What is Critical Thinking?

Critical Thinking is the act of analyzing facts to come to a thorough understanding of a problem and potentially choose the best solution. It is a skill that allows you to make logical and informed decisions to the best of your ability. Good critical thinkers can work both independently and with others to solve problems.

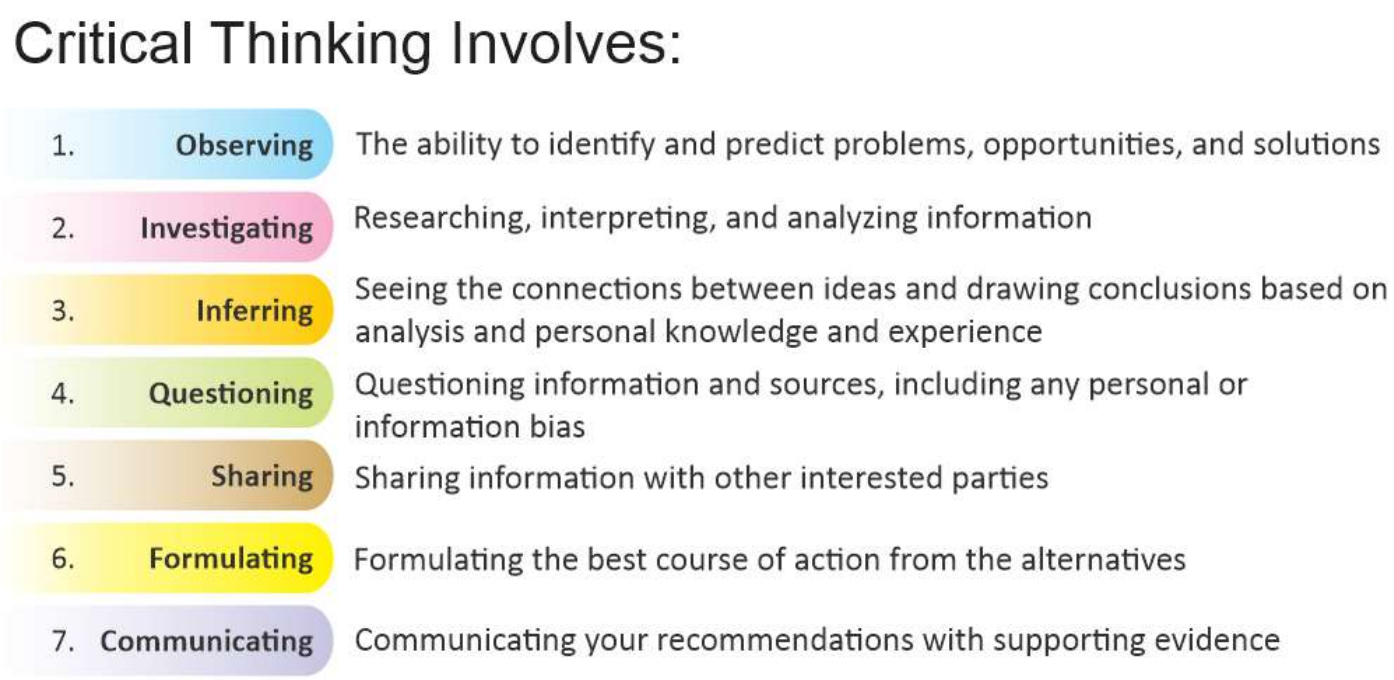
Critical thinking skills are essential in every industry at every career level, from entry-level associates to top executives, and is one of the top skills sought by employers. In fact, a report by the Association of American Colleges and Universities revealed that 93% of employers value critical thinking over the candidate's undergraduate degree. In many job interviews you may be asked to solve a problem – the interviewer will typically be more interested in the critical thinking steps you follow rather than your solution.

Issues such as manufacturing process issues, management, or finances can be improved by using critical thought. Because of this, employers value and seek out candidates who demonstrate strong critical thinking skills. Strong decision-making skills are especially in demand in high-stakes settings where the cost of a mistake may be high.

Examples of Situations Requiring Critical Thinking Skills

	**As a team leader,** Jeanne's job of keeping production high while encouraging the team to work cooperatively together towards solving problems can be stressful. She must logically analyze team members' often passionate suggestions then offer honest, realistic, and constructive criticism, while keeping her own potential biases and opinions in check. This is a common workplace critical thinking situation.

	**Doctor Fatez** is an emergency room physician who must constantly use critical thinking skills and reasoning. He needs to rapidly analyze information and decide on a course of action based on his observations. A small lapse in judgement could mean life or death for his patient. Other team members such as Nurse Callaghan at the patient intake stage need to assess client's symptoms quickly and accurately and apply critical thinking skills to prioritize treatment priorities.
	**The Covid 19 Pandemic** of 2019 may rank in history as perhaps the greatest global failure of critical thinking of all time. Numerous tragic errors were made that cost many lives, most due to failures to accurately assess information sources and ensure they were credible. One example was the official discrediting of inexpensive, safe and effective drugs like ivermectin, which, as demonstrated by some countries, was capable of essentially curing the disease if treatment was begun early.
	**High-risk situations** such a pilot's quick and accurate decision regarding landing a damaged aircraft demand critical thinking. When these important decisions need to be made, instinctive critical thinking skills are necessary and must be natural.
	**Workers in many situations** may be faced with difficult morale and ethical challenges that take an emotional toll. For example, a worker may be tempted to break the rules to advantage one particular group. Critical thinking skills can help someone in this type of situation be aware of their emotions and examine all aspects objectively, including the potential consequences of committing illegal or unethical acts and how this could negatively affect their career. Thinking through all the options may reveal better alternatives.



Characteristics of Critical Thinkers

Some characteristics of naturally good critical thinkers are:

- **Objectivity** – They are able to step away from personal biases and emotions and view situations from a neutral perspective. (Mr. Spock on the TV show Star Trek?)
- **Logical Thinking** – They apply a step-by-step logical approach and sets standards and criteria for assessing each step.
- **Evidence-based** – Good critical thinkers seek evidence-based facts and data while not giving unwarranted consideration to feelings or unsubstantiated claims.
- **Collaborative** – They appreciatively receive input from multiple sources and are willing to give due consider other people's ideas.

While everyone can learn and improve their critical thinking skills, some persons naturally tend toward being more logical and analytical thinkers and may have natural skills or interests in this area. These persons, however, often require the balanced insight and softer people skills of other personality types to in order to successfully create and present solutions that appeal to all.

The 7 Steps of Critical Thinking

1. Precisely identify the issue.
Identify / verify / confirm the issue(s) as precisely as possible – a clear-cut and well-defined issue narrows the potential range of solutions. Is your focus on the right problem? Create inferences about why the issue exists and how it might be solved.

2. *Assemble information, opinions, and arguments.*
Research and organize information from differing sources with divergent approaches and points of view in an attempt to minimize bias. Analyze the information and its sources, watching for bias in your approach.

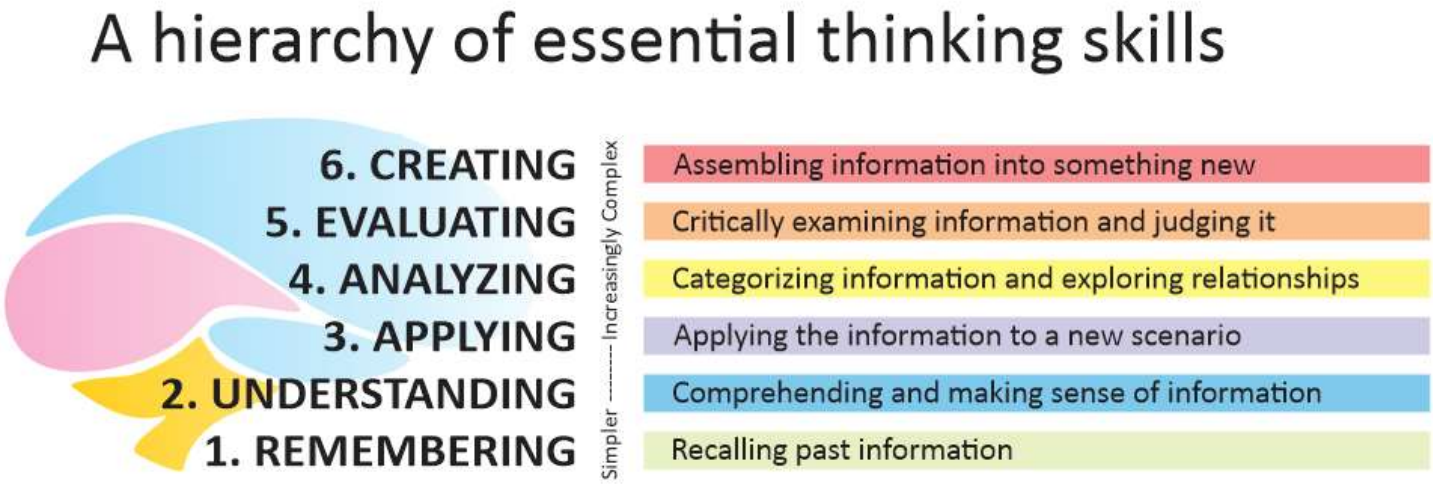
3. *Analyze the information.*
Evaluate each piece of information. Are the information sources credible? Are their arguments evidence based, verifiable, and supportable? Reject any that are not. Involve other stakeholders if possible. One easy way to remember approach is to question everything using the formula: 'who – what – where – when – how'.

4. *Recognize assumptions.*
Can your information be verified in real-world situations, or is it merely an assumption? Examine the possibility of bias at each step.

5. *Evaluate significance.*
Have you found significant information on the issue? Was the original issue accurate, and have you researched enough approaches? Dismiss opinions and arguments not relevant to the issue to be solved. Prioritize those of potential value. If none are, why? Is the issue too broad, or the research too limited?

6. *Formulate a solution*
Assess the potential strengths and limitations of the most credible approaches and decide which (if any) are most feasible. Do any meet your and your organizations standards? If possible review your solution with other knowledgeable persons and ask for their feedback.

7. *Communicate*
Once you've reached a conclusion, present it to stakeholders. Be prepared to answer tough questions about it and to defend your recommended course of action.



As you go through the steps of critical thinking, you should find yourself moving upward through an increasingly complex set of thinking skills before reaching a solution.

An Example of Critical Thinking

A health care facility is contemplating a switch in antibacterial cleaning agents used by maintenance staff. A new supplier has proposed a much less expensive product with similar results to the current product in use. You have been appointed to find the best course of action – to remain with product 'A' or move to the new product 'Z'. The original question posed was: Is it economically beneficial to move to product 'Z', whose price is 30% lower?

This seems like a simple question with an obvious answer, but the question posed is too simplistic as it does not adequately define what 'economically beneficial' means. On first glance, the 30% price reduction is significant and appears compelling, however many potential questions that could impact longer-term economics remain as to whether, for example:

- the products are actually interchangeable, and are effective on the same range of bacteria
- the new product has proven effectiveness
- there are negative impacts from the new product, which may not have become apparent as yet – such as impacts on bacterial mutations
- the products can be interchangeably used by maintenance staff with minimal procedural changes
- other unknown factors such as supply and storage issues which may impede long-term use
- whether the new product will create unknown issues for the maintenance staff or patients
- there are other unknown impacts from switching products (loss or legal action from Supplier A, product incompatibilities, stability, reliability, and reputation of new company, etc.).

1. Identify the Issue

What is the actual problem to be solved? Is this simply a financial consideration (the purchasing department has found a lower cost product that does exactly the same thing) or are there other reasons for this potential switch (Product A is not performing well, the Product A supplier is out of favor, maintenance is reporting problems with Product A, a bias exists towards the new company, etc.)

First - define the scope and focus of the issue – is this issue simply financial, or does it go much deeper? Can Product A and Product Z be assumed to be virtually identical in their application, effectiveness, and impact, meaning Product A can be easily switched to Product Z, or does this area need to be investigated?

Let's assume that purchasing has discovered Product Z and simply wishes to replace Product A for financial reasons, having assumed both products are interchangeable as stated by Product Z advertising. Note that Product A has been in use for many years with no issues.

2. Assemble Information, Opinions, Arguments

You have gathered all available detailed product information from various sources for both products, including:

- Safety Data Sheets (SDS) - detailed technical bulletins for both products
- Manufacturer specifications, efficiency claims, and instructions for handling, storage, and use
- Various publications (both scientific and commercial) reporting claims of product effectiveness in controlling bacterial growth
- A comparative study of both products by an industry association
- References from users of Product Z has been provided by the manufacturer
- Comments from experienced maintenance staff

3. Analyze the Information

In analyzing the information above you have found the products are very similar in general. You've marked these items for further study:

- The product profiles detail the range of bacteria that can be controlled by each product. While very similar, Product Z varies from Product A in two areas. It is unclear how important this may be, or if it is insignificant.
- In analyzing information from the industry association that submitted the comparative study of both products (which reported Product Z superior by a small margin), it is noted that the manufacturer of Product Z advertises heavily in this association's publications. This could be a financial conflict of interest in that the comparative study may tend to favor this heavy advertiser.
- The industry references received from Product Z users were taken into consideration, but the possibility of bias cannot be eliminated.
- The methods of use of both products vary. Product Z requires a 20% longer application period.

You feel that you have captured the majority of the information publicly available on both products and are not missing any known significant data. You have also investigated whether other similar products are available (they are not).

4. Recognize Assumptions

Your main concern is the difference in the bacterial strains controlled by each product. In further investigating it becomes clear that this information was generated from each manufacturer for their own product, and has not been reviewed by an outside agency. Also, the methods and equipment used by each manufacturer to determine this information were not the same, and the time frames of the studies were significantly different. It becomes clear

that there is no actual evidence of anti-bacterial performance of either product that could be considered scientifically conclusive, and no side-by-side comparison of performance is available. The information available is best described as a manufacturer estimate of performance, based on their own internal testing.

5. Establish Significance

Inferring the possible significance of introducing a cleaner of unknown effectiveness, you have highlighted this issue as the major obstacle to acceptance of Product Z, in spite of seeming cost advantages. The consequence of uncontrolled bacteria in a health care facility could lead to many adverse outcomes and potential legal issues legal issues. The fact that product Z requires a 20% longer application period is another, although lesser, concern. You have communicated these concerns with other team members and solicited their views.

6. Formulate Solution

Based on the unknowns above, the proposal is to continue with Product A until such as time as:

1. A definitive side-by-side comparison by an independent third party into the effectiveness of both products can be conducted
2. The potential implications of a 20% longer application time can be considered

7. Communicate

All parties were made aware in writing of the decision to continue to use Product A until such as time as clear evidence of superior performance from Product Z is available.

Related definitions:

Anomaly: A deviation from the standard or norm (eg: 'this one specific planet is much hotter than the others - it's an anomaly').
Argument: A fact or statement put forth as proof or evidence; a reason.
Assumption: information taken for granted without adequate investigation.
Beliefs: Information accepted as true or false; an opinion or conviction which may not be proven or provable as fact.
Deductive reasoning: Forming specific conclusions from general premises. (eg: duck are birds, all birds lay eggs, therefore, ducks lay eggs).
Hypothesis: an educated guess based on a general premise.

Inductive reasoning: Forming general theories from specific observations. (eg: she comes here every day at 9am, so she'll be here today at 9am).
Knowledge: The state or fact of objectively knowing information to be 'true' beyond a reasonable doubt.
Justification: A reason, fact, circumstance, or explanation that justifies or defends.
Logic: a system or mode of reasoning.
Premise: a proposition supporting or helping to support a conclusion.
Propositions: a proposal offered for acceptance (your solution).
Syllogism: A type of deductive reasoning consisting of a major premise ('All ducks are birds'), a minor premise ('This is a duck'), and a conclusion ('Therefore this is a bird').

One easy way to remember a critical thinking approach is to question everything using the formula: 'who – what – where – when – how'.