied to:

- Expressing your own thoughts, beliefs, and opinions.
- Reading or listening to the thoughts, beliefs, opinions of others.

How can you apply critical thinking to class lectures?

Elements of Reasoning (Thinking)

- Reasoning has a purpose.
- Reasoning is figure something out.
- Reasoning is based on assumptions.
- Reasoning is from a point of view.
- Reasoning is based on information.



- Reasoning is expressed through concepts and theories.
- **Reasoning contains interpretation of data and observations.**
- Reasoning has implications and consequences.

Questions Using Elements of Reasoning

- Purpose
  - What am I trying to accomplish?
- Questions
  - What question am I raising or addressing?
  - Am I considering all the complexities?
- Information
  - What information or experience am I using?
  - What information do I need?
- Inferences/Conclusions
  - How did I reach this conclusion?
  - Is there another interpretation?

Questions Using Elements of Reasoning

- Concepts
  - What is the main idea?
  - Can I explain it?
- Assumptions
  - What am I taking for granted?
  - What have I assumed?
- Implications/Consequences
  - What am I implying?
- Points of View
  - What point of view am I using?
  - Is there another point of view to consider?

Intellectual Standards

- Clarity – Further elaboration, examples
- Accuracy – Verify, check out
- Precision – More specific, further details
- Relevance – Relate to question
- Depth – Complexities and difficulties
- Breadth – Another perspective, other point of view
- Logic – Makes sense, conclusions follow evidence
- Significance – Central idea, most important facts
- Fairness – Vested interest in the issue

Applying Standards to Elements of Reason

- Intellectual Standards should be applied to Elements of Reason.
- This approach can be used to:
  - Analyze contents of an article.
  - Analyze and assess research.
  - Help you formulate your own conclusions.
  - Help you take a reasoned stand on an issue.
- This leads to developing Intellectual Traits.

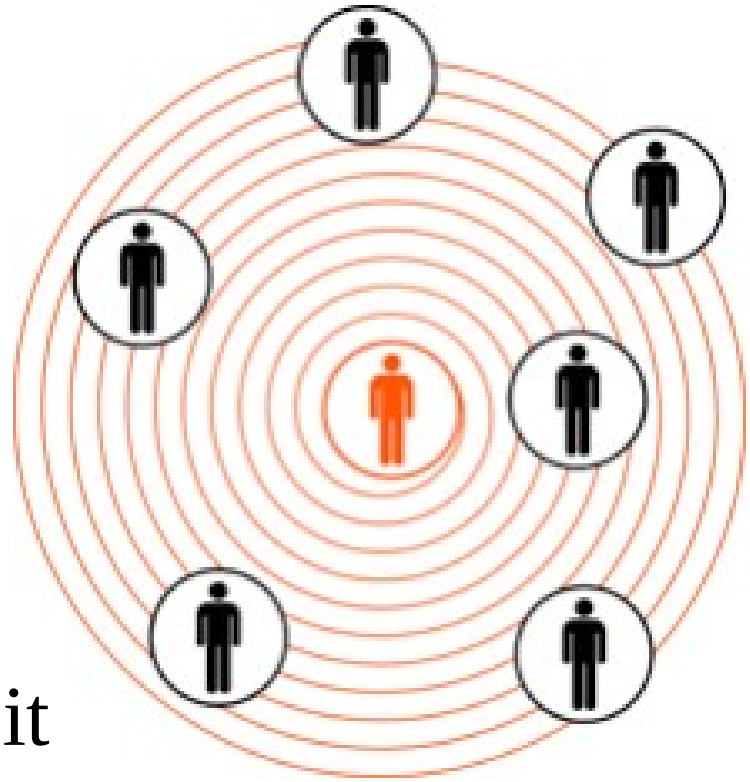
Intellectual Traits

- Intellectual Humility - Realize limits of own knowledge
- Intellectual Courage - Ideas/beliefs/views that counter our own
- Intellectual Empathy - See the other side
- Intellectual Autonomy - Think for yourself
- Intellectual Integrity - Hold yourself to consistent, high standards
- Intellectual Perseverance -Work through confusion
- Confidence in Reason - Believe that high standards will win out
- Fair-mindedness - Treat all viewpoints alike

Egocentric Thinking

It’s true because:

- I believe it
- We believe it
- I want to believe it
- I have always believed it
- It is in my own interest to believe it



Apply Critical Thinking to Weather Modification

- Elements of Reasoning
- Intellectual Standards
- Applying Standards to Elements of Reason
- Intellectual Traits
- Taking Action without Egocentric Thinking

Image from cloud seeding in North Dakota on July 2, 2012. Credit: David Delene