

Increasing Critical-Thinking in the Classroom:

A Practical Guide {with Lisa Van Gemert, facilitator}



Stats Descriptors

- Can Describe How to Teach Critical Thinking in their Discipline _____
- Claim Critical Thinking is a Primary Objective _____
- Use Critical Thinking Standards in Their Assessment Techniques _____
- Can Clearly Define "Critical Thinking" _____
- State Students Lack Critical Thinking Skills _____

How many did I get correct? _____



Defining Critical Thinking:

1. Informed _____-Making
2. Thinking About _____ & How to Improve It
3. Actively Analyzing, Synthesizing, and _____ the Thinking _____
4. A Product of Education, Training, and _____
5. Mental _____ and Power

Interact: Put an asterisk (*) next to the one you think is most important.



TECHNIQUE: MINIMUM EFFECTIVE SUPPORT

- Ask _____
- Narrow or _____ wrong thinking
- Provide the _____
- _____ context
- Is there a rule they should have _____?
- Are they _____ a step?
- Go back _____.



TECHNIQUE: WAIT TIME II

Could I use it? YES NO MAYBE

The idea is:

The benefit that struck me as most needful in my class was:

Notes on how I'd incorporate it:



TECHNIQUE: QUESTIONING

Key Elements of Effective Questioning:

- R_____ the questions
- Be open-ended with no _____ / _____
- Require _____ of information
- Be _____ in the discipline (meaning be arguable)
- Be age-_____
- Set the stage with _____ content and build from there
- Model active _____
- Give _____ time for thought
- Give _____, but keep momentum
- Have _____ stems at the ready

Question Stems from R.W. Paul's Six Types of Socratic questions:

1. Questions for clarification:
 - What sense do you make of this?
 - Why do you say that?
 - How does this relate to our discussion?
 - "Are you going to include diffusion in your mole balance equations?"
 - What do you notice?
2. Questions that probe assumptions:
 - What could we assume instead?
 - What questions come to mind as you think about this?
 - How can you verify or disapprove that assumption?
 - "Why are we neglecting radial diffusion and including only axial diffusion?"
3. Questions that probe reasons and evidence:
 - What would be an example?
 - What kind of pattern do you notice?
 - What part do you know for sure?
 - What is....analogous to?
 - What do you think causes to happen...? Why:?
 - "Do you think that diffusion is responsible for the lower conversion?"
4. Questions about Viewpoints and Perspectives:
 - What would be an alternative?
 - What is another way to look at it?
 - Would you explain why it is necessary or beneficial, and who benefits?
 - Why is the best?
 - What are the strengths and weaknesses of...?
 - How are...and ...similar?
 - What is a counterargument for...?
 - "With all the bends in the pipe, from an industrial/practical standpoint, do you think diffusion will affect the conversion?"

5. Questions that probe implications and consequences:
- What generalizations can you make?
 - What do you wish were easier?
 - What are the consequences of that assumption?
 - What are you implying?
 - How does...affect...?
 - How does...tie in with what we learned before?
 - "How would our results be affected if neglected diffusion?"
6. Questions about the question:
- What was the point of this question?
 - What do you understand the question to be?
 - If you were going to explain this to someone, what would you say?
 - Why do you think I asked this question?
 - What does...mean?
 - How does...apply to everyday life?
 - "Why do you think diffusion is important?"

COSTA'S LEVELS OF QUESTIONS

Level One questions cause students to recall information. This level of question causes students to input the data into short-term memory, but if they don't use it in some meaningful way, they may soon forget.

Level Two questions enable students to process information. They expect students to make sense of information they have gathered and retrieved from long-and short-term memory.

Level Three questions require students to go beyond the concepts or principles they have learned and to use these in novel or hypothetical situations.

TOPIC	LEVEL ONE	LEVEL TWO	LEVEL THREE
	(complete, count, match, name, define, observe, recite, describe, list, identify, recall)	(analyze, categorize, explain, classify, compare, contrast, infer, organize, sequence)	(imagine, plan, evaluate, judge, predict, extrapolate, invent, speculate, generalize)
Science	What is a gene? What is a chromosome?	Compare and contrast genes and chromosomes.	Use what you know about genes and chromosomes to predict a trait in a child.

Spanish	Conjugate the Spanish verb "ser" in the present tense.	Elaborate on the similarities and differences of the preterit and past tenses in the Spanish language.	"Invent" a new Spanish regular "ar" ending verb. Use it in 6 sentences, using different tenses and persons.
Mathematics	Evaluate this expression: $3x^2$ if $x=4$.	When, if ever, can $x^2=2x$?	Prove whether or not the operation $[Y]$ is commutative given that $a[Y]b=a^2-b$
History	Which amendment in the Constitution gives citizens the right to bear arms?	Compare and contrast societal conditions in the US that impacted the inclusion of the second amendment in the US Constitution with conditions today.	If there were a Constitutional amendment that prohibited ownership of weapons by citizens, how might American society be affected?