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# Know your ~~enemy~~ students

*A quick guide to how a lot of college-age people learn*

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New Faculty Workshop



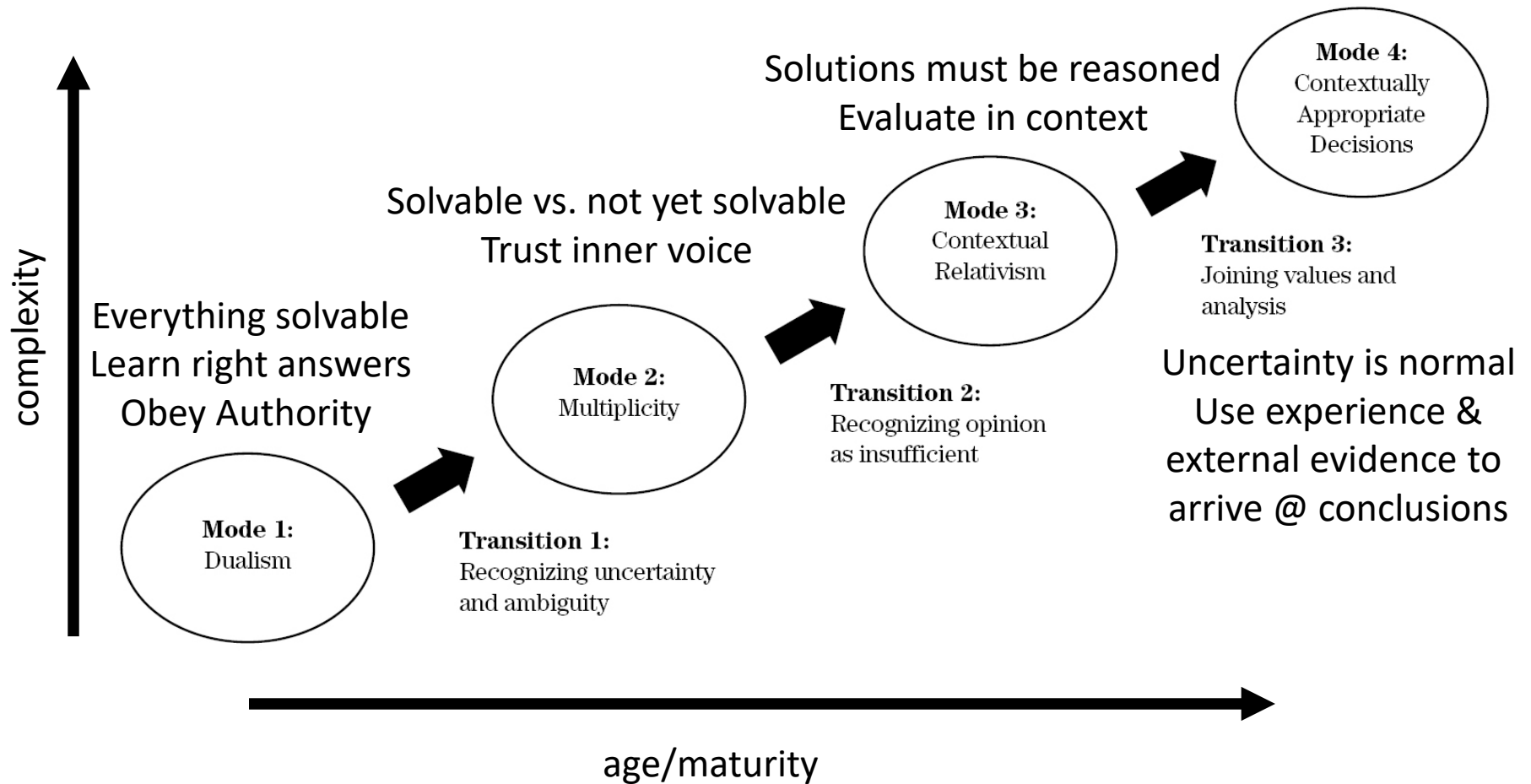
*American Chemical Society  
Washington, DC*



August 2nd, 2019

# University Student Development

Perry's nine stages of development in four categories



[http://perrynetwork.org/?page\\_id=2](http://perrynetwork.org/?page_id=2)

<https://studentdevelopmenttheory.weebly.com/perry.html>

# College Student Development is Variable

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Perry (men)

Dualism

Multiplicity

Relativism

Contextual Relativism

Belenky, et al., (women)

Received knowledge

Subjective knowledge

Procedural knowledge

Constructed knowledge

Belenky, M.F., B.M. Clinchy, N.R. Goldberger and J.M. Tarule.  
1986. Women's Ways of Knowing. Basic Books, NY.

# College Student Development is Variable

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## Belenky, et al., (women)

Received knowledge

Receiving & repeating  
knowledge from authorities

Subjective knowledge

Distrust of analysis & logic

Procedural knowledge

Procedural knowledge

Constructed knowledge

Constructed knowledge

Belenky, M.F., B.M. Clinchy, N.R. Goldberger and J.M. Tarule.  
1986. *Women's Ways of Knowing*. Basic Books, NY.








# Bloom's Taxonomy of Educational Objectives

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# Results from an Intro Survey in 2<sup>nd</sup> Semester organic

The most challenging problems in my earlier organic chemistry class(es) were based on \_\_\_\_\_.

Response	Average	Total
Naming/Nomenclature	 1%	2
Stereochemistry	 8%	13
Mechanism	 18%	30
Predict the Product	 6%	10
Spectroscopy	 18%	29
Multi-step Synthesis	 49%	80
Total	 100%	164/164

**Nomenclature & Predict Product:** Typically involve Knowledge, Comprehension, Application

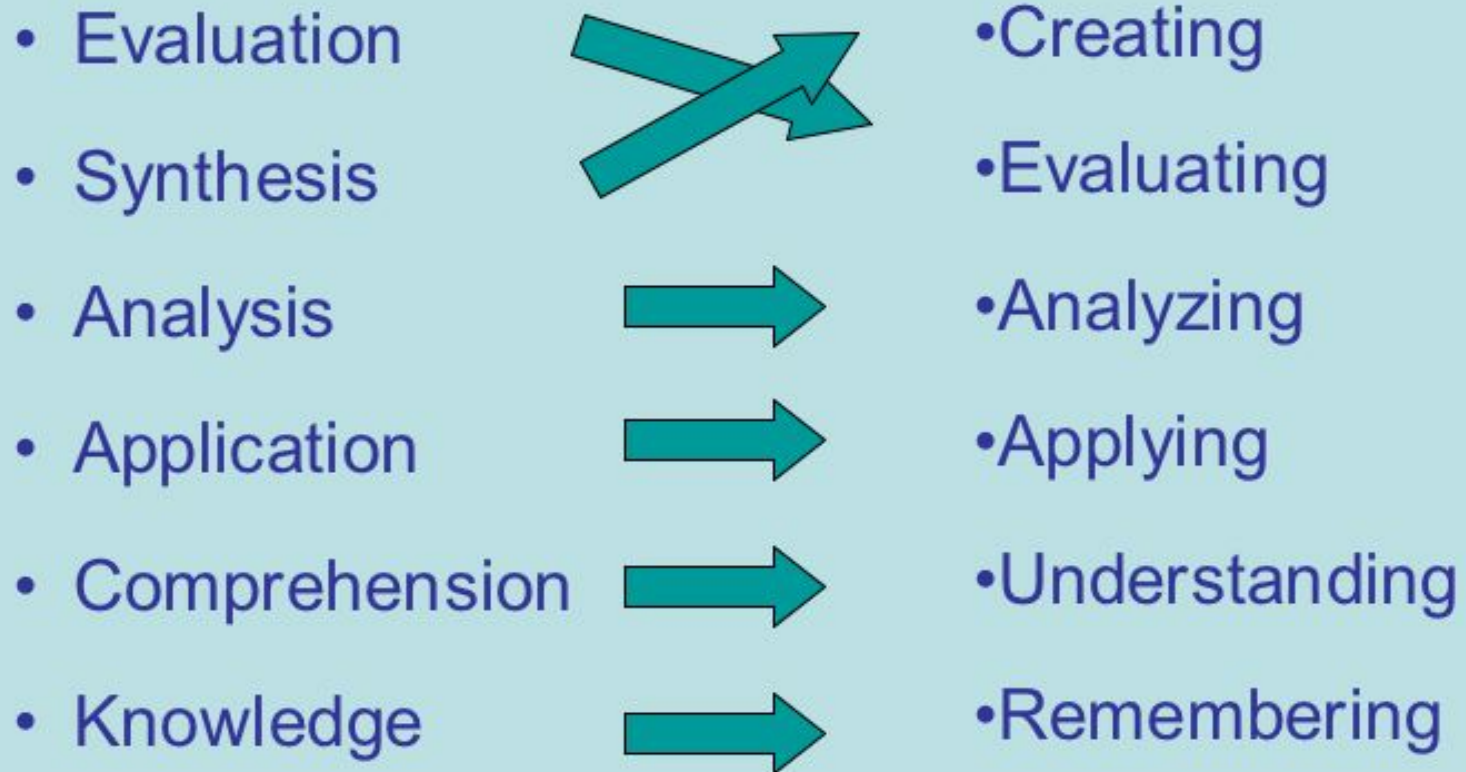
**Multistep Syn, Spec., Mechanisms:** Typically involve Application, Analysis, & Synthesis

Note: knowledge question ≠ easy

# A Revisionist Taxonomy

## Original Domain

## New Domain



# How will this help you to teach better?

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Learning objectives

Something

Outcomes

What do I want them to be able to Do?

Assessment

How will I know they can Do Something?



# Backwards design: *Start from the student outcome*

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## Traditional instruction

“content-oriented”

What will I teach?



Plan lecture

*Retrosynthetic frameworks for models of instruction*

## Modern instruction

“learning-oriented”

What should students learn?



How will I measure that learning?

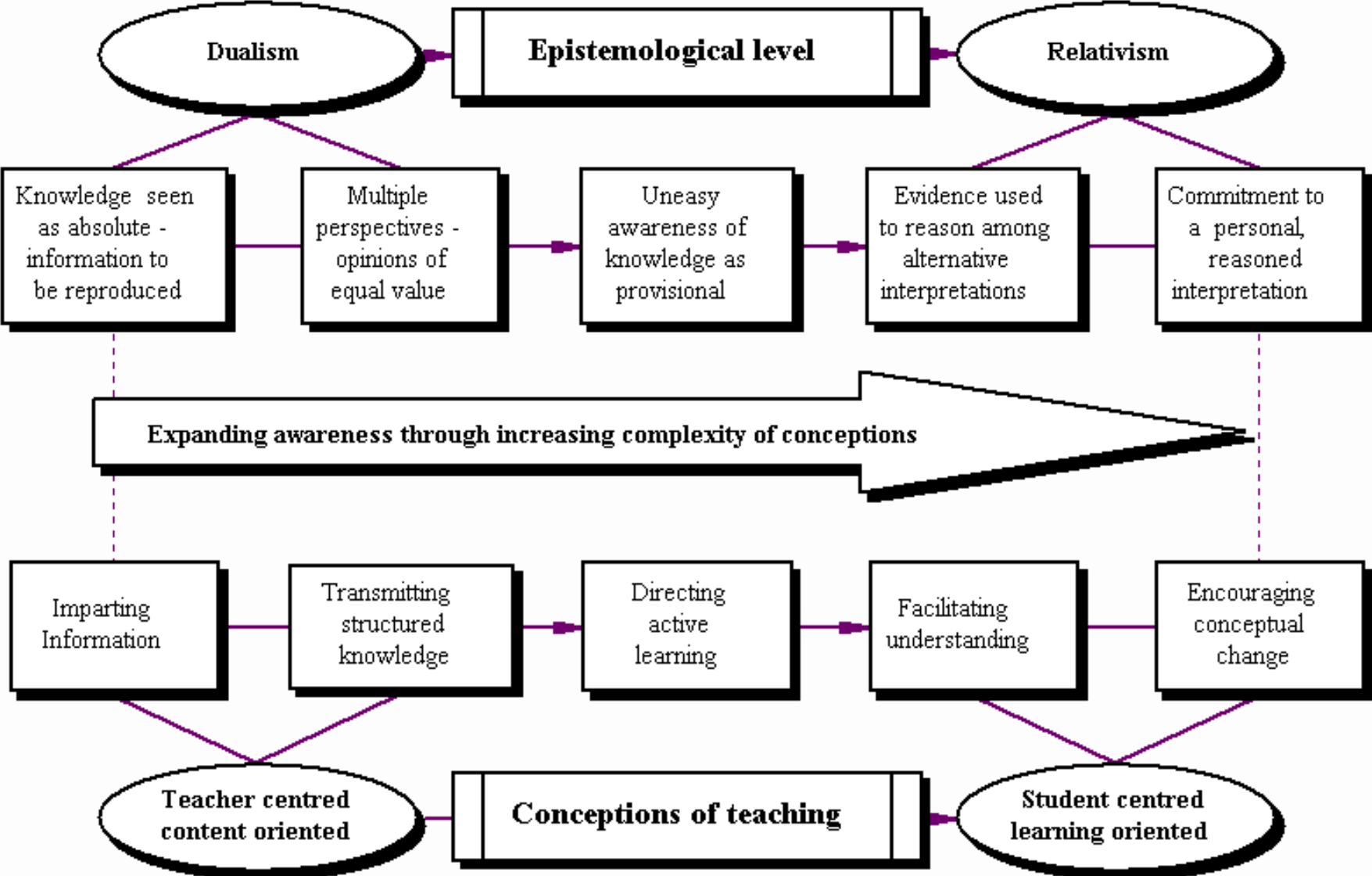


What activities promote that learning?



Design instruction and activities

# How these ideas meet



# Exercise: Making an element of content active

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1. Pick an element of content.
2. Decide on learning objectives.
3. Choose an activity for that content.

# Bloom's Taxonomy with Action Verbs

## B L O O M S T A X O N O M Y

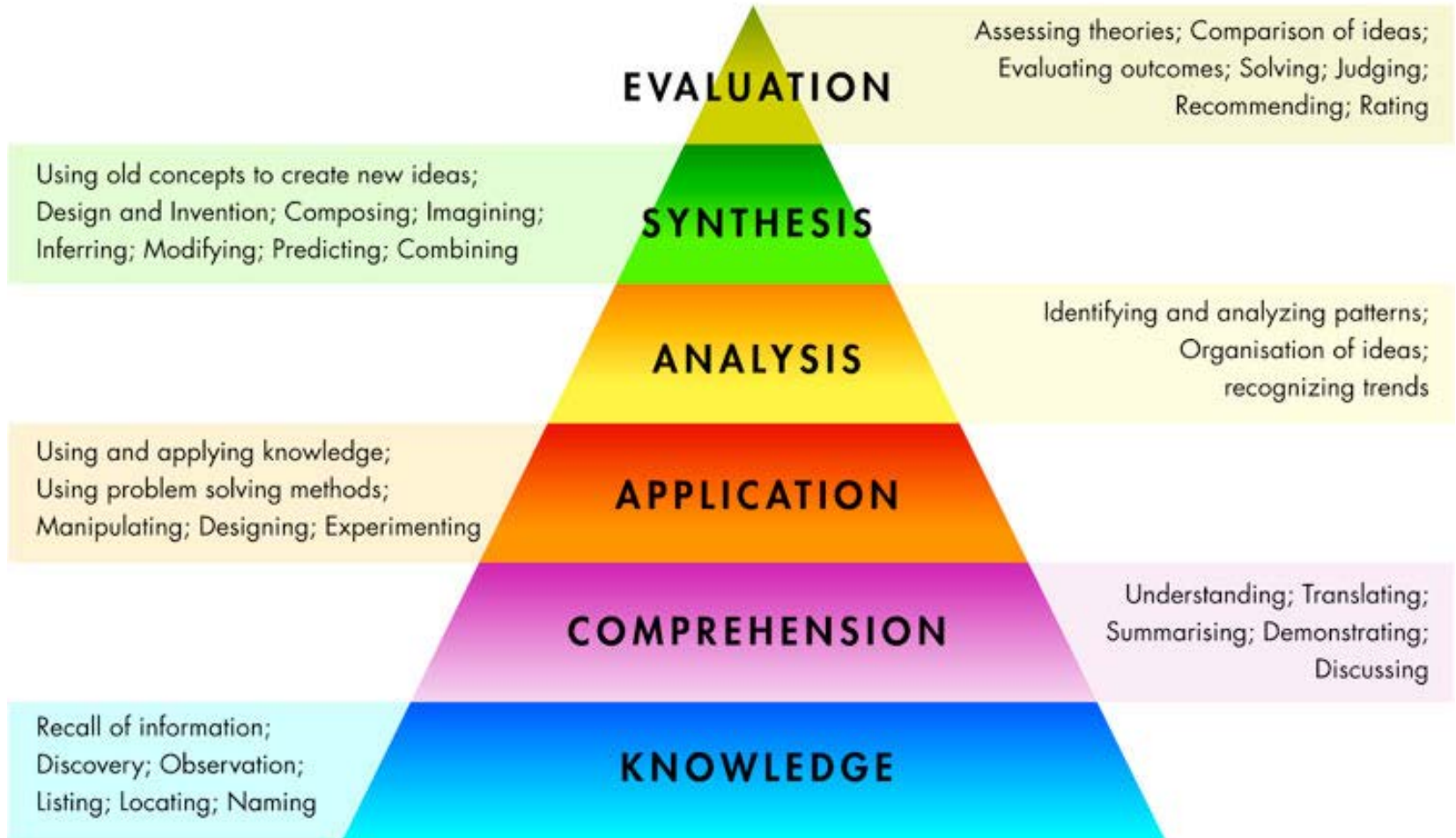
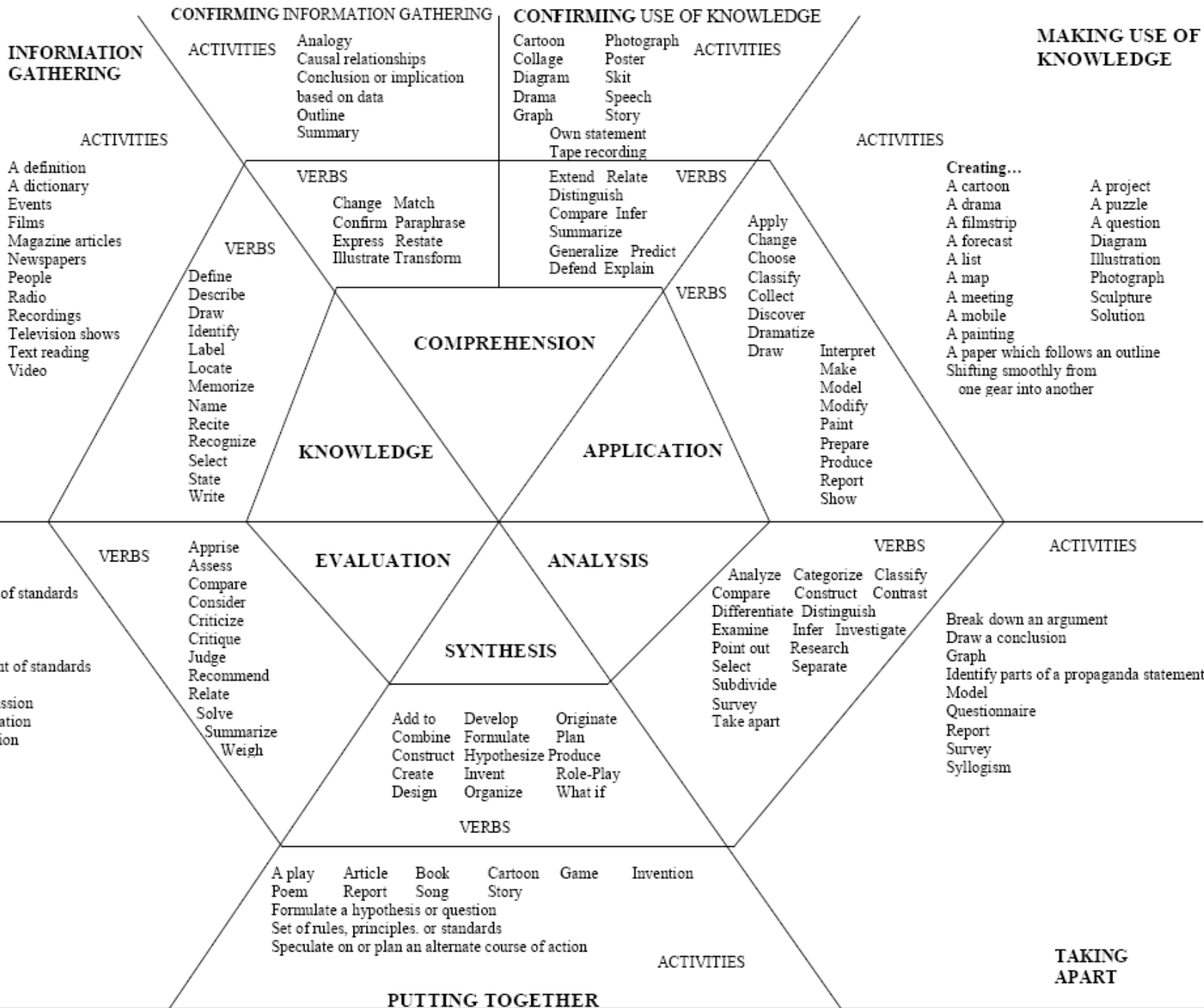


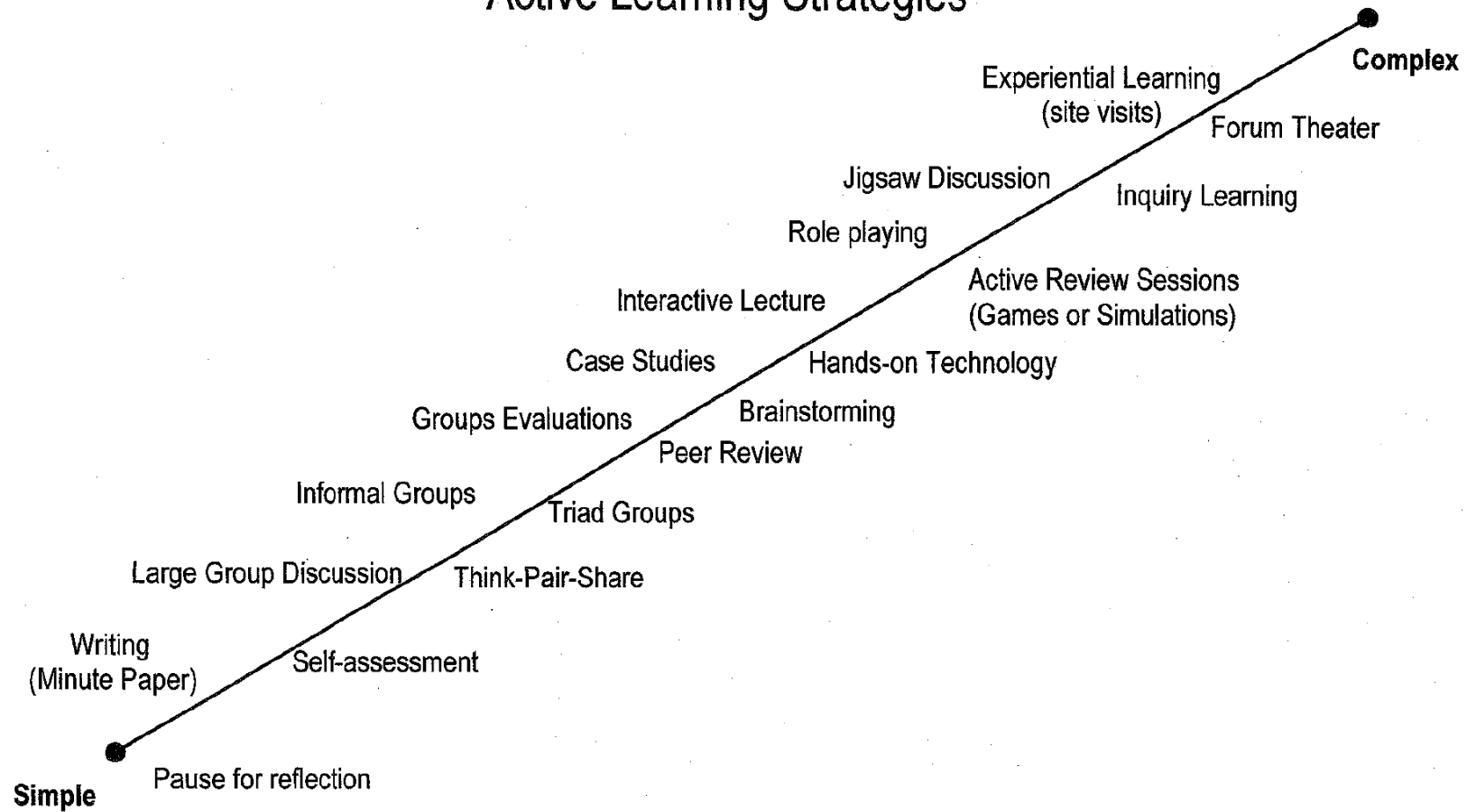
Image from: [http://juliaec.files.wordpress.com/2011/04/blooms\\_taxonomy.jpg](http://juliaec.files.wordpress.com/2011/04/blooms_taxonomy.jpg)

**Task-Oriented Question Construction Wheel Based on Bloom's Taxonomy**

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# Active Learning Strategies



This is a spectrum of some active learning activities arranged by complexity and classroom time commitment.

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