



Critical Thinking and Problem Solving

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What is critical thinking?

Critical thinking can be defined in various ways. Consider the following definitions:

Wiktionary: The application of logical principles, rigorous standards of evidence, and careful reasoning to the analysis and discussion of claims, beliefs, and issues

Dictionary.com: disciplined thinking that is clear, rational, open-minded, and informed by evidence.

The Foundation of Critical Thinking: Self-guided, self-disciplined thinking which attempts to reason at the highest level of quality in a fair-minded way.

What does it mean in an academia?

Critical thinking in the classroom refers to problems and projects that incorporate multiple concepts and ideas.

Rather than following a simple formula or recitation of facts, these problems and activities can require a combination of complex methods and strategies to resolve the problems and projects.

Critical thinking problems:

- ❖ lead you to seeing a bigger picture perspective of a concept.
- ❖ can exist on a spectrum ranging from simple to complex.
- ❖ are important because these are the types of problems you face in the real world!



How do you think critically?

While there aren't any formulas for critically thinking, there are strategies you can take to apply critical thinking skills, depending on the type of problem. Some strategies that may apply include the following:

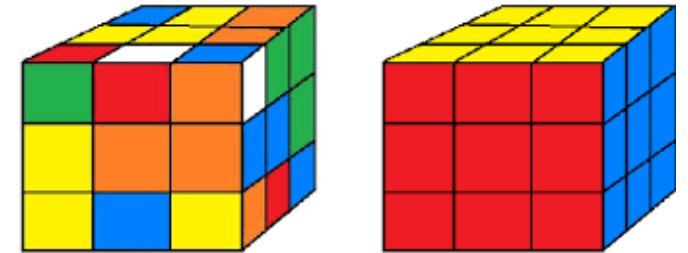
- ❖ Ask questions
- ❖ Revisit questions
- ❖ Revise and update questions or answers
- ❖ Be prepared for disruptions or wrong conclusions
- ❖ Always...separate emotion from reason

Critical thinking in math classes

Mathematical word problems require critical thinking strategies. Even the simplest word problems require more critical thinking than symbol-based math problems.

Simpler problems often have one correct solution, but critical thinking problems can have more than one correct solution. For example, there are many ways to solve a Rubik's Cube.

Even though you might not be able to solve a word problem by plugging numbers into a simple formula, a good strategy is to determine a pathway for solving them. While your solution will incorporate formulas, you first need to determine what information is required and what formulas will get you that solution.



Solving a word problem through critical thinking skills

In a class trip, 400 students go to the museum. Some students pay the regular price at \$30, and some students get a discount and pay \$20. If the class trip costs \$15,000, how many students got the discounted price of \$20?

Steps:

1. Read and then carefully reread.
2. Isolate important information: 400 students; tickets \$30 or \$20; total cost \$15,000
3. Write important information in mathematical terms. In this case, algebraic terms.
4. Solve using system of equations techniques learned in class.

Critical thinking in English & history classes

English & history essay questions require critical thinking because they ask you to compare events rather than describe events.

These questions might be opinion-based or based on topics discussed in class.

The questions may ask you to analyze events from a big picture perspective or to analyze other people's views or interpretations of the events.



Solving a series of history questions through critical thinking skills

These history questions require different levels of critical thinking:

- ❖ What US Civil War battle took place July 1st-3rd, 1863?
- ❖ How did the Battle of Gettysburg affect the course of the U.S. Civil War?
- ❖ The Battle of Gettysburg is often said to be the turning point of the civil war. But less than 2 weeks later, the New York City draft riots occurred and as much as a year later, President Abraham Lincoln seriously feared losing the 1864 presidential election. Do you agree that it was the turning point? Why or why not?

Critical thinking in science classes

Science problems build on previous knowledge, so they often require critical thinking by their nature, but some are simpler and more straightforward than others.

Like math problems, simpler science problems often involve a description of facts or simple plugging into formulas; however, problems that require critical thinking require combining multiple techniques to solve.

Science problems may require you to discuss what is happening from a big-picture perspective.



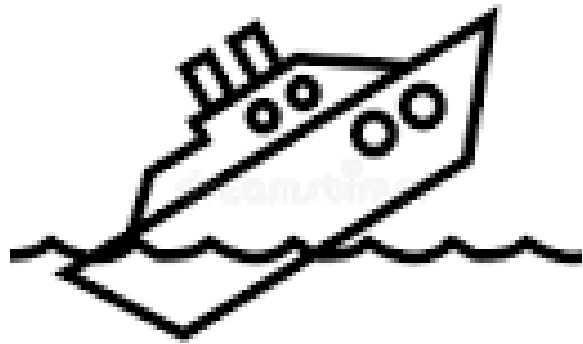
Solving science questions through critical thinking skills

These science questions require different levels of critical thinking; however, the solution of the final question builds on the answer from the first two questions:

- ❖ What are the properties that define something as living?
- ❖ What is an example of a non-living thing that has one of each of the properties that define life?
- ❖ Why are viruses said to be on the edge of living and non-living? What properties of life do they share? What properties do they lack?

Critical thinking in real life

The problems you encounter in real life are more likely to require critical thinking skills.



Real life isn't neatly divided into subjects and classes, so real problems often require you to draw on knowledge from many sources.

Keep in mind that critical thinking activities in a classroom are simpler than most real-life situations. Real-life situations can have multiple “correct” solutions...or no correct solution at all.

Activity - Critical thinking in real life

For this activity, imagine that we are filling a box with emergency supplies for a classroom. I won't be strict with the size of the box, but it must be able to fit in a classroom and be accessible to those who are in the classroom.

Think of all the emergency situations we could encounter in the classroom. What would you put into the box?



Now let's discuss types of classroom emergencies and how your items might be useful. (Content warning; however, no active shooter situations will be discussed.)



Real life critical thinking – Scenario 1

The fire alarm goes off. We smell smoke immediately and see fire and smoke in the hallway.

What items that we put in the box can be useful to us? How would we use them?

Real life critical thinking – Scenario 2

In the middle of class, a student begins to appear sick. Suddenly, she collapses at her desk. Another student thinks she may be diabetic. This appears to be confirmed when the instructor notices a glucometer on her desk.

What items that we put in the box can be useful to us? How would we use them?



Real life critical thinking – Scenario 3

On a stormy afternoon, everyone receives a text from the school's emergency notification system saying that the area is under a tornado warning. Immediately after receiving the message, the power goes out in their building.

What items that we put in the box can be useful to us? How would we use them?





Real life critical thinking – Scenario 4

During a chemistry lab, a student breaks a piece of glassware in his hands. A fragment of glass makes a large cut on his thumb. He is bleeding a lot.

What items that we put in the box can be useful to us? How would we use them?



Taking questions...