

The Basics of Critical Thinking

With Practical Examples in our Everyday life

Dr. Elsayed Abdelfattah Gaballah

Lecturer of Logic and Critical Thinking,
Faculty of Arts, Port Said University
Elsayed.abdelfatah@Arts.psu.edu.eg

Abstract

Critical thinking is reasonable and logical thinking focused on deciding what to do or believe. A good critical thinker has the ability to rigorously understand and evaluate arguments and evidence, and to use these things to come to a reasoned judgment.

This study deals with the Strategies of developing critical thinking skills to make careful judgments, make proper decisions, solve complex problems, analyzing arguments and assessing it, and wipe out the basic inability to communicate appropriately at the everyday life generally.

This study lays the conceptual foundations necessary for understanding the mind, its functions, its natural propensity toward irrationality, and its capacity for rationality. It is designed for those interested in developing their potential to be fair-minded reasonable persons, concerned with how their behavior affects the lives of others, concerned to develop their full humanity, concerned with making the world a more civilized and just place. It is designed for those willing to transform their thinking to improve their decisions, the quality of their lives, the quality of their interpersonal relationships, and their vision of the world.

This study is divided into six chapters preceded by an introduction as follows:

Chapter One: Nature of Human Thinking

Chapter Two: Basic Principles of Critical Thinking

Chapter Three: Argument: its construction and analysis

Chapter Four: Critical Thinking and Assessing Arguments

Chapter Five: Logical Fallacies and Cognitive Biases

Chapter Six: Critical Thinking in Everyday Life

Key Words:

Critical Thinking, argument, Logical Fallacies, Cognitive Biases, Premise, Conclusion.

أساسيات التفكير الناقد

مع أمثلة عملية في حياتنا اليومية

د. السيد عبد الفتاح جاب الله عبد الفتاح

مدرس المنطق والتفكير الناقد

كلية الآداب - جامعة بورسعيد

الملخص باللغة العربية

التفكير النقدي هو التفكير المعقول والمنطقي الذي يركز على تحديد ما يجب فعله أو الاعتقاد به. يتمتع المفكر الناقد الجيد بالقدرة على فهم وتقييم الحجج والأدلة بدقة، واستخدام هذه الأشياء للوصول إلى حكم منطقي مقبول.

تتناول هذه الدراسة آليات تطوير مهارات التفكير الناقد لإصدار أحكام دقيقة واتخاذ القرارات المناسبة وحل المشكلات المعقدة وتحليل الحجج وتقييمها والقضاء على عدم القدرة الأساسية على التواصل بشكل مناسب في الحياة اليومية بشكل عام.

تضع هذه الدراسة الأسس المفاهيمية اللازمة لفهم العقل ووظائفه وميله الطبيعي نحو اللاعقلانية وقدرته على العقلانية. كما أنها مصممة لأولئك المهتمين بتطوير إمكاناتهم ليكونوا أشخاصاً عاقلين منصفين، يهتمون بكيفية تأثير سلوكهم على حياة الآخرين، ويهتمون بتنمية إنسانيتهم الكاملة، ويهتمون بجعل العالم مكاناً أكثر تحضراً وعدالة، ويرغبون في تغيير تفكيرهم لتحسين قراراتهم، ونوعية حياتهم وعلاقاتهم الشخصية ورؤيتهم للعالم.

تنقسم هذه الدراسة إلى ستة فصول تسبقها مقدمة على النحو التالي:

- المبحث الأول: طبيعة التفكير الإنساني
- المبحث الثاني: المبادئ الأساسية للتفكير الناقد
- المبحث الثالث: الحجة: مكوناتها وتحليلها
- المبحث الرابع: التفكير الناقد وتقييم الحجج
- المبحث الخامس: المغالطات المنطقية والتحيزات المعرفية
- المبحث السادس: التفكير الناقد في الحياة اليومية

الكلمات الدالة:

التفكير الناقد، الحجة، المغالطات المنطقية، التحيزات المعرفية، مقدمة، نتيجة.

The Basics of Critical Thinking With Practical Examples in our Everyday life

Dr. Elsayed Abdelfattah Gaballah

Lecturer of Logic and Critical Thinking,
Faculty of Arts, Port Said University

Introduction:

Why are some people better than others at solving problems and making decisions? The answer seems obvious: Some people are smarter than others. But being smart isn't enough. People who follow broad rules like "We can't ignore anything" are playing it too safe. We should ignore some things because they are improbable. It is unreasonable to do a bomb search on the advice of a psychic tip because there is no evidence that psychic tips are any more reliable than flipping a coin or throwing darts at a board.

Why are some people better than others at supporting their beliefs and actions with good reasons? Again, the answer seems obvious: Some people have more knowledge or are more eloquent than others. Still, two equally intelligent people can be equally articulate and knowledgeable, but not be equally good thinkers. If only one of them is thinking critically, that one will be better at analyzing and evaluating facts and opinions, sources and claims, options and alternatives. The critical thinker will be a better problem-solver and better decision-maker¹.

When we're thinking critically, we're using our knowledge and intelligence effectively to arrive at the most reasonable and justifiable position possible. When we're thinking uncritically—no matter how intelligent or knowledgeable we are--we'll make unreasonable decisions and arrive at unreasonable beliefs or take unjustifiable actions, unless we are lucky and end up making the right choice for the wrong reasons! For example, imagine that the search crew finds a bomb. You're vindicated, right? Not necessarily. If it turns out that the psychic planted the bomb herself in order to make it look like she really had psychic powers so she

¹- Robert Todd Carroll, *Becoming a Critical Thinker*, p.1
<http://skepdic.com/refuge/ctlessons/ch1.pdf>

could advance her career, but you had the plane searched because you thought a psychic might actually be able to know such things by paranormal means, then you made the right decision by pure luck. You should have had the plane searched, but you should have held and interrogated the psychic. If a bomb is found, it would be reasonable to infer that the psychic had non-psychic information about the bomb and might even have been involved in planting it. It would not be reasonable to infer that the “psychic” is really psychic. As your boss said, there is little, if any, evidence that any psychic anywhere has ever correctly predicted when a bomb had been placed on a plane. On the other hand, there are plenty of examples where people have lied and deceived in order to advance their careers or to get attention².

The goal of thinking critically is simple: to guarantee, as far as possible, that one’s beliefs and actions are justifiable and can withstand the test of rational analysis. Just what do we do when we’re thinking critically? In general terms, we can say that to think critically is to think clearly, accurately, knowledgeably, and fairly while evaluating the reasons for a belief or for taking some action. This is sometimes easier said than done³.

Educators have long been aware of the importance of critical thinking skills as an outcome of student learning. More recently, the Partnership for 21st Century Skills has identified scientific and critical thinking as one of several learning and innovation skills necessary to prepare students for post-secondary education and the workforce. In addition, the newly created Common Core State Standards reflect Critical thinking as a cross-disciplinary skill vital for college and employment.

Critical thinking is a vital skill for any graduate to demonstrate as it is necessitated in all workplaces. During their studies, students will need to draw on scientific and critical thinking for assessments and to develop their learning. It is also necessary for students when making decisions around the choice of majors and electives or when selecting activities for skill and personal development. Critical thinking will enable students to make an informed evaluation of knowledge, developing skills as an individual learner and gradually decreasing their reliance on university resources. This type of scientific thinking, when integrated with current knowledge can lead to creation of new knowledge.

²- Ibid., p.2

³- Ibid., p.2

Critical thinking is important as it plays a central role in other key graduate skills or graduate learning outcomes such as problem solving, decision making and communication. Critical thinking is sometimes mentioned synonymously with problem solving which can be misleading.

This book studies developing critical thinking skills to make careful judgments, make proper decisions, solve complex problems, analyzing arguments and assessing it, and wipe out the basic inability to communicate appropriately at the everyday life generally.

This book lays the conceptual foundations necessary for understanding the mind, its functions, its natural propensity toward irrationality, and its capacity for rationality. It is designed for those interested in developing their potential to be fair-minded reasonable persons, concerned with how their behavior affects the lives of others, concerned to develop their full humanity, concerned with making the world a more civilized and just place. It is designed for those willing to transform their thinking to improve their decisions, the quality of their lives, the quality of their interpersonal relationships, and their vision of the world.

While making your academic assignments or thesis, you are required to do some research and analyze various things, or for making a career decision or any other decision you are required to think of all pros and cons of that decision. Well, the most important thing that helps us to effectively take these decisions is what we call critical thinking. Critical thinking is very important in both personal and professional life. The process of critical thinking involves the analysis of the various facts and figures in a particular situation before straightaway acting on that situation. Critical thinking demands keen observation, creativity, problem-solving skills, which helps the individual to thoroughly evaluate the gathered information and then use this available information as a guide to making accurate decisions. From doing academic works or regular activities to solving various large scale problems, critical thinking is required in everyday life. In this book, we will learn about some real-life examples where critical thinking plays an important role.

Chapter One

Nature of Human Thinking

1-1: The Human Mind: Its Nature and Functions

To live well is to live as a reasonable and ethical person. Yet humans are not by nature rational or ethical. Humans are predisposed to operate in the world in narrow terms of how it can serve them. Their brains are directly wired into their own pleasure and pain, not that of others. They do not inherently consider the rights and needs of others.

Yet humans have the raw capacity to become reasonable and ethical persons, to develop as fair-minded skilled thinkers. But to do so requires:

1. Understanding how the mind works.
2. Using this understanding to develop skills and insights⁴.

Everyone thinks. It is our nature to do so. But much of our thinking left to itself is biased, distorted, ill-founded, or prejudiced. Much of our thinking leads to problems in our lives. Much of our thinking leads to cruelty and injustice. Of course, the mind doesn't just think, it also feels and wants. What is the connection? Our thinking shapes and determines how we feel and what we want. When we think well, we are motivated to do things that make sense and motivated to act in ways that help rather than harm ourselves and others⁵.

At the same time, powerful emotions or desires influence our thinking, help or hinder how well we think in a situation. At any given moment, our minds (that complex of inner thoughts, feelings and desires) can be under the sway of our native egocentrism or our potential reasonability. When we are ruled by our egocentric tendencies, we see the world from a narrow self-serving perspective. We are not truly concerned with how our behavior affects others. We are fundamentally concerned with getting what we want and/or with validating our beliefs and views⁶.

The key to understanding human thought then, is, to understand its essential duality: its capacity for egocentrism (being trapped in self-

⁴- Linda Elder & Richard Paul., The Miniature Guide to The Human Mind: How It Learns, How It Mislearns, p. preface. At: https://www.criticalthinking.org/TGS_files/SAM-TheHumanMind.pdf

⁵- Ibid., p.3

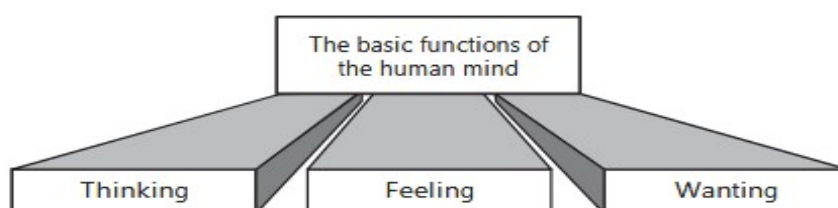
⁶- Ibid, p. 3

delusion, myth, and illusion) and its capacity for reasonability (freeing itself from self-delusion, myth, and illusion).

Though thinking, feeling and wanting are, in principle, equally important, it is only through thinking that we take command of our minds. It is through thinking that we figure out what is going wrong with our thinking. It is through thinking that we figure out how to deal with destructive emotions. It is through thinking that we change unproductive desires to productive ones. It is fair-minded reasonability that frees us from intellectual slavery⁷.

If we understand our mind and its functions, if we face the barriers to our development that egocentrism represents, if we work upon our mind in a daily regimen, we can take the steps that lead to our empowerment as thinkers.

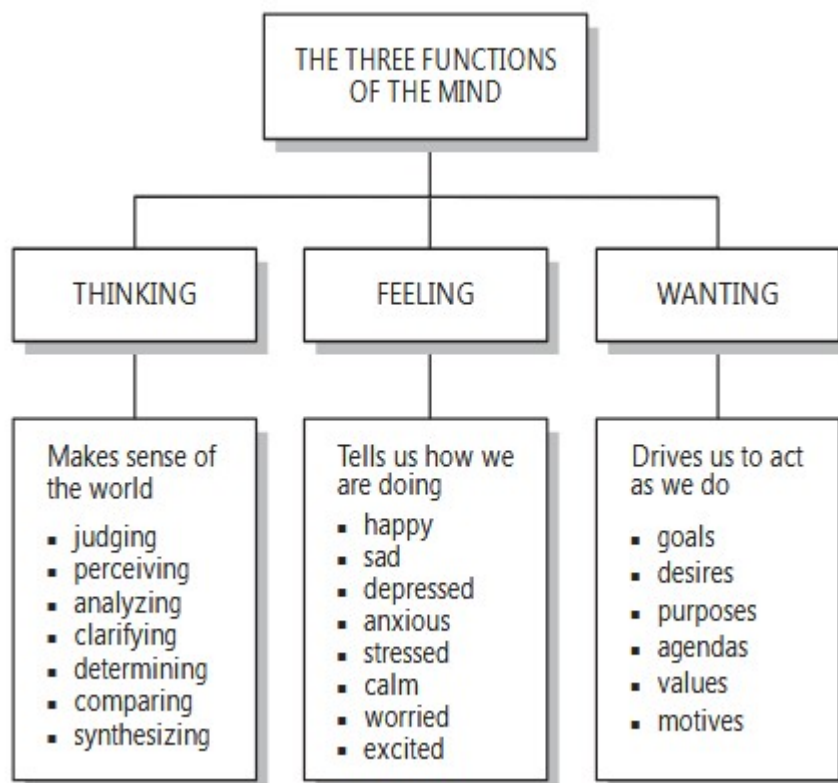
The basic functions of the human mind: Thinking, Feeling and Wanting.



- **Thinking** is the part of the mind that figures things out. It makes sense of life's events. It creates the ideas through which we define situations, relationships and problems. It continually tells us: This is what is going on. This is what is happening. Notice this and that.
- **Feelings** are created by thinking — evaluating whether the events of our lives are positive or negative. Feelings continually tell us: “This is how I should feel about what is happening in my life. I’m doing really well.” Or, alternatively, “Things aren’t going well for me.”
- **Wanting** allocates energy to action, in keeping with what we define as desirable and possible. It continually tells us: “This is worth getting. Go for it!” Or, conversely, “This is not worth getting. Don't bother”⁸.

⁷ - Ibid, p. 3

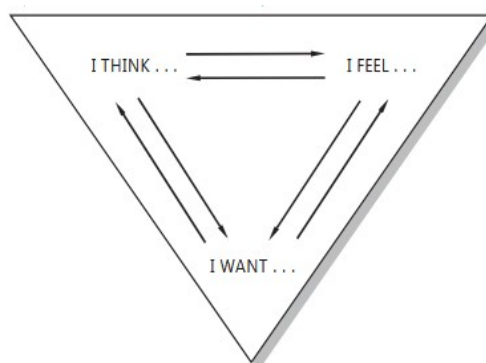
⁸ - Ibid, p.4



Essential Idea: Our mind is continually communicating three kinds of things to us:

- 1) what is going on in life,
- 2) feelings (positive or negative) about those events, and
- 3) things to pursue, where to put our energy (in light of 1 and 2)⁹.

There is an intimate, dynamic interrelation between thinking, feeling, and wanting. Each is continually influencing the other two.



⁹- Ibid, p.5

For example, when we think we are being threatened, we feel fear, and we inevitably want to flee from or attack whatever we think is threatening us. When we feel depressed, we think that there is nothing we can do to improve our situation, and we therefore lack the motivation to do anything about our situation. When we want to improve our eating habits it may be because we think that our diet is causing us harm and we feel dissatisfied with our diet.

Though we can consider the functions of the mind separately (to better understand them), they can never be absolutely separated. Imagine them as a triangle with three necessary sides: thoughts, feelings and desires. Eliminate one side of the triangle and it collapses. Each side depends on the other two. In other words, without thinking there can be no feelings or desires, without feelings no thoughts or desires, without desires, no thoughts or feelings. For example, it is unintelligible to imagine thinking that something is threatening you and might harm you, want to escape from it, yet feel nothing in relationship to what you think and want. Because you think you might be harmed and you want to flee, you necessarily feel fear¹⁰.

Though thinking, feelings and desires play equally important roles in the mind, continually influencing and being influenced by one another, thinking is the key to command of feelings and desires. To change a feeling is to change the thinking that leads to the feeling. To change a desire is to change the thinking that underlies the desire¹¹.

1-2: What is thinking?

The variety of activities called 'thinking' is extremely large but includes at least: reflecting, anticipating, deciding, imagining, remembering, wondering, pondering, intending, believing, disbelieving, meditating, understanding, inferring, predicting and introspecting.

Thinking may take place in language, in an ordinary language such as English, or in an artificial language such as a logical notation. Some thinking also takes place in neither of those media but in mental images - pictures in the mind's eye.

¹⁰ - Ibid, p.6

¹¹ - Ibid, p.8

All thinking has some subject matter. It does not make sense to say there is thinking that is not about anything. If there is thinking, there is something that is thought, some content, even if the thought is not truth-valued but, say, interrogative or subjunctive. Thinking may be conscious or unconscious. If thinking is unconscious, then the mind thinking either does not know that it is thinking or, if it does know that, then it does not know what it is thinking. If thinking is conscious, then the thinking mind knows both that it is thinking and what it is thinking. Also, thinking may or may not have a phenomenology. Thinking has a phenomenology if and only if that thinking includes events which are experiences¹².

"I did it without thinking" When we come to reflect, this remark would apply to most of the actions we perform in our ordinary daily routine. Many of our actions are instinctive or automatic responses to certain situations: thus we blink if a threatening fist suddenly approaches close to the face, we shade our eyes in an unaccustomed glare, and we step out of the way of some obstacle in our path. Many again are matters of habit — having discovered the way to act, either for ourselves or by learning from others, we have performed the action so often that when the appropriate situation occurs our response is almost involuntary and requires no more perhaps than a momentary thought¹³.

But when we begin to think? we begin to think when we are confronted with a difficulty, perplexity, or problem, that is, an unfamiliar situation to which we have no response ready, either instinctive or habitual, then we 'put on our thinking cap'; for thinking is the characteristically human method of seeking a solution, as opposed to the haphazard, hit or miss, trial and error method common in the rest of the animal world. It is this power of dealing with a novel situation by reflection, without overt action, that is the distinguishing mark of homo sapiens¹⁴.

Thinking therefore should first of all be distinguished from day-dreaming, in which we allow our minds to wander at random or to indulge in idle fancies or to build castles in the air without the direction exercised by the will-power. Thinking is essentially purposive — directed and controlled, at any rate in its earlier stages, by the conscious exercise of will, and set in motion by the conscious realization of the existence of

¹²- Stephen Priest, Theories of the Mind, HOUGHTON MIFFLIN COMPANY, Boston New York London, 1991, p. 213

¹³- Jepson. R.W., Clear Thinking, Longmans, Green and Co. London, 1941, p.10

¹⁴- Ibid, p.11

a problem demanding solution. It is true that if a solution is slow in forthcoming, the thinking process thus initiated may be continued, without any conscious direction or interference on our part, at times when our conscious thoughts are otherwise occupied or even when we are asleep. At these times, the solution might be said to be 'hatching,' so they are known as 'incubation' or 'gestation' periods; and as a result of this non-conscious process, often the solution occurs to the conscious mind when we least expect it — in a flash or inspiration, as we say, comparable to that experienced by Archimedes in his bath. But it is seldom that such Eureka's come 'out of the blue': they are more often the unexpected, but nevertheless merited, results of previous conscious hard thinking and concentration. And 'intuitions,' often regarded as peculiarly characteristic of the feminine mind, probably occur in a similar way — that is, when they are not idle guesses or outlets for prejudice¹⁵.

The kind of thinking then that we are considering is controlled, constructive thinking, directed towards the solution of a problem. The problem may be a practical or a theoretical one. It may be to repair a faulty piece of mechanism in a bicycle or a motor-car, to find the answer to a problem in Arithmetic or Geometry, to arrest the spread of an epidemic, to discover the secrets of atomic energy, to find the missing 'light' in an acrostic or the hidden clue in a crossword, to ease the congested traffic in a large town, to find an explanation of the existence of evil, to translate a piece of Ovid or La Fontaine, to track down a criminal, to find a quicker, more convenient way home from the office, to decide what candidate to vote for in an election, or to find out why Athens or Rome declined and fell¹⁶.

1-3: Thinking is skilled work.

The way we think affects almost all aspects of our lives, including our relationships, career and financial success. We each think more than 100,000 thoughts every day. How many of your thoughts are happy, optimistic and productive? Are your thoughts disciplined? Are they creative?

Thinking is one of the greatest gifts and powers given to mankind. But, the fact is, we don't always use the mind to its maximum potential.

¹⁵- Ibid, p.11

¹⁶- Ibid, p.11

In school you probably learned how many types of insects there are or what the average lifespan of a female whale is. While there is nothing wrong with learning all these facts, did anyone ever teach you how to think? Have you ever learned how to improve your thinking skills and processes?¹⁷.

It is not true that we are naturally endowed with the ability to think clearly and logically- without learning how, or without practicing. It is ridiculous to suppose that any less skilled is required for thinking than for carpentering, or for playing tennis, golf, or bridge, or for playing some musical instrument. People with untrained minds should know more expect to think clearly and logically than people who have never learnt and never practiced can expect to find themselves good carpenters, golfers, bridge-players, or pianists. Yet our world is full of people who apparently do suppose that thinking is entirely unskilled work; that thinking clearly and accurately is so easy and so "natural" that nobody need trouble to learn how to do it; that "anybody can think"; and that any one person's thinking is quite as reliable as any other person's. This accounts for the fact that, as people, we are so much less efficient in this respect that we are in our sports. For nobody assumes that any game is so easy that we are all first class players "naturally", without having to learn how to play or without practice¹⁸.

Those who are in earnest in wishing to think more clearly, more accurately, and more rationally should face their task in the spirit in which they would set themselves to learn the rules, to learn the technique, and to practice some new game. They should be prepared to devote as much time and attention to this as they would to learn golf, bridge, or music¹⁹.

So what is the meaning of the thinking?

1-4: Definition of Thinking

To think is to analyze, examine and sort out information and form in the mind ideas or opinions, to perform any mental operation, to reason, to bring to mind or recollect, to determine, resolve and to work things out.

¹⁷- Mahran. M., Scientific Thinking, Misr University for Science and Technology, 6 October, 2011-2012, pp. 22-23

¹⁸- Mander. A. E., Clearer Thinking (Logic for everyman), The Thinker's Library, No.57, 3rd ed., WATTS & CO., London, 1938, p. VII

¹⁹- Ibid, p. viii

Thinking is to conceive thoughts and ideas by reasoning, to form an opinion, to judge, to consider, to employ and to bring one's intellectual faculties to work, to concentrate one's thoughts on any given subject.

Thinking is the act of reasoning from factual knowledge or evidence. Thinking is to use the mind for processing imagination and information, to arrive at logical conclusions, from premises known and or assumed to be true for making imaginative decisions.

To think is to reason about or reflect on, to ponder. Think how complex our home the Milky Way Galaxy really is. Think the matter through creatively. To decide by reasoning, reflection or pondering, thinking what to believe, what to say or what to do.

To think is to judge, or regard, look upon. To think is to learn of, or from, by analyzing what one could learn by thinking about the newly acquired knowledge, thought, suggestion and or idea, in order to learn and accept as truth.

Thinking is to call to mind, to remember, to visualize and recall the images of what was once known to the mind. To think is to have creative thoughts, to bring a thought to mind by imagination or invention to devise or evolve to invent by imaginative thinking.

Thinking is to bring one's mind into a given condition by mental preoccupation, to exercise the power of one's mind by reasoning and by conceiving ideas, drawing inferences, and using or arriving to a judgment²⁰.

In short: Thinking is the highest mental activity present in man. All human achievements and progress are simply the products of thought. The evolution of culture, art, literature, science and technology are all the results of thinking²¹.

Thought and action are inseparable - they are actually the two sides of the same coin. All our deliberate action starts from our deliberate thinking. For a man to do something he should first see it in his mind's eye -- he should imagine it, think about it first, before he can do it. All

²⁰- Bahram Maskanian., To Think - What Is Rational Critical Thinking?,
<https://venusproject.org/keywords/what-is-thinking-and-how-to-think.html>

²¹- Mahran. M., Scientific Thinking, p. 20

creations-- whether artistic, literal or scientific --first occur in the creator's mind before it is actually given life in the real world²².

Therefore thinking is the process of using your mind to consider something carefully²³.

Finally, Thinking is a mental activity of: (a) theoretical contemplation directed towards some object with a view to reaching a propositional conclusion, or (b) Practical deliberation directed towards some object with a view to reaching a decision to act²⁴.

1-5: Kinds of Thinking

Different problems require different types of thinking. In general, we don't deal with unfamiliar problems in the same way we deal with familiar ones. Not only that but people vary in the ways they prefer to think about things.

We face a variety of problems daily and deal with them in a variety of ways. The aim of this section is to categorize the kinds of thinking we use to cope with familiar and unfamiliar situations.

There are many kinds of thinking that we will try to explain the most important of these kinds:

1- Mythical thinking

Mythical thinking is a thinking that is based on denying science and rejecting its methods, or resorting - in the age of science- to methods that precede this age. It is that type of thinking whereby the individual is subject to imaginary ideas, interpretations and solutions in the interpretation of phenomena. This means that the reasons used by humans to interpret the phenomenon are not intrinsically linked to the problem they are trying to interpret or resolve.

Mythological thinking has to do with the stories we tell about ourselves or tell to ourselves and others about how the world works. It is characterized by an emphasis on symbolism, narrative, and the perceived experience rather than what is necessarily quantifiable or testable. Myth itself is a form of narrative which involves supernatural beings and phenomena, often as an explanation for why things are the way they are.

²²- Ibid, p. 20

²³- Ibid, p. 25

²⁴- Antony Flew (Ed.), A Dictionary of Philosophy, Macmillan Press Ltd, London, 1979, P. 327

Examples of Mythological thinking include the following:

- There are people who believe that if found inverted shoes it will cause him depression and calamities, so when he finds it upside down immediately modified.
- There are those who tell you that cutting hair at night causes problems, do not cut your hair at night.
- There are those who say do not play scissors and do not open it wide, it causes divorce.
- There are those who think when he sees the black cat that his day is bad.
- There are those who associate certain clothes with bad or good luck.

And other such ideas that cause the depression of their members and the loss of their time and money and effort in such matters.

The mythical thinking is not a special phenomenon that is out of nature or is used only by the primitives, but that the civilized man may think in a way that close to the mythical thinking, even if based on scientific facts. What is important is the way of dealing with phenomena and facts and the way of linking them. A person may unconsciously depart from logic and think mythical.

In any case it can be said that science gradually achieved a clear victory for the public to sterility of the mythical solution of the problems, through the experimental presentation of the causes of phenomena and predictability of its occurrence, Many of the phenomena whose interpretations were inherited from the deep past have been re-examined according to the scientific thinking associated with interpretation, prediction and control.

2- Scientific thinking

What does it mean to think scientifically? We might label a preschooler's curious question, a high - school student ' s answer on a physics exam, and scientists ' progress in mapping the human genome as instances of scientific thinking. But if we are to classify such disparate phenomena under a single heading, it is essential that we specify what it is that they have in common. Alternatively, we might define scientific thinking narrowly, as a specific reasoning strategy (such as the control - of - variables strategy that has dominated research on the development of scientific thinking), or as the thinking characteristic of a narrow population (scientific thinking is what scientists do). But to do so is to seriously limit the interest and significance the phenomenon holds. This chapter begins, then, with an attempt to define scientific thinking in an inclusive way that encompasses not only the preceding examples, but numerous other instances of thinking, including many not typically associated with science²⁵.

Is scientific thinking of any relevance outside of science? In this chapter I answer this question with an emphatic yes and portray scientific thinking as a human activity engaged in by most people, rather than a rarefied few. As such, it connects to other forms of thinking studied by cognitive psychologists, such as inference and problem-solving. In particular, I highlight its connection to argumentative thinking and characterize its goals and purposes as more closely aligned with argument than with experimentation. Scientific thinking is most often social in nature, rather than a phenomenon that occurs only inside people's heads. A group of people may rely jointly on scientific thinking in pursuing their goals²⁶.

To fully appreciate scientific thinking, it must be situated in a developmental framework, with a goal of identifying both its origins and endpoints. These endpoints are more general than the practices and standards of professional science. The most skilled, highly developed thinking that we identify here is essential to science, but not specific to it²⁷.

²⁵- Deanna Kuhn., What is Scientific Thinking and How Does it Develop? p.497

²⁶- Ibid, pp. 497- 498

²⁷- Ibid, p. 498

Then, what is meant by scientific thinking is not Scientists' thinking in a specialized matter with familiar terms and symbols. Rather, it is the kind of organized thinking that we can use in our everyday affairs provided that it is based on a set of clear and repeatable principles which we often apply at every moment without the feeling, such as the principle of the impossibility of asserting the thing and its opposite at the same time, the principle that each incident has two reasons and that it is impossible for something to happen from nothing.

3- Critical thinking

Consider the following scenarios. An advertisement for a residential treatment center for youth claims, “We’ve been serving youth for over fifty years with success.” Does this convince you? If not, what kind of evidence would you seek and why? You read an article stating that “grassroots community organization will not be effective in alienated neighborhoods.” What questions would you raise?

Finally, a social worker tells you that because Mrs. Smith recalls having been abused as a child, insight therapy will be most effective in helping her to overcome her depression and anger. Here too, what questions would you ask?

If you thought carefully about these statements, you engaged in critical thinking. Critical thinking involves the careful examination and evaluation of beliefs and actions. It requires paying attention to the process of reasoning, not just the product²⁸.

Critical thinking involves the use of standards such as clarity, accuracy, relevance, and completeness. It requires evaluating evidence, considering alternative views, and being genuinely fair-minded in accurately presenting opposing views. Critical thinkers make a genuine effort to critique fairly all views, preferred and unpreferred using identical rigorous criteria. They value accuracy over “winning” or social approval. Questions that arise when you think critically include the following:

1. What does it mean?
2. Is it true? How good is the evidence?

²⁸- Gambrill. E & Gibbs. L, Critical Thinking for Helping Professionals: A Skills-Based Workbook, p.3-4

3. Who said the claim was accurate? What could their motives be? How reliable are these sources? Do they have vested interests in one point of view?
4. Are the facts presented correct?
5. Have any facts been omitted?
6. Have critical tests of this claim been carried out? Were these studies relatively free of bias? What samples were used? How representative were they? What were the results? Have the results been replicated?
7. Are there alternative well-argued views?
8. If correlations are presented, how strong are they?
9. Are weak appeals used, for example, to emotion or special interests?²⁹.

Specialized knowledge is often required to think effectively in a domain. Creativity plays a role in critical thinking. For instance, it may be required to discover assumptions, alternative explanations, and biases. Thus, critical thinking is much more than reasoned appraisal of claims and related arguments. Well-reasoned thinking is a form of creation and construction³⁰.

In other words, critical thinking is defined as a purpose-built mental activity, governed by rules of logic and reasoning, and leads to predictable results, aimed at verifying something and evaluating it based on acceptable criteria.

The goal of critical thinking, then, is to analyze and evaluate beliefs to distinguish what is acceptable and what is unacceptable according to purely mental standards.

4- Creative Thinking

Most people associate creativity with the arts such as writing a novel, painting a picture, or composing music. While these are all creative endeavors, not all creative thinkers are artists. Many jobs require creative thinking, including positions in the world of business and science. Creativity simply means being able to come up with something new. If you can create something, not only will you enrich your personal life, you'll have an advantage in whatever field you enter. The first thing you need to do is recognize your own creativity.

²⁹ - Ibid, p.4

³⁰ - Ibid, p.4

Creative thinking means looking at something in a new way. It is the very definition of “thinking outside the box”. Often, creativity in this sense involves what is called lateral thinking, or the ability to perceive patterns that are not obvious. The fictional detective Sherlock Holmes used lateral thinking in one famous story when he realized that a dog *not* barking was an important clue in a murder case³¹.

Creative thinking is this kind of thinking that has raised man from his pristine, sub savage ignorance and squalor to the degree of knowledge and comfort which he now possesses³².

Some people are naturally more creative than others, but creative thinking can be strengthened with practice. You can practice creative thinking by solving riddles, being aware of (and letting go of) your assumptions, and through play. Play connotes anything unstructured and relaxing such as daydreaming³³.

Creative thinking is this kind of meditation begets knowledge, and knowledge is really creative inasmuch as it makes things look different from what they seemed before and may indeed work for their reconstruction³⁴.

Creative people have the ability to devise new ways to carry out tasks, solve problems, and meet challenges. They bring a fresh, and sometimes unorthodox, perspective to their work. This way of thinking can help departments and organizations move in more productive directions³⁵.

³¹- Alison Doyle., Creative Thinking Definition, Skills, and Examples, March 29, 2018,

<https://www.thebalancecareers.com/creative-thinking-definition-with-examples-2063744>

³²- Robinson, J. H., Four Kinds of Thinking, In: Samuel. N. Bogorad & Jack Trevithick (eds.), the College Miscellany, RINEHART & COMPANY, INC., New York, 1952, p. 11

³³- Alison Doyle., Creative Thinking Definition, Skills, and Examples, March 29, 2018, <https://www.thebalancecareers.com/creative-thinking-definition-with-examples-2063744>

³⁴- J. H. Robinson, Four Kinds of Thinking, p. 11

³⁵- Alison Doyle., Creative Thinking Definition, Skills, and Examples, March 29, 2018, <https://www.thebalancecareers.com/creative-thinking-definition-with-examples-2063744>

5- Logical Thinking (Reasoning)

This kind of thinking is based on logic, based on the idea inferring the validity of a specific judgement from other judgements. In this kind of thinking, we start from the facts (premises) we recognize in order to arrive at the knowledge of the unknown, which is the necessary results are required for those premises from which we started. There are two paths of Logical Thinking: Inductive reasoning and deductive reasoning.

Deduction means using a general rule by applying it to particular cases. It is thus the reverse process to Induction; Induction moves from a number of particulars to a generalization.

Deductive reasoning is a basic form of valid reasoning. Deductive reasoning, or deduction, starts out with a general statement, or hypothesis, and examines the possibilities to reach a specific, logical conclusion.

"In deductive inference, we hold a theory and based on it we make a prediction of its consequences. That is, we predict what the observations should be if the theory were correct. We go from the general — the theory — to the specific — the observations,".

Deductive reasoning usually follows steps. First, there is a premise, then a second premise, and finally an inference. A common form of deductive reasoning is the syllogism, in which two statements — a major premise and a minor premise — reach a logical conclusion. For example, the premise "Every A is B" could be followed by another premise, "This C is A." Those statements would lead to the conclusion "This C is B." Syllogisms are considered a good way to test deductive reasoning to make sure the argument is valid. For example, "All men are mortal. Harold is a man. Therefore, Harold is mortal." For deductive reasoning to be sound, the hypothesis must be correct.

It is assumed that the premises, "All men are mortal" and "Harold is a man" are true. Therefore, the conclusion is logical and true. In deductive reasoning, if something is true of a class of things in general, it is also true for all members of that class.

Deductive inference conclusions are certain provided the premises are true. It's possible to come to a logical conclusion even if the generalization is not true. If the generalization is wrong, the conclusion may be logical, but it may also be untrue. For example, the argument, "All bald men are grandfathers. Harold is bald. Therefore, Harold is a

grandfather," is valid logically but it is untrue because the original statement is false.

Inductive reasoning makes broad generalizations from specific observations. Basically, there is data, then conclusions are drawn from the data.

"In inductive inference, we go from the specific to the general. We make many observations, discern a pattern, make a generalization, and infer an explanation or a theory".

An example of inductive inference is, "The coin I pulled from the bag is a penny. That coin is a penny. A third coin from the bag is a penny. Therefore, all the coins in the bag are pennies."

Even if all of the premises are true in a argument, inductive reasoning allows for the conclusion to be false. Here's an example: "Harold is a grandfather. Harold is bald. Therefore, all grandfathers are bald." The conclusion does not follow logically from the premises.

Finally, Inductive reasoning has its place in the scientific method. Scientists use it to form hypotheses and theories. Deductive reasoning allows them to apply the theories to specific situations³⁶.

1-6: A Checklist for Scientific Reasoning³⁷

1) All scientific reasoning has a purpose.

- Take time to state your purpose clearly.
- Distinguish your purpose from related purposes.
- Check periodically to be sure you are still on target.
- Choose realistic scientific purposes.

2) All scientific reasoning is an attempt to figure something out, to settle some scientific question, to solve some scientific problem.

- State the question at issue clearly and precisely.

³⁶- Alina Bradford., Deductive Reasoning vs. Inductive Reasoning, July 24, 2017, <https://www.livescience.com/21569-deduction-vs-induction.html>

³⁷- Richard Paul & Linda Elder., The Thinker's Guide to Scientific Thinking - Based on Critical Thinking: Concepts & Principles, The Foundation for Critical Thinking, 2012, pp. 6-7, www.criticalthinking.org

- Express the question in several ways to clarify its meaning and scope.
- Break the question into sub-questions.
- Distinguish questions that have definitive answers from those that are a matter of opinion and from those that require consideration of multiple viewpoints.

3) All scientific reasoning is based on assumptions.

- Clearly identify your assumptions and determine whether they are justifiable.
- Consider how your assumptions are shaping your point of view.

4) All scientific reasoning is done from some point of view.

- Identify your point of view and make sure it is scientific.
- Seek other points of view and identify their strengths as well as weaknesses.
- Strive to be fair-minded in evaluating all scientific points of view.

5) All scientific reasoning is based on scientific data, information, and evidence.

- Restrict your claims to those supported by the available data.
- Search for information that opposes your position as well as information that supports it.
- Make sure that all information used is clear, accurate and relevant to the question at issue.
- Make sure you have gathered sufficient information.

6) All scientific reasoning is expressed through, and shaped by, scientific concepts and ideas.

- Identify key scientific concepts and explain them clearly.
- Consider alternative concepts or alternative definitions of concepts.
- Make sure you are using concepts with care and precision.

7) All scientific reasoning contains inferences or interpretations by which we draw scientific conclusions and give meaning to scientific data.

- Infer only what the evidence implies.
- Check inferences for their consistency with each other.
- Identify assumptions underlying your inferences.

8) All scientific reasoning leads somewhere or has implications and consequences.

- Trace the implications and consequences that follow from your reasoning.
- Search for negative as well as positive implications.
- Consider all possible consequences.

Chapter Two

Critical Thinking

2-1: What is Critical Thinking?

‘Critical’, ‘criticism’ and ‘critic’ all originate from the ancient Greek word *kritikos*, meaning able to judge, discern or decide. In modern English, a ‘critic’ is someone whose job it is to make evaluative judgements, for example about films, books, music or food. Being ‘critical’ in this sense does not merely mean finding fault or expressing dislike, although that is another meaning of the word. It means giving a fair and unbiased opinion of something. Being critical and thinking critically are not the same thing. If critical thinking did just mean judging, wouldn’t that mean that anyone could do it simply by giving an opinion? It takes no special training or practice to pass a judgement. If I watch a film and think that it is boring, even though it has had good reviews, no one can really say that my judgement is wrong and the professional critics are right. Someone can disagree with me, but that is just another judgement, no better or worse, you might say, than mine. In a limited sense, this is true. But a serious critical judgement is more than just a statement of preference or taste. A critical judgement must have some basis, which usually requires a measure of knowledge or expertise on the part of the person making the judgement. Just saying ‘I like it’ or ‘I don’t like it’ is not enough. There have to be some grounds for a judgement before we can call it critical³⁸.

Critical thinking means correct thinking in the pursuit of relevant and reliable knowledge about the world. Another way to describe it is reasonable, reflective, responsible, and skillful thinking that is focused on deciding what to believe or do. A person who thinks critically can ask appropriate questions, gather relevant information, efficiently and creatively sort through this information, reason logically from this information, and come to reliable and trustworthy conclusions about the world that enable one to live and act successfully in it. Critical thinking is not being able to process information well enough to know to stop for red

³⁸- Butterworth. J & Thwaites. G *Thinking Skills: Critical Thinking and Problem Solving*, Second edition, Cambridge University press, Cambridge, New York, 2013, p.7

lights or whether you received the correct change at the supermarket. Such low-order thinking, critical and useful though it may be, is sufficient only for personal survival; most individuals master this. True critical thinking is higher-order thinking, enabling a person to, for example, responsibly judge between political candidates, serve on a murder trial jury, evaluate society's need for nuclear power plants, and assess the consequences of global warming. Critical thinking enables an individual to be a responsible citizen who contributes to society, and not be merely a consumer of society's distractions³⁹.

Children are not born with the power to think critically, nor do they develop this ability naturally beyond survival-level thinking. Critical thinking is a learned ability that must be taught. Most individuals never learn it. Critical thinking cannot be taught reliably to students by peers or by most parents. Trained and knowledgeable instructors are necessary to impart the proper information and skills. Math and science instructors have precisely this information and these skills⁴⁰.

2-2: What does it mean to think critically?

Why are some people better than others at solving problems and making decisions? The answer seems obvious: Some people are smarter than others. But being smart isn't enough. People who follow broad rules like "We can't ignore anything" are playing it too safe. We should ignore some things because they are improbable. It is unreasonable to do a bomb search on the advice of a psychic tip because there is no evidence that psychic tips are any more reliable than flipping a coin or throwing darts at a board.

Why are some people better than others at supporting their beliefs and actions with good reasons? Again, the answer seems obvious: Some people have more knowledge or are more eloquent than others. Still, two equally intelligent people can be equally articulate and knowledgeable, but not be equally good thinkers. If only one of them is thinking

³⁹- Steven D. Schafersman, *An Introduction to Critical Thinking*, p. 3

<http://facultycenter.ischool.syr.edu/wp-content/uploads/2012/02/Critical-Thinking.pdf>

⁴⁰- Ibid, p.3

critically, that one will be better at analyzing and evaluating facts and opinions, sources and claims, options and alternatives. The critical thinker will be a better problem-solver and better decision-maker⁴¹.

When we're thinking critically, we're using our knowledge and intelligence effectively to arrive at the most reasonable and justifiable position possible. When we're thinking uncritically—no matter how intelligent or knowledgeable we are--we'll make unreasonable decisions and arrive at unreasonable beliefs or take unjustifiable actions, unless we are lucky and end up making the right choice for the wrong reasons! For example, imagine that the search crew finds a bomb. You're vindicated, right? Not necessarily. If it turns out that the psychic planted the bomb herself in order to make it look like she really had psychic powers so she could advance her career, but you had the plane searched because you thought a psychic might actually be able to know such things by paranormal means, then you made the right decision by pure luck. You should have had the plane searched, but you should have held and interrogated the psychic. If a bomb is found, it would be reasonable to infer that the psychic had non-psychic information about the bomb and might even have been involved in planting it. It would not be reasonable to infer that the "psychic" is really psychic. As your boss said, there is little, if any, evidence that any psychic anywhere has ever correctly predicted when a bomb had been placed on a plane. On the other hand, there are plenty of examples where people have lied and deceived in order to advance their careers or to get attention⁴².

The goal of thinking critically is simple: to guarantee, as far as possible, that one's beliefs and actions are justifiable and can withstand the test of rational analysis. Just what do we do when we're thinking critically? In general terms, we can say that to think critically is to think clearly, accurately, knowledgeably, and fairly while evaluating the reasons for a belief or for taking some action. This is sometimes easier said than done⁴³.

⁴¹ - Robert Todd Carroll, *Becoming a Critical Thinker*, p.1
<http://skepdic.com/refuge/ctlessons/ch1.pdf>

⁴² - *Ibid.*, p.2

⁴³ - *Ibid.*, p.2

2-3: The Roots of Critical Thinking

From its beginnings in Greece over 2,500 years ago, Western philosophy and science have been primarily public activities. Some of the best minds of each generation have presented their views on important issues for their fellow citizens to accept or reject. Using only the forces of reason and eloquence to persuade, rather than torture or threats of death or damnation, the critical thinkers of the past developed rules and guidelines for determining beliefs and actions. Their predecessors or contemporaries relied on the authority of ancient texts and customs, or on the power granted them by their social position, to coerce agreement. Critically thinking philosophers and scientists used evidence available to all as they sought to discover the truth and to persuade others to accept their discoveries. It is true that often the arguments and disputations of philosophers have been over questions that are unanswerable in any final sense. It is also true that there is no universal agreement about the methods and standards of evaluation used in these disputes. Nevertheless, much progress has been made in understanding not only the scope and limits of possible knowledge, but also the bases for reasonable belief. Three of the most important areas of philosophy relevant to critical thinking are logic, epistemology, and ethics. The first two have long and important histories of making significant contributions to the methods and standards of evaluation now prevalent in science, law, and philosophy. Ethics is most important for its contributions to the standards for evaluating the morality of actions. Logic studies the principles of valid and invalid reasoning. The domain of logic is narrower than the domain of critical thinking, which is concerned with evaluating the justification of beliefs and actions. Epistemology studies the origin, nature, and limits of knowledge⁴⁴.

One philosopher stands out as having had the greatest influence on our critical thinking standards: the Socrates (469 –399 BCE) of Plato (470-347 BCE). “The unexamined life is not worth living,” says the Socrates of Plato’s Apology. The Socrates known to us is a figure from Plato’s dialogues. For centuries, Socrates has stood as a model of intellectual integrity and inquiry: the ideal critical thinker. It is not any particular idea that earned him this reputation. It is his method of questioning and cross-

⁴⁴- Robert Todd Carroll, *Becoming a Critical Thinker*, p.2
<http://skepdic.com/refuge/ctlessons/ch1.pdf>

examination of positions that is taken as an ideal for critical thinking. The technique is known as the Socratic Method--named after the technique he used in Plato's earliest dialogues such as Gorgias, Euthyphro, Apology, and the first part of the Republic. In those dialogues, Socrates takes up such issues as the nature of virtue, piety, or justice, and through a series of questions examines the meanings and implications of various views expressed by others. In each case, Socrates is depicted as confronting someone who claims to be an expert. Each expert is depicted as arrogant and self-righteous, without the slightest self doubt. Socrates leads his antagonists not to the answer but to confusion. What Plato seemed to admire about Socrates was not only his method of cross-examination, but also his humble and skeptical attitude. That attitude was in stark contrast to the arrogance of the priest Euthyphro or the sophist Thrasymachus. Socrates meaning is clear. The arrogant do not examine their views. They are not worth imitating⁴⁵.

Of all Plato's works, perhaps the best known is his Apology, the account of Socrates' trial for impiety and corrupting the youth of Athens. Nothing else Plato wrote has had a more profound effect on the intellectual attitude of philosophers who came after him. In the Apology, Socrates is depicted as defending his way of life, rather than defending himself against the charges against him. In one of the most eloquent works in Western literature, Socrates defends a life of constant inquiry and examination of beliefs and actions. Finally, Socrates assures his accusers that the death sentence handed down to him would guarantee that he would be known to history as a heroic figure, one who died for the "crime" of thinking for himself and for encouraging others to do likewise⁴⁶.

Socrates may have been put to death over two thousand years ago, but his spirit of critical inquiry lives on. One of Socrates' main critical concerns was clarity. Of course, standards of clarity change. As we have become more aware of the power and functions of language, we have become both more demanding in our quest for clarity and more understanding of the limits of language. Simultaneously, those who would like to manipulate the thoughts and deeds of others (advertisers, politicians, con artists, evangelists, talk show hosts, lawyers, cult recruiters, and the like) continue to use their creative powers to persuade us to believe or do things that remain unclear to us. Today, the study of

⁴⁵- Ibid., p.3

⁴⁶- Ibid., p.3

clarity requires a companion study of the persuasive techniques of modern propagandists, especially their attempts to manipulate thought and action through the clever use and abuse of language⁴⁷.

Socrates was not concerned with clarity for its own sake, however. He knew that without clarity we couldn't understand what it is we are being asked to believe or to do. But he also recognized that clarity is not enough to base any belief or action on. Today we recognize that in addition to being based on clear claims, a critical thinker's beliefs and actions should be based on accurate information. Information can only be as accurate as the source from which it comes. If we can't discover something for ourselves, what criteria should we use to determine the accuracy and reliability of sources, especially sources who claim some sort of special expertise or knowledge? How accurate is the mass media, one of the main sources of information for many of us?⁴⁸

In this chapter will concern such questions as what makes a reason a good reason for believing something or for taking some action. Or, what makes any reason or set of reasons adequate to justify believing something or taking some action. Since, at the very least, a good reason must be relevant to justifying a belief or action, the issue of relevance is one we must take up. Good reasons must also be sufficient to warrant accepting a belief or taking some action. Hence, the criteria by which we judge the sufficiency of evidence are going to be examined in detail, including how much weight should be given to each piece of evidence. We'll also consider the completeness requirement: that pertinent evidence not be suppressed or ignored, that everything relevant to the issue be presented. It was good that you, as our hypothetical airport safety manager, took every bomb threat seriously. But you should have considered all the relevant evidence, including the fact that people sometimes lie to further their own ends. You should have made some effort to get more information about the source of the tip. Relying on the psychic's self-proclaimed talent on a television show is not sufficient⁴⁹.

Knowing and adhering to the standards of critical thinking will take us a long way toward becoming a critical thinker. But if we don't have the right attitude, we may fail despite our knowledge of the standards.

⁴⁷ - Ibid., p.3

⁴⁸ - Ibid., p.3

⁴⁹ - Ibid., p.4

2-4: Definition of Critical Thinking

The writings of Socrates, Plato, Aristotle, and more recently, Matthew Lipman and Richard Paul, exemplify the philosophical approach. This approach focuses on the hypothetical critical thinker, enumerating the qualities and characteristics of this person rather than the behaviors or actions the critical thinker can perform (Lewis & Smith, 1993; Thayer-Bacon, 2000). Sternberg (1986) has noted that this school of thought approaches the critical thinker as an ideal type, focusing on what people are capable of doing under the best of circumstances. Accordingly, Richard Paul (1992) discusses critical thinking in the context of “perfections of thought”. This preoccupation with the ideal critical thinker is evident in the American Philosophical Association’s consensus portrait of the ideal critical thinker as someone who is inquisitive in nature, open-minded, flexible, fair-minded, has a desire to be well-informed, understands diverse viewpoints, and is willing to both suspend judgment and to consider other perspectives (Facione, 1990)⁵⁰.

Those working within the philosophical tradition also emphasize qualities or standards of thought. For example, Bailin (2002) defines critical thinking as thinking of a particular quality—essentially good thinking that meets specified criteria or standards of adequacy and accuracy. Further, the philosophical approach has traditionally focused on the application of formal rules of logic (Lewis & Smith, 1993; Sternberg, 1986). One limitation of this approach to defining critical thinking is that it does not always correspond to reality (Sternberg, 1986). By emphasizing the ideal critical thinker and what people have the capacity to do, this approach may have less to contribute to discussions about how people actually think⁵¹.

Definitions of critical thinking emerging from the philosophical tradition include:⁵²

- “The propensity and skill to engage in an activity with reflective skepticism” (McPeck, 1981).

⁵⁰- Emily R. Lai, Critical Thinking: A Literature Review, June 2011, p. 5
<https://images.pearsonassessments.com/images/tmrs/CriticalThinkingReviewFINAL.pdf>

⁵¹- Ibid, p. 5

⁵²- Ibid, p. 6

- “Reflective and reasonable thinking that is focused on deciding what to believe or do” (Ennis, 1985).
- “Skillful, responsible thinking that facilitates good judgment because it 1) relies upon criteria, 2) is self-correcting, and 3) is sensitive to context” (Lipman, 1988).
- “Purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgment is based” (Facione, 1990).
- “Disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought” (Paul, 1992).
- thinking that is goal-directed and purposive, “thinking aimed at forming a judgment,” where the thinking itself meets standards of adequacy and accuracy (Bailin et al, 1999)
- “Judging in a reflective way what to do or what to believe” (Facione, 2000).

In short, the definition most useful in assessing critical thinking abilities is as follows: Critical thinking is the process of analyzing and assessing thinking with a view to improving it.

Each of these is an excellent definition of critical thinking. It pays to read them several times and to stop and reflect on every aspect of each definition. Why did the expert include this word rather than another? Just what are the experts trying to capture with the words they have chosen? What overlap is there in the definitions, and what main differences of emphasis are there?

It may seem hard to believe, but each of these definitions, brief as they are, is the product of a long period of intense pondering about how best to describe critical thinking. Each definition is an attempt to convey in words the essence of an activity, a “thing”—critical thinking. Before trying to define it, each expert had an intuitive grasp of what critical

thinking is, based on years of working with it. This was what the experts tried to capture in the words they chose⁵³.

So in reading the experts' definitions and in the discussion ahead, one very important goal to keep in mind is for you to develop a solid intuitive grasp of just what critical thinking is and what it is not.

2-5: Essential Intellectual Standards of Critical Thinking:⁵⁴

In this section, we introduce and explicate some of the intellectual standards essential to reasoning well through the problems and issues implicit in everyday human life.

We postulate that there are at least nine intellectual standards important to skilled reasoning in everyday life. These are clarity, precision, accuracy, relevance, depth, breadth, logicalness, significance, and fairness. It is unintelligible to claim that any instance of reasoning is both sound and yet in violation of these standards. To see this, suppose someone were to claim that her or his reasoning is sound regarding "x," though, at the same time, admittedly unclear, inaccurate, imprecise, irrelevant, narrow, superficial, illogical, trivial, and unfair with respect to "x." Beginning with these nine intellectual standards will help set the stage for conceptualizing intellectual standards (more broadly) and for appreciating the essential role of intellectual standards in human reasoning.

Clarity: Understandable, the meaning can be grasped; to free from confusion or ambiguity, to remove obscurities.

Clarity is a "gateway" standard. If a statement is unclear, one cannot determine whether it is accurate or relevant. In fact, it is impossible to tell anything about a statement without knowing what it is saying. For example, here is an unclear question: "What can be done about the education system in America?" To adequately address the question, a clearer understanding of how the person asking the question is conceptualizing the "problem" is needed. A clearer question might be

⁵³- Gerald M. Nosich, Learning to Think Things Through: A Guide to Critical Thinking Across the Curriculum, Prentice-Hall international limited, London, 2001, pp. 2-3

⁵⁴- Richard Paul and Linda Elder, Critical Thinking: Intellectual Standards Essential to Reasoning Well Within Every Domain of Human Thought, Part Two, Journal of Developmental Education, v37, n1, Fall 2013, pp. 32- 33

“What can educators do to ensure that students learn the skills and abilities which help them understand the world in which they live and function as ethical persons in that world?”.

Thinking is always more or less clear. It is helpful to assume that one does not fully understand a thought except to the extent that he or she can elaborate, illustrate, and exemplify it. Questions that focus on clarity in thinking include:

- Could you elaborate on that point? or Do I need to elaborate on that point?
- Could you express that point in another way? Can I express that point differently?
- Could you give me an illustration? or Should I give an illustration?
- Could you give me an example? or Should I provide an example?
- Let me state in my own words what I think you just said. Am I clear about your meaning?
- I hear you saying “___.” Am I hearing you correctly, or have I misunderstood you?

Accuracy: free from errors, mistakes or distortions; true, correct. A statement can be clear but not accurate, as in “Most dogs weigh more than 300 pounds.” Thinking is always more or less accurate. It is useful to assume that a statement’s accuracy has not been fully assessed except to the extent that one has checked to determine whether it represents things as they really are. Questions that focus on accuracy in thinking include:

- How could I check that to see if it is true?
- How could I verify these alleged facts?
- Can I trust the accuracy of these data given the source from which they come?

Precision: exact to the necessary level of detail, specific. A statement can be both clear and accurate, but not precise, as in “Jack is overweight.” (One doesn’t know how overweight Jack is, one pound or 500 pounds.)

Thinking is always more or less precise. It is likely that one does not fully understand a statement except to the extent that he or she can specify it in detail. Questions that focus on precision in thinking include:

- Could you give me more details about that?
- Could you be more specific?
- Could you specify your allegations more fully?

Relevance: bearing upon or relating to the matter at hand; implies a close logical relationship with, and importance to, the matter under consideration.

A statement can be clear, accurate, and precise but not relevant to the question at issue. For example, students often think that the amount of effort they put into a course should be used in raising their grade in a course. Often, however, “effort” does not measure the quality of student learning, and when this is so, effort is irrelevant to their appropriate grade.

Thinking is always capable of straying from the task, question, problem, or issue under consideration. It is useful to assume individuals have not fully assessed thinking except to the extent that they have considered all issues, concepts, and information relevant to it. Questions that focus on relevance in thinking include:

- I don't see how what you said bears on the question. Could you show me how it is relevant?
- Could you explain the connection between your question and the question we are addressing?
- How does this fact bear upon the issue?
- How does this idea relate to this other idea?
- How does your question relate to the issue at hand?

Depth: containing complexities and multiple interrelationships, implies thoroughness in thinking through the many variables in the situation, context, idea, or question.

A statement can be clear, accurate, precise, and relevant, but superficial (i.e., lack depth). For example, the statement “Just Say No,” which was used for a number of years to discourage children and teens from using drugs, is clear, accurate, precise, and relevant. Nevertheless,

those who take this injunction to solve the social problem of unhealthy drug use fail to appreciate the true complexities in the problem. Their thinking is superficial at best.

Thinking can either function at the surface of things or probe beneath that surface to deeper matters and issues. A line of thinking is not fully assessed except to the extent that one has fully considered all the important complexities inherent in it. Questions that focus on depth in thinking include:

- Is this question simple or complex? Is it easy or difficult to answer well and truly?
- What makes this a complex question?
- How am I dealing with the complexities inherent in the question?

Breadth: encompassing multiple viewpoints, comprehensive in view, wide-ranging and broadminded in perspective.

A line of reasoning may be clear, accurate, precise, relevant, and deep but lack breadth (as in an argument from either the conservative or liberal standpoints which details the complexities in an issue, but only recognizes insights from one perspective).

Thinking can be more or less broad-minded (or narrow-minded), and breadth of thinking requires the thinker to reason insightfully within more than one point of view or frame of reference. One has not fully assessed a line of thinking except to the extent that individual has determined how much breadth of thinking is required to understand it (and how much has in fact been exercised). Questions that focus on breadth in thinking include:

- What points of view are relevant to this issue?
- What relevant points of view have I ignored thus far?
- Am I failing to consider this issue from an opposing perspective because I am not open to changing my view?
- Have I entered the opposing views in good faith or only enough to find flaws in them?

- I have looked at the question from an economic viewpoint. What is my ethical responsibility?
- I have considered a liberal position on the issue. What would conservatives say?

Logic: the parts make sense together, no contradictions; in keeping with the principles of sound judgment and reasonability.

When one thinks, a person brings a variety of thoughts together into some order. When the combination of thoughts is mutually supporting and makes sense in combination, the thinking is logical. When the combination is not mutually supporting, it is contradictory or does not make sense, the combination is not logical.

Thinking can be more or less logical. It can be consistent and integrated. It can make sense together or be contradictory or conflicting. Questions that focus on logic include:

- Does all this fit together logically?
- Does this really make sense?
- Does that follow from what you said?
- Does what you say follow from the evidence?
- Before you implied this and now you are saying that, I don't see how both can be true. What exactly is your position?

Significance: having importance, being of consequence; having considerable or substantial meaning.

When reasoning through an issue, one should concentrate on the most important information (relevant to the issue) and take into account the most important ideas or concepts. It is easy to forget that, though many ideas may be relevant to an issue, they may not be equally important. Similarly, a thinker may fail to ask the most important questions and instead become mired in superficial questions, questions of little weight. In college, for example, few students focus on important questions such as, "What does it mean to be an educated person? What do I need to do to become educated?" Instead, students tend to ask questions such as, "What do I need to do to get an 'A' in this course? How many pages does this paper have to be? What do I have to do to satisfy this professor?"

Thinking can be more or less significant. It can focus on what is most substantive, what is of the highest consequence, what has the most important implications; or it can focus on the trivial and superficial. Questions that focus on significance include:

- What is the most significant information needed to address this issue?
- How is that fact important in context?
- Which of these questions is the most significant?
- Which of these ideas or concepts is the most important?

Fairness: free from bias, dishonesty, favoritism, selfish-interest, deception or injustice.

Humans naturally think from a personal perspective, from a point of view that tends to privilege their position. Fairness implies the treating of all relevant viewpoints alike without reference to one's own feelings or interests. Because everyone tends to be biased in favor of their own viewpoint, it is important to keep the intellectual standard of fairness at the forefront of thinking. This is especially important when the situation may call on us to examine things that are difficult to see or give something up we would rather hold onto.

Thinking can be more or less fair. Whenever more than one point of view is relevant to the situation or in the context, the thinker is obligated to consider those relevant viewpoints in good faith. To determine the relevant points of view, look to the question at issue. Questions that focus on fairness include:

- Does a particular group have some vested interest in this issue that causes them to distort other relevant viewpoints?
- Am I sympathetically representing the viewpoints of others?
- Is the problem addressed in a fair manner, or is personal vested interest interfering with considering the problem from alternative viewpoints?
- Are concepts being used justifiably (by this or that group)? Or is some group using concepts unfairly in order to manipulate (and thereby maintain power, control, etc.)?
- Are these laws justifiable and ethical, or do they violate someone's rights?

2-6: Core Critical Thinking Skills

There are six core critical thinking skills involved in critical thinking processes according to Facione (1998). “The skills are: interpretation, analysis, evaluation, inference, explanation, and self-regulation”. We will address these skills in some detail below:⁵⁵

Interpretation is “to comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria.” Interpretation includes the sub-skills of categorization, decoding significance, and clarifying meaning. Can you think of examples of interpretation? How about recognizing a problem and describing it without bias? How about reading a person’s intentions in the expression on her face; distinguishing a main idea from subordinate ideas in a text; constructing a tentative categorization or way of organizing something you are studying; paraphrasing someone’s ideas in your own words; or, clarifying what a sign, chart or graph means? What about identifying an author’s purpose, theme, or point of view? How about what you did above when you clarified what “offensive violence” meant?

Analysis is “to identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions”. The experts include examining ideas, detecting arguments, and analyzing arguments as sub-skills of analysis. Again, can you come up with some examples of analysis? What about identifying the similarities and differences between two approaches to the solution of a given problem? What about picking out the main claim made in a newspaper editorial and tracing back the various reasons the editor offers in support of that claim? Or, what about identifying unstated assumptions; constructing a way to represent a main conclusion and the various reasons given to support or criticize it; sketching the relationship of sentences or paragraphs to each other and to the main purpose of the passage? What about graphically organizing this

⁵⁵- Peter A. Facione, Critical Thinking: What It Is and Why It Counts, p.5-7
https://www.nyack.edu/files/CT_What_Why_2013.pdf

essay, in your own way, knowing that its purpose is to give a preliminary idea about what critical thinking means?

Evaluation is “to assess the credibility of statements or other representations which are accounts or descriptions of a person’s perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation.” Your examples? How about judging an author’s or speaker’s credibility, comparing the strengths and weaknesses of alternative interpretations, determining the credibility of a source of information, judging if two statements contradict each other, or judging if the evidence at hand supports the conclusion being drawn? Among the examples the experts propose are these: “recognizing the factors which make a person a credible witness regarding a given event or a credible authority with regard to a given topic,” “judging if an argument’s conclusion follows either with certainty or with a high level of confidence from its premises,” “judging the logical strength of arguments based on hypothetical situations,” “judging if a given argument is relevant or applicable or has implications for the situation at hand”.

Do the people you regard as strong critical thinkers have the three cognitive skills described so far? Are they good at interpretation, analysis, and evaluation? What about the next three? And your examples of weak critical thinkers, are they lacking in these cognitive skills? All, or just some?

Inference is “to identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to reduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation.” As sub-skills of inference the experts list querying evidence, conjecturing alternatives, and drawing conclusions. Can you think of some examples of inference? You might suggest things like seeing the implications of the position someone is advocating or drawing out or constructing meaning from the elements in a reading. You may suggest that predicting what will happen next based what is known about the forces at work in a given situation or formulating a synthesis of related ideas into a coherent perspective. How

about this: after judging that it would be useful to you to resolve a given uncertainty, developing a workable plan to gather that information? Or, when faced with a problem, developing a set of options for addressing it. What about, conducting a controlled experiment scientifically and applying the proper statistical methods to attempt to confirm or disconfirm an empirical hypothesis?

Beyond being able to interpret, analyze, evaluate and infer, strong critical thinkers can do two more things. They can explain what they think and how they arrived at that judgment. And they can apply their powers of critical thinking to themselves and improve on their previous opinions. These two skills are called “explanation” and “self-regulation”.

Explanation is “being able to present in a cogent and coherent way the results of one’s reasoning”. This means to be able to give someone a full look at the big picture: both “to state and to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological, and contextual considerations upon which one’s results were based; and to present one’s reasoning in the form of cogent arguments.” The sub-skills under explanation are describing methods and results, justifying procedures, proposing and defending with good reasons one’s causal and conceptual explanations of events or points of view, and presenting full and well-reasoned, arguments in the context of seeking the best understandings possible. Your examples first, please... Here are some more: to construct a chart which organizes one’s findings, to write down for future reference your current thinking on some important and complex matter, to cite the standards and contextual factors used to judge the quality of an interpretation of a text, to state research results and describe the methods and criteria used to achieve those results, to appeal to established criteria as a way of showing the reasonableness of a given judgment, to design a graphic display which accurately represents the subordinate and super-ordinate relationship among concepts or ideas, to cite the evidence that led you to accept or reject an author’s position on an issue, to list the factors that were considered in assigning a final course grade.

Maybe the most remarkable cognitive skill of all, however, is this next one. This one is remarkable because it allows strong critical thinkers to improve their own thinking. In a sense this is critical thinking applied to itself. Because of that some people want to call this “meta-cognition,” meaning it raises thinking to another level. But “another level” really

does not fully capture it, because at that next level up what self-regulation does is look back at all the dimensions of critical thinking and double check itself. Self-regulation is like a recursive function in mathematical terms, which means it can apply to everything, including itself. You can monitor and correct an interpretation you offered. You can examine and correct an inference you have drawn. You can review and reformulate one of your own explanations. You can even examine and correct your ability to examine and correct yourself! How? It is as simple as stepping back and saying to yourself, “How am I doing? Have I missed anything important? Let me double check before I go further.”

Self-regulation is “self-consciously to monitor one’s cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis, and evaluation to one’s own inferential judgments with a view toward questioning, confirming, validating, or correcting either one’s reasoning or one’s results.” The two sub-skills here are self-examination and self-correction. Examples? Easy — to examine your views on a controversial issue with sensitivity to the possible influences of your personal biases or self-interest, to check yourself when listening to a speaker in order to be sure you are understanding what the person is really saying without introducing your own ideas, to monitor how well you seem to be understanding or comprehending what you are reading or experiencing, to remind yourself to separate your personal opinions and assumptions from those of the author of a passage or text, to double check yourself by recalculating the figures, to vary your reading speed and method mindful of the type of material and your purpose for reading, to reconsider your interpretation or judgment in view of further analysis of the facts of the case, to revise your answers in view of the errors you discovered in your work, to change your conclusion in view of the realization that you had misjudged the importance of certain factors when coming to your earlier decision.

And therefore, good critical thinkers are able to interpret, analyze, evaluate, infer and explain what they think and how they come out with their judgments.

2-7: Critical Thinking Steps

The steps that the thinker can take to achieve critical thinking skills can be identified as follows:

1. Gathering a series of studies, research, information and facts related to the subject of the study.
2. Review the different opinions related to the topic.
3. A discussion of different opinions to determine the correct ones and the incorrect ones.
4. Distinguish the strengths and weaknesses of opposing opinions.
5. Evaluate opinions in an objective way, free from bias and subjectivity.
6. Demonstrating and presenting an argument for the validity of the opinion or judgment being approved.
7. Refer to more information if evidence and argument require it.

2-8: Characteristics of Critical Thinkers⁵⁶

Effective critical thinkers function by way of different thought processes in different circumstances. After all, figuring out how to make it to work on time when your car breaks down in rush hour traffic requires critical thinking application as much as negotiating world peace does.

Both scenarios facilitate such skills in far different settings, and with different stakes and outcomes, but they call upon these skills nonetheless. The question is about what universal traits the effective critical thinkers in each circumstance, and all those in between, would share.

That's the mystery we intend to solve here by offering suggestions of what the most important defining characteristics of a critical thinker would be. Our hope is to give you and those you teach the highest ideals to strive for in terms of nurturing this undeniably valuable skill set:

⁵⁶ - Lee Watanabe -Crockett, the 7 Most Important Characteristics of Effective Critical Thinkers, May 31, 2017, <https://globaldigitalcitizen.org/7-characteristics-effective-critical-thinkers>

1- Curiosity

Effective critical thinkers are inherently curious about a wide range of topics and generally have broad interests. They tend to have a healthy inquisitiveness about the world and about people. An understanding of and appreciation for the diversity of cultures, beliefs, and views that encompass humanity are one of the hallmarks of a great critical thinker.

2- Compassion

As we seek to gift our learners with these indispensable skills, we must not forget that they embrace the emotional and instinctual as much as the intellectual. Effective critical thinkers act as much with their hearts as they do with their minds. The world is full of enough judgment and segregation, much of it from lack of a clear understanding of one another's secret history of perseverance through often unimaginable suffering.

Each one of us has a story of our own that makes us who we are, as well as personal trials and challenges that have shaped us. Critical thinkers recognize this and compassionately celebrate the uniqueness in everyone, and are willing to help us see the best in ourselves and others.

3- Awareness

Opportunities to apply critical thinking skills are all around us every moment. Effective critical thinkers remain tuned into this and are always alert for chances to apply their best thinking habits to any situation. A desire to think critically about even the simplest of issues and tasks indicates a desire for constructive outcomes.

Effective critical thinkers don't take anything at face value, either. They never stop asking questions and enjoy exploring all sides of an issue and the deeper facts hiding within all modes of data. As such, those who think critically also tend to be instinctual problem solvers. This ranks as probably the most important skill we can help our learners build upon.

4- Decisiveness

Many situations that call for critical thinking also call for quick and decisive action. When we think critically, we weigh our options and imagine the outcomes in the moment with speed and clarity and are able to put aside fear when it comes to making decisions. In essence, critical

thinkers like to move things forward rather than moving backward or procrastinating, because they thrive on progression.

In addition to this, often choices have to be made even when we don't have all the information we need to make them with confidence. When facing any kind of a challenge, often someone has to take the lead and make the hard decisions others shy away from. Effective critical thinkers realize that, more often than not, it's necessary to take the initiative and make a decision even if it ends up being the wrong one. To them, that's preferable to not making any decision at all.

5- Honesty

Honesty is important in any sense, but it is especially important to critical thinking. Moral integrity, ethical consideration and action, and global citizenship practices are all hallmarks of effective critical thinkers. It's not a surprise that honesty resides at the core of all these things. We see in such people a strong desire for harmony and fulfillment in the world, and part of attaining this involves pursuing honesty in all endeavors and relationships.

The practice of honesty in critical thinking also extends to how one looks within oneself to embrace what resides there. It takes into account the processes behind managing our emotions, controlling our impulses, and recognizing any attempts at self-deception. Critical thinkers are as equally aware and accepting of themselves as they are of others.

6- Willingness

Willingness and flexibility encompass a number of key considerations for the critical thinker. They include but aren't limited to things like the ability to:

- learn from their own personal mistakes and shortcomings
- challenge the status-quo when the need arises.
- open-mindedly embrace other opinions and views that challenge their own.
- reconsider and revise their opinions in the wake of new evidence.
- listen actively rather than simply wait for their turn to talk.
- constantly improve, learn, and excel.

7- Creativity

There's no question that effective critical thinkers are also largely creative thinkers. Creativity has unquestionably defined itself as a requisite skill for having in the collaborative modern workforce. Critical thinking in business, marketing, and professional alliances relies heavily on one's ability to be creative. When businesses get creative with products and how they are advertised, they thrive in the global marketplace.

Teaching our learners to be effective critical thinkers doesn't require countless hours of lesson planning. You don't need special courses of study or guest speakers to do it for you. All you need are what both you and your learners already have in abundance—curious and open minds, committed hearts, diverse interests and abilities, and a desire to be better than you were yesterday. Think about which of the above qualities your students demonstrate in abundance, and the myriad of different ways you can help them develop others. Working together, you can all achieve more than you imagine.

But what do we mean when we say that someone thinking critically? To answer this question and to give a simple idea, the following is a list of the most important features and characteristics that distinguish the critical thinker, the most important of which are:⁵⁷

1. Have a passion for clarity, precision, accuracy, relevance, consistency, logicalness, completeness, and fairness.
2. Are sensitive to ways in which critical thinking can be skewed by egocentrism, wishful thinking, biases, and ignorance.
3. Are intellectually honest with themselves, acknowledging their limitations and lack of knowledge.
4. Listen open-mindedly to opposing points of view, welcoming criticisms of beliefs and assumptions.
5. Base their views on facts and evidence rather than on self-interest.
6. Are aware of biases and preconceptions that shape the way they perceive the world.

⁵⁷- David Brock, Eleven Characteristics of Critical Thinkers, June 18th, 2008, <http://partnersinexcellenceblog.com/eleven-characteristics-of-critical-thinkers/>

7. Think independently and are not afraid to disagree with the group opinion.
8. Are able to get to the heart of an issue or problem without being distracted by details.
9. Have the courage to consider ideas that may challenge their own position or beliefs.
10. Love truth and are curious about a wide range of issues.
11. Have the intellectual honesty to pursue insights or truths, despite obstacles or difficulties.

2-9: Characteristics of Critical and Uncritical Thinkers⁵⁸

Critical Thinkers	Uncritical Thinkers
Are honest with themselves, acknowledging what they don't know, recognizing their limitations, and being watchful of their own errors.	Pretend they know more than they do, ignore their limitations, and assume their views are error-free.
Regard problems and controversial issues as exciting challenges.	Regard problems and controversial issues as nuisances or threats to their ego.
Strive for understanding, keep curiosity alive, remain patient with complexity, and are ready to invest time to overcome confusion.	Are impatient with complexity and thus would rather remain confused than make the effort to understand.
Base judgments on evidence rather than personal preferences, deferring judgment whenever evidence is insufficient. They revise judgments when new evidence reveals error.	Base judgments on first impressions and gut reactions. They are unconcerned about the amount or quality of evidence and cling to their views steadfastly.

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<https://sca.district70.org/ourpages/auto/2013/4/3/34698791/Critical%20Thinking%20Characteristics.pdf>

Critical Thinkers	Uncritical Thinkers
Are interested in other people's ideas and so are willing to read and listen attentively, even when they tend to disagree with the other person.	Are preoccupied with themselves and their own opinions, and so are unwilling to pay attention to others' views. At the first sign of disagreement, they tend to think, "How can I refute this?"
Recognize that extreme views (whether conservative or liberal) are seldom correct, so they avoid them, practice fair-mindedness, and seek a balance view	Ignore the need for balance and give preference to views that support their established views.
Practice restraint, controlling their feelings rather than being controlled by them, and thinking before acting.	Tend to follow their feelings and act impulsively.

2-10: Three Parts of Critical Thinking⁵⁹

Full-fledged critical thinking involves three parts:

1-Critical thinking involves asking questions.

It involves asking questions that need to be asked, asking good questions, questions that go to the heart of the matter. Critical thinking involves noticing that there are questions that need to be addressed.

2-Critical thinking involves trying to answer those questions by reasoning them out.

Reasoning out answers to questions is different from other ways of answering questions. It is different from giving an answer we have always taken for granted but never thought about. It is different from answering impressionistically ("That reminds me of . . ."), or answering simply according to the way we were raised, or answering in accordance with our personality. It is also different from answering by saying the first

⁵⁹- Gerald M. Nosich, Learning to Think Things Through: A Guide to Critical Thinking Across the Curriculum, pp.5-6

thing that comes into our mind, and then using all our power of reasoning to defend that answer.

3- Critical thinking involves believing the results of our reasoning.

Critical thinking is different from just engaging in a mental exercise. When we think through an issue critically, we internalize the results. We don't give merely verbal agreement: we actually believe the results because we have done our best to reason the issue out and we know that reasoning things out is the best way to get reliable answers. Furthermore, when we think critically through a decision about what to do in a situation, then what follows the reasoning is not just belief, but action: Unless something unforeseen occurs, we end up taking the action we concluded was most reasonable.

2-11: Obstacles to Critical Thinking⁶⁰

The way we think is an adaptation to the surroundings we have lived in. The patterns in our thinking are ways we have developed to make sense of what goes on around us. These patterns can be effective, but they can also be dysfunctional. Most likely, for each of us, the patterns are variable: effective in some areas, wildly ineffective in others, and mixed most of the time.

Many aspects of the world we live in can be Obstacles to learning to think more critically:

1- Forming a Picture of the World on the Basis of the News

Most of us form a picture of what the world is like based on the news: TV news, newspapers, news magazines. Even if you don't watch the news or read newspapers much, you indirectly form a good deal of your picture of the world from the news. You get a picture of what the world is like by talking to friends, or listening to talk shows or watching MTV, or just through hearsay. But your friends and the people on MTV form their picture of the world from the news—and so indirectly you and I do too.

Here is a question I ask students in Louisiana. (You may not know much about Louisiana, but answer the question anyhow):

⁶⁰- Gerald M. Nosich, Learning to Think Things Through: A Guide to Critical Thinking Across the Curriculum, pp. 18-28

Consider people who are convicted of murder in Louisiana and sentenced to life imprisonment. How much time do such people, on the average, actually spend in prison? (Remember: the question is not how many years they are sentenced to; it is how many years they end up actually spending in prison.)

- a. 0–5 years
- b. 5–10 years
- c. 10–20 years
- d. 20–50 years
- e. until they die.

Choose an answer before you read on.

I have asked thousands of students this question over the last few years or so; almost no one ever gets it right. Even with myself, it was hard to become convinced of the right answer. The first few times I heard it, I simply didn't believe it. (The answer is in the footnotes.)

Now, this is a purely factual question, not a critical thinking one. But there is a critical-thinking question behind the mistaken answers. Where do we get our false impression? We get it, directly or indirectly, from the news media. But how? We do not get the wrong answer because the news tells us the wrong answer. News media are very careful to check the accuracy of factual statements they report.

Rather, the news media tell us stories. They report on someone getting released from prison early. Maybe over the course of time they report several such stories, including some where a criminal then commits a violent crime while on parole. Maybe we hear politicians or relatives of a victim talking about how life means only twenty years, and we believe them. (These people get their impression from the news.) These stories are vivid. They are simplified and made dramatic. Often there is stirring footage. They register in our minds. Whether we are aware of it or not, we form a general picture that violent criminals (including murderers sentenced to life in Louisiana) are getting out of prison early all the time.

Any picture like that one, formed on the basis of news presentations, is likely to be seriously distorted. This is because the news media report not on what is usual or typical, but on what is unusual. That's why it is called news: it reports on what is out of the ordinary.

That's also why it works so well as entertainment. In contrast, what is usual is for people to wake up in the morning, eat breakfast, go to work, eat lunch, come home at the end of the day, watch TV for a while, go to bed. That is not a news event. Rather, what the news reports on is Iraq (hardly a typical country), a fire in an apartment complex (not a common event), an ax murder in Montana (maybe the only one to occur there in fifty years), a highly controversial bill in Congress (not the hundreds of bills that are passed regularly).

If you want an accurate picture of what the world is usually like, you need to look to reputable books, studies, or websites that deal with the subject in depth. Textbooks are usually an excellent source. And, of course, you have to do some intensive critical thinking about the topic as well.

This doesn't imply that it's wrong to consult the news media regularly. On the contrary, the news—especially if it has more in-depth coverage—is an excellent way to keep up with the unusual, even earthshaking, events of our time.

2- Forming a Picture of the World on the Basis of Movies, TV, Advertising, Magazines

If forming a picture of the world on the basis of the news results in distortion, forming a picture on the basis of fictionalized or sensationalized material results in vastly more distortion. Sometimes the distortion is obvious, at least to reflective adults: People do not get thrown through plate-glass windows and emerge intact; there is no reason to believe there are aliens among us; the clothes in the glossy picture will not make most of us look like the model in the picture; products often have unmentioned defects. Other examples are more subtle and affect our attitudes in deep and disturbing ways: Trying your hardest, though it may give you personal satisfaction, will not usually result in beating the competition (especially because they may be trying their hardest too); most people's grades (or height or intelligence or abilities) cannot be above average; everyone cannot be glamorous, young, physically attractive, or strong; being a lone wolf rebel who can't get along with superiors does not usually bring success.

3- All-or-Nothing Thinking (Black-and-White Thinking), Us-Versus-Them Thinking, Stereotyping.

Each of these ways of thinking is deeply ingrained in us. Some biologists even think we have a built-in genetic bias in favor of thinking in these ways. Nevertheless, each stand in the way of critical thinking, and for similar reasons. Thinking in terms of concepts like these is a way of simplifying our world. In fact, each of them vastly oversimplifies the complexity of reality, and each serve as an excuse for not thinking things through.

Effective thinking requires us to pay attention to the complexity of things. It requires us to develop a tolerance for ambiguity and an acceptance of less-than-certain answers. It requires a commitment to seeing both sides of an issue and to trying to find out the truth, rather than merely trying to bolster our side: our country, our race, our gender, our political views.

4- Fears

Although, as we have seen, all fears are not automatically an Obstacle to critical thinking, some fears do tend to become obstacles. That's especially true of

- fear of making mistakes
- fear of trying something new, of sticking your neck out
- fear of looking foolish

The full exercise of critical thinking requires that you develop intellectual courage. For example, making mistakes is an essential part of critical thinking. What important skill have you ever learned that did not involve making many mistakes? Most critical-thinking experts believe you learn a great deal more from mistakes than from successes. In fact, though you may make fewer critical-thinking mistakes as your higher-order thinking skills develop, there will always be mistakes to be made and learned from.

The same will be true when you try new ways of thinking, when you risk looking foolish by exposing how you think about issues, and when you take the risk of giving original solutions to old problems.

5- Deeper, More Pervasive Obstacles to Critical Thinking

In addition to the specific Obstacles listed previously, there are other, deeper and more pervasive obstacles to critical thinking. they are difficult Obstacles to come to terms with. Maybe it is fair to say that none of us ever completely overcomes them. We can, however, gain deeper insights into how they work, and that can help us overcome their influence.

6- Egocentrism

Each of us is at the center of our own experience. We live in the middle of our feelings, pains and pleasures, the things we want and the things we are afraid of, the experiences that have shaped our lives and our attitudes, whether we know it or not. Our experience is heavily influenced by how we think, and, conversely, how we think is influenced by our experience.

In accord with this, people often have a way of thinking that always puts themselves first. When they are engaged in such egocentric thinking, they tend to make judgments about how things are, but they may base those judgments on wishful thinking or mere self-interest. This occurs in all of us, probably a good deal of the time. Sometimes it's so blatant that, when it is pointed out to us, we easily see it. Most of the time, though, it operates far beneath the surface. It is easy to delude myself into believing that I am working in the best interests of humanity as a whole when in fact I am working for my own interests and even against the interests of humanity. This is always easier to see in other people than it is in myself.

Egocentrism interferes with critical thinking on all levels, from the deepest to the most superficial. It stands in the way of the empathy that is such an important part of critical thinking. If I am in the health-care professions, for example, it's easy to stay bound up in my own desires and needs and not see things from the patient's point of view.

Egocentrism stands in the way of fair-mindedness too, another essential component of critical thinking. Part of thinking effectively is being able to understand points of view that are opposed to my own. Sometimes when I feel threatened, though, I can't even hear what the other person is saying. For many people, when someone critiques their country or culture or religion or family, all they hear is the fact that they are being criticized. Anger rises, and often they can't even repeat the substance of the comments the person made. This interferes with their ability to give a fair evaluation of their country, culture, and so on. If I

can't hear a critique, then I can't come to a balanced conclusion, and that deprives me of information I can use to assess the validity of my beliefs.

Egocentrism makes it difficult for me to tell accurate from inaccurate statements. It leads me to misunderstand other people's motives as well as my own. It influences me to put incorrect interpretations on what people say. In course work, egocentrism can lead to my seeing education only in terms of grades, in effect causing me to miss out on all the other benefits to be derived from education. It can lead to plagiarism and cheating, or thinking that teachers are unfair even if they're not. One of the most valuable things to be gained from critical thinking is an ability to see the egocentricity of our own thinking.

7- Previous Commitments, Previous Personal Experience

Suppose someone makes a point about a controversial issue, about politics maybe, or capital punishment, or the benefits of a trade agreement. The most usual way to evaluate the person's statement is first to see how much it agrees with my views, and then give reasons for or against it based on the amount of agreement.

This might be reasonable if my views were the product of extensive critical examination on my part. But often my views are ones I just happen to hold; they only seem to be the result of previous examination. There may be no reason to think that my previously held beliefs are more likely to be correct than the newer points I am evaluating for the first time.

We can also think in a biased way with respect to evidence. On the one hand, if I lean toward a certain belief, then just a small amount of evidence weighs heavily in its favor for me. If I believe in aliens visiting earth, or herbal remedies for cancer, or homeopathic cures, or predestination, then even the negative fact that such views have not been absolutely disproven counts heavily in their favor in my eyes.

On the other hand, if I oppose a belief, then a vague piece of evidence, or just the fact that it has not been absolutely proven, weighs heavily against it:

“I don't believe in global warming. Nobody has *proved* the earth is getting warmer. Last winter it was very cold.”

“Smoking does not cause lung cancer: correlation is not the same thing as causation.”

“You can’t prove that I won’t win the lottery. There’s always a chance. You can’t win if you don’t play.”

That is, we slant the amount of evidence to fit in with our predispositions. We require a *mountain* of evidence to make us doubt something we already believe, but we require only the *slightest* of evidence to make us more sure of it. Even our own ingenuity can work against us. No matter how bizarre or farfetched a point of view is, if we become convinced that it is true, our ingenious minds can almost always construct at least *some* evidence in its favor.

How *should* we make judgments? If we are interested in accuracy, in knowing the truth or what is likely to come closest to the truth, we should go with the *preponderance of evidence*, regardless of whether we started out for or against a particular conclusion. That is often extremely difficult to do because decisions can be made below the level of our awareness and because our beliefs are so often bound up with our egos and developmental ways of thinking. We can increase our awareness and open-mindedness by using critical thinking.

This is also true when we are basing judgments on *personal experience*. Personal experience gives us a valuable supply of information, one that we can use to draw conclusions, make decisions. One of the main ways teachers get students to think critically about a discipline is by asking them to relate the discipline’s concepts to their personal experiences. No one would deny the value of personal experience in critical thinking.

However, personal experience can also be an Obstacle to critical thinking. That’s particularly true of vivid personal experiences, the kind that are unusual and imprint themselves on our minds. For each of us, our personal experience is limited. If we make generalizations from it that go beyond what we are acquainted with, we stand a good chance of drawing distorted conclusions. Your own experience has far more impact on you than the experiences of a hundred other people you hear about. But, if you want to draw accurate conclusions about what is likely to happen, then (other things being equal) you should put more faith in the experiences of a hundred people than in the experience of one—even if that one happens to be you.

What do you need to do to broaden your knowledge base so as to take account of a wide variety of experiences and conclusions beyond your own? Look at reputable books, studies, journal articles, sources that gather and assemble information from a great variety of human experience. If you own a Toyota that repeatedly gives you trouble, that is an excellent reason not to trust that car in the future. But if you want to make a wise decision about whether the next car you buy should be a Toyota, your personal experience is too limited. It would be wiser to consult *Consumer Reports* or some other neutral agency that evaluates cars. The best-selling and highly influential book *Men Are from Mars, Women Are from Venus* draws conclusions about what men and women are really like—but the conclusions are based on the behavior of only a handful of American men and women who decided to go into therapy and consulted the author. That sample is so tiny and unrepresentative that when it is projected on to men and women in general, it's liable either to be inaccurate or to be seen as accurate only because it's a set of stereotypes. What should the author have done if he wanted to think critically about profound differences between men and women? At the very least, he needed to consult well-substantiated studies of men and women from a great variety of cultures, and he needed to research the behavior of people who have never consulted a therapist.

2-12: How Deep Is Our Need for Critical Thinking?⁶¹

One of the great things about critical thinking is its versatility. It is valuable at all levels of our thinking.

1- At the Level of Practical Decision Making

Critical thinking helps when we are simply trying to deal with ordinary tasks: how to study more efficiently, find a strategy when we are stuck in an airport, decide what kind of clothes to buy. This is thinking about the means to use to accomplish our goals. It is problem solving of the most authentic kind. This is an important level of critical thinking, one that addresses all those ordinary decisions we make.

Developing thinking skills helps you envision alternative paths you could take. It helps you identify and discard outdated assumptions you

⁶¹ - Ibid, pp. 28- 31

may be making. It helps you anticipate some of the consequences, both positive and negative, of decisions you or others may make. It helps you keep your goals in sight and think of more effective means of achieving those goals.

2- At the Level of Meaningfulness

Learning to think critically also helps people deal with the much larger issues of living their life. Critical thinking frees people, the way nothing else really can, from habits of thinking they are often ruled by. Not completely of course, but substantially. Critical thinking opens up other viable courses of action that leave people far more fulfilled, paths that otherwise might never occur to them. Finding a life partner or a new occupation; incorporating the profound knowledge that's available in your courses into your way of thinking about your life; developing reasonable attitudes toward self, toward others, toward your values, toward all the things that make life meaningful for you—all of these can be made richer and more attainable when you examine them thoughtfully.

3- At the Level of Concepts

We think in terms of concepts, and these inevitably shape our life to a considerable degree. Very often the concepts we think in terms of are ones we accept uncritically. We may understand what love is from movies and from the way we feel. We may understand what freedom is simply by having heard the word over and over and making vague associations with it. We may grow up thinking justice means getting even. We all have concepts of what it is to be a student, a teacher, a woman, a man, a religious person, an atheist, a scientist, an artist, a professional in the field we are studying. We have concepts of what it means to be brave, to be treated fairly, to be intelligent, to be cool, to be anything you can name or describe. We can reach a deep level of critical thinking by examining our concepts critically, becoming more aware of the way individual concepts help us or hurt us, limit us or free us.

Even aspects of ourselves that are distinct from thinking are heavily influenced by our concepts. Desires, for instance: If you like something, or hate it—a person, a movie, a subject in school, a kind of car—the liking or the hating is not itself an instance of thinking. Rather, the liking or hating is influenced by the concepts you use in your thinking. It is only recently that anyone thought suntans were beautiful, that beaches were a desirable place to spend a vacation, that thinness in men and women was

attractive, that wilderness held value, that toleration was a virtue, that democracy was workable, that it was unhealthy to be a caretaker in a relationship. Our standard concepts for each of these key terms has changed, becoming strikingly more positive or negative. The concepts may well change again. It can be liberating to step out of the fads that come and go with respect to what is desirable. Re-examining the concepts you have of the things you desire will help you rise above the fads.

Similarly, your concepts have an immense influence on what you are afraid of and what brings you joy. If you are afraid of the dark, afraid of math, or even afraid of dying—these are not universal fears. There are many people, not very different from you, who don't share these fears. Some people feel safe in the dark, delight in math (even if they are not very good at it) and find peace and acceptance in contemplating death. We fear things in part because of the concepts we have of those things, because of how we classify them and think about them.

The influence of our thinking extends even to bodily sensations: “Even though nerve signals work the same way, something as obviously biological as pain in childbirth is experienced differently depending on cultural expectations [that is, on concepts in our culture]. Women develop expectations not just about how they should respond but about how they should experience their own sensations and emotions.”

Emotions are not really under our direct control, though how we act on those emotions often is. Many of the ways people try to gain direct control over their emotions actually hurt. If you are afraid of speaking in public, for example, but feel you shouldn't be afraid of it, you can try to suppress the fear. Maybe you can even force yourself to speak in public or pretend to yourself that you are not afraid of it. You can reason as follows: “It doesn't make sense to feel fearful of speaking in public. There's really nothing to be afraid of. Therefore, I am not afraid of speaking in public.” This is called denial. Denial is when you keep yourself from seeing something you know is true. The classic case is alcoholics who refuse to see that they are alcoholics. Many people confuse denial of this sort with being rational. Neither suppression nor denial is very healthy. Neither is very effective either, at least not in the long run. Both have high psychological costs.

Though our emotions are not under our direct control, we can indirectly affect them by addressing our concepts. You can work on your

concept of public speaking and try to understand why you see it as fearsome. You can admit and honor the fear that arises. You can investigate what its roots are, what associations you have with it that generate the fear, and build new associations. You can rethink the concept over time, and usually this will be effective in changing your reaction to it.

2-13: Relationship of Critical Thinking to the Scientific Method⁶²

Because of the identification of critical thinking as scientific thinking, it is reasonable to conclude that math and science courses are a good place to learn critical thinking by learning the scientific method; unfortunately, this is not always true. Good scientists who conduct science must practice critical thinking, and good science teachers usually teach it, but few ordinary individuals learn the scientific method, even those who successfully take a number of science classes in high school and college. This is because, as discussed above, science in the United States is often poorly taught as a fact-based discipline rather than as a way of knowing or method of discovery. As incredible as it may seem, studies reveal that 3% of the U.S. population is scientifically literate, down from 5% about twenty years ago. Thus, it does not appear that science alone will teach critical thinking to the masses. In fact, critical thinking programs are almost always designed by social scientists and directed toward improving thinking in the humanities and social studies, but the same can be accomplished with math and science courses. Properly taught university courses should teach a student critical thinking in addition to the disciplinary content of the course.

It is useful to ask why the scientific method--now recognized, in its guise of critical thinking, as so important to modern education that hundreds of critical thinking programs exist in thousands of schools across the nation--is so valuable for an individual to learn and practice. The reason is because the scientific method is the most powerful method ever invented by humans to obtain relevant and reliable knowledge about nature. Indeed, it is the only method humans have of discovering reliable knowledge (knowledge that has a high probability of being true). Another name for this type of knowledge is justified true belief (belief that is probably true because it has been obtained and justified by a reliable

⁶²- Steven D. Schafersman, An Introduction to Critical Thinking, p. 5
<http://facultycenter.ischool.syr.edu/wp-content/uploads/2012/02/Critical-Thinking.pdf>

method). Nobel Prize-winner Sir Peter Medawar claimed that, "In terms of fulfillment of declared intentions, science is incomparably the most successful enterprise human beings have ever engaged upon." Other methods of gaining knowledge--such as those using revelation, authority, artistic and moral insight, philosophical speculation, hopeful and wishful thinking, and other subjective and authoritarian means--have historically resulted in irrelevant and unreliable knowledge, and they are no better today. These nonscientific methods of discovering knowledge, however, are more popular than scientific methods despite their repeated failures in obtaining reliable knowledge. There are many reasons for this, but two of the most important are that nonscientific methods are (1) more congenial to emotional and hopeful human nature, and (2) are easier to learn and practice than scientific methods. Despite these reasons, however, the value and power of possessing reliable knowledge--as contrasted with the usual unreliable, misleading, irrelevant, inaccurate, wishful, hopeful, intuitive, and speculative knowledge most humans contend with--have caused modern government, business, and education leaders to place the scientific endeavor in high regard, and caused them to promote teaching the scientific method and its popular manifestation: critical thinking.

2-14: Critical and Creative Thinking⁶³

In understanding critical thinking, it is important to recognize the interrelationship of critical and creative thought. These two modes of thinking, though often misunderstood, are inseparable in everyday reasoning. Creativity masters a process of making or producing, criticality a process of assessing or judging. The mind when thinking well must simultaneously both produce and assess, both generate, and judge, the products it constructs. Sound thinking requires both imagination and intellectual discipline.

Intellectual discipline and rigor are not only quite at home with originality and productivity, but these so-called poles of thinking (i.e. critical and creative thought) are in fact inseparable aspects of excellence in thought. Whether we are dealing with the most mundane acts of the mind or those of the most imaginative artist or thinker, the creative and

⁶³- Richard Paul & Linda Elder., A Guide for Educators to Critical Thinking: Competency Standards, the Foundation for Critical Thinking, 2007, p.11 www.criticalthinking.org

the critical are interwoven. It is the nature of the mind to create thoughts, though the quality of that creation varies enormously from person to person, as well as from thought to thought. Achievement of quality requires standards of quality—and hence, a full measure of criticality.

The logic of learning an academic discipline—from the point of view of critical and creative thought—is illuminating. Each academic discipline is a domain of thinking in which humans deploy specialized concepts (and thus make inferences that follow from, or are suggested by, those concepts). To learn the key concepts in a discipline, we must construct them in our minds by a series of mental acts. We must construct them as an ordered system of relationships. We must construct both foundations and the concepts derivative of those foundations. Each moment of that creation requires discernment and judgment. There is no way to implant, transfer, or inject the system in the mind of another person in pre-fabricated form. It cannot be put on a mental compact disk and downloaded into the mind without an intellectual struggle. Critical judgment is essential to all acts of construction; and all acts of construction are open to critical assessment. We create and assess; we assess what we create; we assess as we create. In other words, at one and the same time, we think critically and creatively.

Chapter Three

Argument: Its Construction and Analysis

3-1: What is argument?

In ordinary usage, an argument is often taken to be a somewhat heated dispute between people. But in logic and critical thinking, an **argument** is a list of statements, one of which is the **conclusion**, and the others are the **premises** or **assumptions** of the argument.

An example:

It is raining.

So you should bring an umbrella.

In this argument, the first statement is the premise and the second one the conclusion. The premises of an argument are offered as *reasons for* accepting the conclusion. It is therefore irrational to accept an argument as a good one and yet refuse to accept the conclusion. Giving reasons is a central part of critical thinking. It is not the same as simply expressing an opinion. If you say "that dress looks nice," you are only expressing an opinion. But if you say "that dress looks nice *because* the design is very elegant," then it would be an argument indeed. Dogmatic people tend to make assertions without giving arguments. When they cannot defend themselves, they often resort to responses such as "this is a matter of opinion," "this is just what you think," or "I have the right to believe whatever I want"⁶⁴.

More technically, an argument consists of one or more statements that are used to provide support for a **conclusion**. The statements that provide the support for a conclusion are called the **reasons** or **premises** of the argument. The reasons or premises are presented in order to persuade the reader or listener that the conclusion is true or probably true. Let's consider an example. Suppose that I want to convince you to stay in college until graduation. Here are some reasons (premises) that I could give. You can think of this as an addition problem with each premise summing to the conclusion.

⁶⁴- Lau, Joe Y. F., An introduction to critical thinking and creativity: think more, think better, John Wiley & Sons, Inc., Hoboken, New Jersey, 2011, pp. 69- 70

- Premise #1:** College graduates earn more money than college dropouts or people who have never attended college.
- +Premise #2:** College graduates report that they are more satisfied with their lives than people who have not graduated from college.
- +Premise #3:** College graduates are healthier and live longer than people who have not graduated from college.
- +Premise #4:** College graduates have jobs that are more interesting and more responsible than people who have not graduated from college.

Conclusion: You should graduate from college.

Arguments are sometimes called “the giving of reasons”. Harman (1986) calls this process “a change in view” because the objective is to change an “old view” or belief into a “new view” or belief with reasoning⁶⁵.

Every argument will have one or more premises (or reasons) and one or more conclusions. Usually, there will be several premises for one conclusion, but other combinations (one premise for several conclusions and several premises for several conclusions) are possible. **If you cannot identify at least one premise *and* at least one conclusion, then it is not an argument.** Of course, in everyday, natural-language arguments, the premises and conclusions are not labeled. They are usually embedded in extended prose. The extended prose could be a paragraph, a section or chapter of a book, or even an entire book or semester-long class⁶⁶.

Here are some examples of prose that are *not* arguments:⁶⁷

- I like my critical thinking course better than my chemistry course.
(No reasons are given for this preference.)
- We drove up to the mountains, went skiing, and then drove home.
(This is just a descriptive list of activities linked together. There are no reasons or conclusions.)

⁶⁵- Halpern, D.F., Thought and knowledge: an introduction to critical thinking, Fifth edition, Psychology Press, New York, 2014, p. 233

⁶⁶- Ibid, p. 233

⁶⁷- Ibid, p. 234

- Buy your burgers at Burgerland. (No reasons given, but reasons are often inferred from context in statements like this one.)
- We saw the Martians land. (This is a simple description.)
- Never trust anyone over 30. (This is an opinion without reasons.)
- Is dinner ready? (Simple question.)

It may seem that it should be fairly simple to determine whether a statement or set of statements contain an argument, but in everyday language most arguments are incomplete. Sometimes the premises aren't stated, but are inferred, and other times the conclusion is unstated. Sometimes arguments are deliberately disguised so that it may appear that the speakers are not supporting some conclusion, when they really are⁶⁸.

The ability to construct, identify, and evaluate arguments is a crucial part of critical thinking. Giving good arguments helps us convince other people, and improve our presentation and debating skills. More important, using arguments to support our beliefs with reasons is likely to help us discover the truth and eliminate errors and biases⁶⁹.

3-2: Construction of Argument

Here is an example of a short argument made up of three statements. We use a straight line to separate the premises at the top from the conclusion at the bottom. Call this the **standard format** for presenting an argument:

Singapore is an island.

All islands are surrounded by water.

Singapore is surrounded by water.

You can also number the premises and the conclusion to make it easier to refer to them in a discussion:

⁶⁸- Ibid, p. 234

⁶⁹- Lau, Joe Y. F., An introduction to critical thinking and creativity : think more, think better, p. 70

1. Amie is taller than Beth.
 2. Beth is taller than Cindy.
 3. Cindy is taller than Denise.
 4. Denise is taller than Emily.
-
5. Amie is taller than Emily⁷⁰.

3-2-1: Identifying Premises⁷¹

The premises are the reasons that support a conclusion. They are the “why” part of an argument. In everyday language, they can appear anywhere among a set of statements. Sometimes, the conclusion will be stated first followed by its premises. (Here is what I believe and the reasons for this belief are) Other times the conclusion may be presented last or embedded in the middle of a paragraph or other text with premises both before and after it. Premises are not always easy to recognize. There are certain key words, called **premise indicators** or **premise markers** that often signal that what comes after them is a premise. Although premise indicators are not *always* followed by a premise, they often are, and for this reason, it is a good idea to check for these key words when identifying premises. These terms often indicate that what follows is a reason.

Premise Indicators

- because
- for
- since (when it means because and not the passage of time)
- if
- given that (or being that)
- as shown by
- as indicated by
- the reasons are
- it may be inferred (or deduced) from
- the evidence consists of

⁷⁰- Ibid, p. 70

⁷¹- Halpern, D.F., Thought and knowledge: an introduction to critical thinking, p. 234-235

- in the first place (suggests that a list of premises will follow)
- secondly
- seeing that
- assuming that
- it follows from
- whereas

Here are some simple examples of the use of premise indicators:

- You should graduate from college **because** you will earn more money with a college degree.
- The need for the United States to send troops to Central America **is indicated by** the buildup of armed rebels in countries neighboring those with civil wars.
- **Seeing that** the current policy of supplying organ transplants is benefiting the rich, a new program is needed.

Premises can be “matters of fact” or “matters of opinion” or both. Consider, for example, the following sentences:

- All teenagers should be taught safe sex practices because of the risk of AIDS and other sexually transmitted diseases. (The reason is a matter of fact.)
- All teenagers should be taught how to knit because this will provide them with an enjoyable hobby. (The reason is a matter of opinion).

3-2-2: Identifying Conclusions⁷²

The conclusion is the purpose or the “what” of the argument. It is the belief or point of view that is supported or defended with the premises. Both the premises and the conclusion are important, and both are essential components of any argument.

It is usually easier to identify the conclusion of an argument than the other components. For this reason, it is a good idea to start with the conclusion when you are analyzing arguments. There are **conclusion indicators** or **conclusion markers** that indicate that what follows is

⁷²- Ibid, pp 235-236

probably a conclusion. As with premise indicators, they do not guarantee that a conclusion follows them.

Conclusion Indicators

- therefore
- hence
- so
- thus
- consequently
- then
- shows that (we can see that)
- accordingly
- it follows that
- we may infer (conclude) (deduce) that
- in summary
- as a result
- for all these reasons
- it is clear that

Here are some simple examples of the use of conclusion indicators:

- Based on all of the reasons just stated, we **can conclude that** the flow of illegal drugs must be stopped.
- **In summary**, postal rates must be increased because we can no longer afford to run the postal system with a deficit.
- We have had very little rain this season. **Consequently**, water will have to be rationed.

3-3: Validity and Soundness⁷³

Validity is a most important concept in critical thinking. A valid argument is one where the conclusion follows logically from the premises. But what does it mean? Here is the official definition:

An argument is valid if and only if there is no logically possible situation in which the premises are true, and the conclusion is false.

To put it differently, whenever we have a valid argument, *if the* premises are all true, then the conclusion *must* also be true. What this

⁷³- Lau, Joe Y. F., An introduction to critical thinking and creativity: think more, think better, pp 75- 76, 84

implies is that if you use only valid arguments in your reasoning, as long as you start with true premises, you will never end up with a false conclusion. Here is an example of a valid argument:

Marilyn is 20 years old.

Marilyn is more than 10 years old.

This simple argument is obviously valid since it is impossible for the conclusion to be false when the premise is true. However, notice that the validity of the argument can be determined without knowing whether the premise and the conclusion are *actually* true or not. Validity is about the *logical connection* between the premises and the conclusion. We might not know how old Marilyn actually is, but it is clear the conclusion follows logically from the premise. The simple argument above will remain valid even if Marilyn is just a baby, in which case the premise and the conclusion are both false. Consider this argument also:

Every bird can fly.

Every bat is a bird.

Every bat can fly.

Again the argument is valid—if the premises are true, the conclusion must be true. But in fact both premises are false. Some birds cannot fly (the ostrich), and bats are mammals and not birds. What is interesting about this argument is that the conclusion turns out to be true. So, a valid argument can have false premises but a true conclusion. There are of course also valid arguments with false premises and false conclusions. What is not possible is to have a valid argument with true premises and a false conclusion.

Soundness: An argument is sound if: (a) It is valid, and (b) It has true premises.

Given a valid argument, all we know is that if the premises are true, so is the conclusion. But validity does not tell us whether the premises or the conclusion are actually true. If an argument is valid, *and all* the premises are true, then it is called a **sound** argument. Of course, it follows from such a definition that the conclusion of a sound argument must be true. An argument that is not sound is **unsound**. In a discussion, we should try

out best to provide sound arguments to support an opinion. The conclusion of the argument will be true, and anyone who disagrees would have to show that at least one premise is false, or the argument is invalid, or both. This is not to say that we can define a good argument as a sound argument.

Let's look at an example:

All men are mortal.

Socrates is a man.

Therefore, Socrates is mortal.

This is an argument. This argument about Socrates is valid, because the conclusion **MUST** be true if the premises are true. But it is also sound, because it is valid and the premises are true.

Arguments can even be sometimes completely absurd. Here's one:

All chickens are mammals.

All mammals are green.

All chickens are green.

This is an argument. It is valid, because **IF** the premises **WERE** true, then the conclusion would also **HAVE** to be true. But, as it turns out, the argument is unsound. Though it meets criterion (a) for soundness—namely, it is valid—it does **NOT** meet criterion (b). It does not have true premises. Premise 2, “All mammals are green” is absurd and clearly false.

3-4: Inductive and Deductive Arguments

An inductive argument is an argument in which it is thought that the premises provide reasons supporting the probable truth of the conclusion. In an inductive argument, the premises are intended only to be so strong that, if they are true, then it is unlikely that the conclusion is false.

A deductive argument is an argument in which it is thought that the premises provide a guarantee of the truth of the conclusion. In a deductive argument, the premises are intended to provide support for the

conclusion that is so strong that, if the premises are true, it would be impossible for the conclusion to be false⁷⁴.

- ▶ Deductive arguments are arguments in which the conclusion is presented as following from the premises with necessity.
- ▶ Inductive arguments are arguments in which the conclusion is presented as following from the premises with a high degree of probability.

The difference between the two comes from the sort of relation the author or expositor of the argument takes there to be between the premises and the conclusion. If the author of the argument believes that the truth of the premises definitely establishes the truth of the conclusion due to definition, logical entailment or mathematical necessity, then the argument is deductive. If the author of the argument does not think that the truth of the premises definitely establishes the truth of the conclusion, but nonetheless believes that their truth provides good reason to believe the conclusion true, then the argument is inductive⁷⁵.

3-4-1: Inductive argument

Some dictionaries define "deduction" as reasoning from the general to specific and "induction" as reasoning from the specific to the general. While this usage is still sometimes found even in philosophical and mathematical contexts, for the most part, it is outdated. For example, according to the more modern definitions given above, the following argument, even though it reasons from the specific to general, is deductive, because the truth of the premises guarantees the truth of the conclusion:

The members of the Williams family are Susan, Nathan and Alexander.

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https://www.lanecce.edu/sites/default/files/trio/deductive_and_inductive_arguments.pdf

⁷⁵ - Ibid

Susan wears glasses.

Nathan wears glasses.

Alexander wears glasses.

Therefore, all members of the Williams family wear glasses.

Moreover, the following argument, even though it reasons from the general to specific, is inductive:

It has snowed in Massachusetts every December in recorded history.

Therefore, it will snow in Massachusetts this coming December⁷⁶.

The important point about inductive arguments is this: it's possible that, even though an argument is a good one, starting from true premises and reasoning in the right way, it can give you a false conclusion⁷⁷.

For example, consider these two arguments:

1- 93% of Chinese have lactose intolerance.

Lee is Chinese.

Lee has lactose intolerance.

2- It has never snowed in Jakarta in the last 50 years.

It is not going to snow in Jakarta this year.

Notice first that this fits the modern definition for a good inductive argument. If you believed those premises, you'd have some reason to believe the conclusion. These arguments are of course not valid. Lee might be among the 7% of Chinese who can digest lactose. Snow might fall in Jakarta this winter due to unusual changes in global weather. But despite the fact that the arguments are invalid, their conclusions are more likely to be true than false given the information in the premises. If the

⁷⁶ - Ibid

⁷⁷ - Robert M. Martin, Scientific Thinking, Broadview press, Canada, 1985, p.31

premises are indeed true, it would be rational for us to be highly confident of the conclusion, even if we are not completely certain of their truth. In other words, it is possible for the premises of an invalid argument to provide strong support for its conclusion. Such arguments are known as **inductively strong** arguments. We might define an inductively strong argument as one that satisfies two conditions:

1. It is an invalid argument.
2. The conclusion is highly likely to be true *given that* the premises are true.

Let us elaborate on this definition a bit more:

- Recall that a valid argument can have false premises. The same applies to an inductively strong argument. The two arguments given earlier remain inductively strong, even if Lee is not Chinese, or it turns out that it snowed in Jakarta last year.
- When we say the conclusion is highly likely to be true *given that* the premises are true, it does not mean "it is highly likely for the conclusion *and* the premises to be true." Consider this argument:

Someone somewhere is eating bread right now.

Someone somewhere is eating rice right now.

It is surely plausible that at this very moment, there are people eating bread and there are people eating rice somewhere in the world. This makes it highly likely for the premise and the conclusion to be true. But the argument is not inductively strong because the fact that someone is eating bread gives us no reason to believe that someone is eating rice. There is no evidential connection between them, which is what is required when the conclusion is highly likely to be true *given that the* premise is true. What we should do is imagine a situation in which the

premises are true, and then ask ourselves how likely it is that the conclusion is true in the same situation⁷⁸.

What this means is that in evaluating an inductive argument, we have to think about two things: (1) are its premises true? (2) do they strongly support the conclusion? I suppose that we should restrict the term "good inductive argument" to an inductive argument for which both (1) and (2) are the case. We can instead use the term 'strong inductive argument' to refer to any inductive argument in which (2) is the case, whether or not the premises are true⁷⁹.

This means that the inductive argument is divided into three kinds as follows:⁸⁰

A STRONG INDUCTIVE ARGUMENT is an argument in which the premises give strong evidence for the conclusion.

(As far as strength is concerned, it doesn't matter whether the premises or the conclusion are true or false)

A WEAK INDUCTIVE ARGUMENT is an argument in which the premises don't give strong evidence for the conclusion. (The truth or falsity of the premises or the conclusion are both irrelevant here again.)

A GOOD INDUCTIVE ARGUMENT is a strong inductive argument with true premises.

3-4-2: Deductive argument⁸¹

A good inductive argument provides good evidence for its conclusion, but, as we've seen in, no matter how good the evidence for the conclusion, it's always possible that the conclusion is false. This is an important fact that be remarking on several times.

There is, however, a different sort of argument in which the truth of the premises doesn't just make' the truth of the inclusion more likely- it guarantees the truth of the conclusion. In this different sort of argument

⁷⁸- Lau, Joe Y. F., An introduction to critical thinking and creativity: think more, think better, pp.87-88

⁷⁹- Ibid, p.35

⁸⁰- Ibid, p.35

⁸¹- Ibid, pp. 37-38

(i.e.: **Deductive argument**), if the premises true, the conclusion must be true. Here's an example:

PREMISES: All fish breathe under water with gills.
Flounders are a kind of fish.

CONCLUSION: All flounders breathe under water with gills

When you're thinking about this example, ignore whether or not the premises are true, or what evidence there is for them. Concentrate on the fact that if those premises are true, then that conclusion would have to be true also.

It's logically impossible that the premises be true while the conclusion is false.

Here are some more examples of this sort of argument:

PREMISES: If it rains on Tuesday, the picnic is off.
It's raining.
It's Tuesday.

CONCLUSION: The picnic is off.

PREMISES: None of Fred's skateboards is cool.
Sally has borrowed a cool skateboard.

CONCLUSION: The skateboard Sally has borrowed Fred's.

PREMISES: The filling in this Twinkie, tastes wonderful
Real whipped cream tastes terrible.

CONCLUSION: The filling in this Twinkie isn't whipped cream

Notice again that as far as "the logic" of these arguments is concerned, it doesn't matter whether any statement in them is actually true or false. All that matters is whether it's the case that if the premises were all true, then the conclusion couldn't be false.

All of the above are examples of deductive reasoning. In a good deductive argument, true premises guarantee a true conclusion. Now look at this argument:

PREMISES: All chickens are mammals.
All mammals are green.

CONCLUSION: All chickens are green.

You know that all the premises in this argument are false, and so is the conclusion. Nevertheless, the "logic" of this Deductive argument is okay: if the premises were true, then the conclusion would have to be true too.

So, the situation with deductive arguments is analogous to one already described with inductive ones. Remember that the *strength* of an inductive argument had to do only with the logical relationship between the premises and the conclusion, and ignored whether or not the premises were true. In the case of deductive reasoning, the analogous measure which ignores the truth or falsity of the premises is validity.

Therefore, deductive argument is divided into two kinds as follows:⁸²

- **Deductive valid argument:** is an argument in which it's impossible that the premises be true but the conclusion false. That is: in every valid deductive argument, if the premises were true, then the conclusion would have to be true.

As we've seen, we can have valid deductive arguments for one or more false premises. The chicken argument above is an example of this. Despite the fact that this argument is deductively valid, it doesn't tell us that the conclusion is true, Use the premises are false.

- **Deductive sound argument:** is valid argument which in fact does guarantee the truth of its conclusion and the premises are all true.

⁸²- Ibid, p.38

Because deductive arguments are those in which the truth of the conclusion is thought to be completely guaranteed and not just made probable by the truth of the premises, if the argument is a sound one, the truth of the conclusion is "contained within" the truth of the premises; i.e., the conclusion does not go beyond what the truth of the premises implicitly requires. For this reason, deductive arguments are usually limited to inferences that follow from definitions, mathematics and rules of formal logic⁸³.

Inductive arguments, on the other hand, can appeal to any consideration that might be thought relevant to the probability of the truth of the conclusion. Inductive arguments, therefore, can take very wide ranging forms, including arguments dealing with statistical data, generalizations from past experience, appeals to signs, evidence or authority, and causal relationships⁸⁴.

⁸³ _

https://www.lanecc.edu/sites/default/files/trio/deductive_and_inductive_arguments.pdf

⁸⁴ - Ibid

Chapter Four

Critical Thinking and Assessing Arguments

One evaluates arguments by assessing their quality, i.e., how good they are as arguments. They might be eloquent as speeches or spine tingling as theater, but that won't make them good arguments. An argument's purpose is to compel a listener to believe the conclusion on the basis of the reasons given in support. To be a good argument, it must supply agreeable reasons that make the conclusion seem clearly true. Thus, a good argument guides reason, whether or not it appeals to emotion.

4-1: Strategies for Assessing Arguments

We now come to the assessment of arguments. Before we consider the details of how this should be done, we need to say something about the nature of the task. Every argument, as we saw in section 3.1, supports its conclusion by making a double claim: (a) that its premises are true and (b) that its premises support its conclusion. Whenever we assess an argument, we are really only asking whether these claims are true. An argument makes a kind of promise; assessing an argument is asking whether it can make good on its promise. A good argument is one that does what it claims to do, and a bad argument is one that fails to do what it claims to do. But how are we to tell whether an argument has made good on its promise?

Philosophers have developed two approaches for assessing arguments. The first and more traditional is the fallacies approach, in which we identify all the specific fallacies (or mistakes) that an argument can make and then ask whether a given argument commits any of these fallacies. If it commits none of them, it will be a good argument, and if it commits one or more of them, it will be a bad argument. The second is the criterial approach in which we appeal to the criteria, or standards, that a good argument must satisfy and ask whether a given argument meets these criteria. If it meets them all, it will be a good argument, and if it fails to meet one or more of them, it will be a bad argument⁸⁵.

⁸⁵- William Hughes & Jonathan Lavery, *Critical Thinking: An Introduction to the Basic Skills*, 5th edition, Broadview press, Canada, 2008, p. 95

4-1-1: The Fallacies Approach⁸⁶

The concept of a fallacy presents several theoretical difficulties for logicians that need not detain us here. For our purposes we can define a fallacy as any error or weakness that detracts from the soundness of an argument, yet somehow manages to disguise this weakness so as to give the argument the appearance of being better than it really is. For example, one traditional fallacy is the appeal to pity, as in:

Jane is a widow with three teenage children living in a two-bedroom basement apartment. Therefore, her employer should promote her to supervisor.

Whether Jane should be promoted depends upon whether she has the qualification and experience to be a good supervisor. The fact that she is a widow with three teenage children living in a two-bedroom basement apartment says nothing about her qualifications as a supervisor. But if someone can arouse our sympathies for Jane, we may want her to be promoted for reasons that have nothing to do with the qualifications necessary for the job. Since the pity we naturally feel is irrelevant to the question whether she should be promoted, the appeal to pity is fallacious.

Logicians have long been fascinated by fallacies and have devoted much time and energy to identifying and explaining specific fallacy types. Aristotle listed 13 types, but modern logicians have identified approximately 150 different types. This proliferation of fallacies suggests a misleading picture of a logician as a kind of microbiologist of the intellect searching for new logical viruses.

One problem with the fallacies approach is that there is no limit to the number of ways in which an argument can be weak. The only way to limit the list of fallacies is to restrict ourselves to those errors that occur frequently. However, we still will never have a list of fallacy types that is complete, for there is no simple way to determine what counts as a “frequently” occurring error. Another problem is that as more and more fallacy types are identified, it has become increasingly difficult to use them effectively as the basis for assessing arguments. Not only do we have to memorize a very long list of fallacies, but we often find arguments that clearly contain a weakness but where we have difficulty in deciding which particular fallacy has been committed.

⁸⁶ - Ibid, p. 96

The underlying problem with the fallacies approach is that it is negative in nature. This is an especially serious problem when we are trying to develop good arguments for ourselves, rather than merely criticizing other people's arguments. Rather than telling us what we want to see in a good argument, it only tells what we should try to avoid.

4-1-2: The Criterial Approach⁸⁷

The criterial approach, unlike the fallacies approach, is positive in nature. It begins by establishing the criteria that a good argument must satisfy and then uses these criteria as the basis for assessing particular arguments. To develop these criteria we rely directly upon the concept of a sound argument. We defined before a logically strong argument as one whose premises, if true, support its conclusion, and a sound argument as a logically strong argument whose premises are true. It is now time to use these concepts to establish the criteria for a sound argument. They give rise to three criteria.

- The three criteria of a sound argument

The requirement that a sound argument must have true premises is the basis for our first criterion for a sound argument: it should have true premises. Obviously, since premises are offered as support for a conclusion, if a premise is false, then no matter how good the argument is in other respects, the premise provides no support for the conclusion. But there is a problem here. Often we are not able to *prove* that our premises are true: most of us cannot actually prove, for example, that cigarette smoking is a health hazard. However, in most contexts there are reasons that justify the acceptance of such a claim even though we cannot prove it is true. The fact that our government requires all cigarette packages to include the claim as a warning, for example, makes it reasonable for us to accept it, even though such a reason is clearly not a proof. We must therefore expand our first criterion to take account of those contexts where all that we can reasonably demand is that there be good reasons for accepting the premises. Our first criterion, therefore, is that the premises must be acceptable. Of course, in some contexts, such as assessing mathematical proofs, the only good reason for accepting the premises will be that they can actually be proven.

Logical strength, the second requirement for a sound argument, gives rise to our second and third criteria. The second is that the premises must

⁸⁷ - Ibid, pp. 96- 98

be relevant to the conclusion. We have noticed before that an argument may have premises that are known to be true but that nevertheless fail to provide any support for its conclusion.

This is what happens when the premises are not relevant to the conclusion. Clearly, if the premises of an argument are to support its conclusion, they must supply us with information that is relevant to the question whether or not the conclusion is true. Precisely what information is relevant to the truth of a particular conclusion may sometimes be difficult to determine, but it is clear that what we are looking for is relevant information. Our second criterion, therefore, is that each individual premise should be relevant to the conclusion.

The logical strength requirement also gives rise to our third criterion, namely, that the premises must be adequate to support the conclusion. A premise may be both true and relevant to the conclusion, but it may nevertheless not be adequate to support the conclusion. Adequacy is usually (but not always, as we shall see later) a matter of degree. In most cases a true, relevant premise can provide support that ranges from very little to a great deal. Consider the following:

My neighbour, my wife, and all the people I work with, all of whom voted Tory in the last election, have decided to vote Liberal in the next election. Therefore, the Liberals will probably win the next election.

The premise of this argument is obviously relevant to the conclusion, and it does provide some, albeit minimal, support for the conclusion. It is, we might say, a straw in the wind. We would be foolish to bet on the outcome of the election on the basis of this evidence. By itself, therefore, this premise is not adequate. If, however, we keep asking friends and neighbours, or better yet undertake a proper public opinion survey, we may accumulate more information that shows that large numbers of voters are switching from Tory to Liberal. If this extra information is included as additional premises, then the support provided for the conclusion is much more adequate. The third criterion, therefore, is that the premises, considered collectively, must provide adequate support for the conclusion.

Thus there are three different criteria that a sound argument must meet:

- (1) The premises must be acceptable.
- (2) The premises must be relevant.
- (3) The premises must be adequate.

Notice how in moving from (1) to (2) to (3) the criteria become more complex. Acceptability concerns the assessment of each premise considered on its own. The other two criteria ask us to assess the inference from the premise(s) to the conclusion of an argument. Relevance concerns the relationship between each individual premise, considered on its own, and the rest of the argument. And adequacy concerns the relationship between all the premises considered collectively and the conclusion. We are not entitled to pass final judgement on any argument until we have assessed it against each of these criteria. If it meets all three criteria, we should conclude that it is a sound argument. If it fails to meet any one criterion, we should regard it as a weak or defective argument.

4-2-: Seven Rules for Assessing Arguments⁸⁸

At this point it will be useful to present a set of rules that should be followed whenever an argument is being assessed.

Rule 1. Identify the main Conclusion

You may have noticed that none of the three criteria listed above asks us to assess the conclusion of an argument directly. When assessing an argument on the basis of these three criteria, we assess the conclusion indirectly by considering the evidence offered in support of it—that is, the acceptability, relevance, and adequacy of the premises. Still, even though we don't assess the conclusion directly, we must begin our assessment by identifying the conclusion. This is especially important when assessing the argument for relevance and adequacy.

The way to identify the main conclusion should be familiar by now:

- (1) Look for the main point of the passage, by asking, what is the author driving at?
- (2) Look for inference indicators, such as therefore, hence, so, consequently. And so on.

⁸⁸- William Hughes & Jonathan Lavery, *Critical Thinking: An Introduction to the Basic Skills*, pp. 98- 100

- (3) Pay attention to the context and background for clues as to what the argument is all about.
- (4) Bear in mind the principle of charity when interpreting an ambiguous conclusion or when supplying a missing conclusion.

If the conclusion is difficult to elicit, it may be because we are not dealing with an argument at all. We have already come across several passages that look like arguments but should not be regarded as genuine arguments. Reports of arguments and forceful assertions can be especially troublesome. Remember that every argument presents a claim and a reason to support that claim.

Rule 2. Identify the Premises

The next step is to identify the premises. If the conclusion has been correctly identified, the rest of the argument will include the premises. But it may also include some material that is not specifically part of the argument itself, such as illustrations and examples. It may also include alternative versions of what is really a single premise. The question we should ask here is, *What information or reasons does the author provide to support the conclusion?* As always, it is important to pay attention to the context and the principle of charity when identifying the premises and when supplying missing premises.

Rule 3. Identify the Structure of the argument

Once the conclusion and the premises have been identified the structure of the argument must be identified. If the argument has a simple structure, we can pass straight on to the critical assessment. In all other cases care should be taken to ensure that the structure of the argument has been correctly identified, if necessary by drawing a tree diagram.

Rule 4. Check the Acceptability of the Premises

Two warnings should be mentioned here. First, if the argument is intended to be a counterfactual argument, it is irrelevant to ask whether the premises are true, since the author is not claiming that they are true. Second, we need to note that a false premise does not always deprive the conclusion of all support. If an argument has two independent premises, the fact that one of them is false has no bearing on whether the other premise is true, and if the other premise is true, then the conclusion may still have some support.

Rule 5. Check the Relevance of the Premises

It should be stressed that the premises must be considered in context, for a premise that is irrelevant when considered by itself may have its relevance established by other premises in the argument.

Rule 6. Check the adequacy of the premises

When assessing adequacy it is important to notice the degree of support which the argument claims is provided by the premises. We need this criterion because even if an argument satisfies the two criteria (i.e., each premise is acceptable and relevant to the conclusion), the set of premises may nevertheless be inadequate to support the conclusion.

Clearly, an argument with premises that are inadequate to support its conclusion suffers from a major weakness. Relying on premises that are inadequate to support a conclusion is sometimes called jumping to conclusions, or reaching a hasty conclusion.

Adequacy is a matter of degree. In this respect the criterion of adequacy differs from the first two criteria (i.e., each premise is acceptable and relevant to the conclusion). If the premises of an argument are unacceptable, then they give us no reason to think that its conclusion is true. Again, if the premises are irrelevant, then they give us no reason to think that the conclusion is true. But if the premises are inadequate, they may still provide some support for the conclusion, although this support may be too weak or inadequate to make the conclusion acceptable. The fact that premises may be partly but not entirely adequate to support a conclusion is often reflected in the tentative way we assert the conclusion. For example:

Look at those dark clouds on the horizon. We might be in for some rain, so maybe we should head back to the car.

Notice the tentative nature of the inference. By using the words might and maybe, the speaker is acknowledging that the evidence is not conclusive. Suppose, however, the argument had been:

Look at those dark clouds on the horizon. It's going to rain, and if we don't head back to the car right away, we're going to get soaked.

Here, the inference is not tentative at all. The speaker is arguing that the dark clouds mean that it will rain, and since, as we all know, the

presence of dark clouds on the horizon does not always mean that it will rain, the argument violates the criterion of adequacy⁸⁹.

Rule 7. Look for counter-arguments

Finally, we should look for counter-arguments. A counter-argument attempts to show that our opponent's conclusion is false or problematic by constructing a different argument altogether to support a conclusion that is inconsistent with the original conclusion. For example:

Roy: The state must retain the right to apply the death penalty in extreme cases. I believe that any person who commits cold-blooded, premeditated murder is unfit to remain a member of any civilized community. By their act of denying another's right to life, they have renounced their own right to life, and the state is therefore entitled to put them to death.

Dale: The trouble with your position is that it brings the state down to the level of the murderer. If the right to life is so important, then don't you think the state ought to show how important it is by refusing to execute anyone, no matter how heinous his or her crime? The real question is whether you want to live in a society where the government from time to time kills some of its citizens.

Notice that Dale makes no attempt to challenge any of Roy's premises and does not even suggest that Roy's conclusion does not follow from his premises. In fact, she is actually in partial agreement with one of Roy's premises: that there is a right to life. But she ignores Roy's argument and attempts instead to show that the state ought not to inflict the death penalty by appealing to a different set of premises. Every genuine counter-argument has this feature: it ignores the premises of the original argument and presents an independent set of reasons in support of a contrary conclusion.

Every weak argument is therefore open to a counter-argument. In fact, counterarguments can often be developed against arguments whose weakness we are unable to identify. If we are presented with an argument whose conclusion we are reluctant to accept, there are two possible explanations for our reluctance: (a) the argument is weak, or (b) we are being irrational about the matter. If the argument really is weak, then we

⁸⁹- William Hughes & Jonathan Lavery, *Critical Thinking: An Introduction to the Basic Skills*, pp. 139-140

ought to be able to describe the weakness in such a way as to persuade our opponent. But if, as sometimes happens, we cannot do so, we would have to concede that our refusal to accept it may be irrational. In these circumstances it can be very useful to attempt to develop a counter-argument. If we can develop a plausible one, then we have a good reason to believe that our opponent's argument is weak and that we are not being irrational⁹⁰.

⁹⁰ - Ibid, p. 242

Chapter Five

Logical Fallacies and Cognitive Biases

A primary aim of critical thinking research and teaching is to improve human reasoning with the intent of getting people to be more rational with respect to their beliefs and actions. For the Informal Logic/critical thinking community, this effort has largely taken the form of analyzing the structure of arguments and identifying certain types of errors or problems in reasoning, in particular those commonly identified as fallacies. The focus is on exposing the nature of the error -- showing why these particular arguments are fallacious. The pedagogical assumption underlying this focus is that once people are aware of these errors, they will notice them in the arguments of others and be able to resist them, and that they will avoid making these errors themselves⁹¹.

It is our contention that this work can make a contribution both to reflection on reasoning errors and to the development of an appropriate pedagogy to instruct people in how to avoid these errors.

5-1: Common errors in thinking:⁹²

There are some common thinking errors that most of us make from time to time. thinking errors are irrational patterns of thinking that cause

⁹¹- Battersby, Mark and Bailin, Sharon, "Critical thinking and cognitive biases" (2013). OSSA Conference Archive. 16. <https://scholar.uwindsor.ca/ossaarchive/OSSA10/papersandcommentaries/16/>

⁹²- see:

- Sarah Edelman and Louise Rémond, Taking Charge! A Guide for Teenagers: Practical Ways to Overcome Stress, Hassles and Upsetting Emotions, Foundation for Life Sciences (2004), <https://trove.nla.gov.au/work/9667705>
- Mahran. M., Scientific Thinking, pp. 36-43
- Joseph Bennette, Thinking Errors,
- <https://strengtheningmarriage.com/wp-content/uploads/2012/11/DOCS-thinking-errors.pdf>
- <http://counseling.cofc.edu/documents/thinkingerrorsanxiety.pdf>
- <https://web3us.com/drupal6/content/top-ten-thinking-errors>

you to feel bad, and sometimes to act in self-defeating ways. Whenever you find yourself feeling upset (e.g. anxious, angry, depressed, resentful, guilty, ashamed, etc) look for any thinking errors that might be contributing to the way you feel. Here are a few common thinking errors and ways to challenge them.

1- Black and White Thinking

Categorizing things into one of two extremes. Example: Believing that people are either excellent in social situations or terrible, without recognizing the large gray area in-between. In other words, this error means that thinking of things in absolute terms, like “always”, “every” or “never”. For example, if your performance falls short of perfect, you see yourself as a total failure. Few aspects of human behavior are so absolute. Nothing is 100%. No one is all bad, or all good, we all have grades.

THE CHALLENGE: Look for Shades of Grey

It is important to avoid thinking about things in terms of extremes. Most things aren't black-and-white - usually they are somewhere in-between. Just because something isn't completely perfect doesn't mean that it's a complete write-off.

Ask yourself:

- Is it really so bad, or am I seeing things in black-and-white?
- How else can I think about the situation?
- Am I taking an extreme view?

2- Jumping to Conclusions

Assuming something negative where there is actually no evidence to support it. Example: believing that someone does not like you without any actual information to support that belief.

Two specific subtypes are also identified:

Mind reading: assuming the intentions of others. You arbitrarily conclude that someone is reacting negatively to you, and you don't bother to check it out. To beat this one, you need to let go of your need for approval – you can't please everyone all the time. Ask yourself, “How do you know that...?” Check out “supporting” facts with an open mind.

Fortune telling: anticipating that things will turn out badly, you feel convinced that your prediction is an already established fact. To beat this, ask, “How do you know it will turn out in that way?” Again, check out the facts.

THE CHALLENGE: *Don't assume that you know what others are thinking*

Ask Yourself:

- What is the evidence? How do I know what other people are thinking?
- Just because I assume something, does that mean I'm right?

3- Overgeneralization

This is the error of making a broad rule based on single events. Example: In overgeneralization when we experience a single, negative event such as not getting a job that we applied for, we tend to think we will never get a job ever again.

THE CHALLENGE: *Be Specific - Don't Over-generalize*

Ask yourself:

- Am I over-generalizing?
- What are the facts, and what are my interpretations?

4- Personalization and Blame

Personalization occurs when you hold yourself personally responsible for an event that isn't entirely under your control. For example, “My son is doing poorly in school. I must be a bad mother...” and “What's that say about you as a person?” instead of trying to pinpoint the cause of the problem so that she could be helpful to her child. When another woman's husband beat her, she told herself, “If only I were better in bed, he wouldn't beat me.” Personalization leads to guilt, shame, and feelings of inadequacy.

On the flip side of personalization is blame. Some people blame other people or their circumstances for their problems, and they overlook ways that they might be contributing to the problem: “The reason my marriage

is so lousy is because my spouse is totally unreasonable.” instead of investigating their own behavior and beliefs that can be changed.

THE CHALLENGE: Don't Personalize

It's important to consider that not everything is your fault or your responsibility. Most things have more than one cause.

Ask yourself:

- Am I really to blame? Is this all about me?
- What other explanations might there be for this situation?

5- Catastrophizing (or Magnification)

Taking an event you are concerned about and blowing it out of proportion to the point of becoming fearful. i.e You exaggerate the importance of small things. Example: believing that if you fail a quiz then the teacher will completely lose respect for you, that you will not graduate from college, that you will therefore never get a well-paying job, and will ultimately end up unhappy and dissatisfied with life.

THE CHALLENGE: De-catastrophize

Ask Yourself:

- What's the worst thing that can happen?
- What's the best thing that can happen?
- What's the most likely to happen?
- Will this matter in five years time?
- Is there anything good about the situation?
- Is there any way to fix the situation?

6- Minimization

This is the opposite of Catastrophizing (or Magnification), but not in a good way! This is when you downplay anything good that might have happened to you because you are too focused on any aspect of the event that went wrong. It is possible to acknowledge where things might not have been perfect without allowing them to ruin the overall event.

An example of minimizing is taking a significant issue or event and reducing its importance so it appears inconsequential

THE CHALLENGE: De-minimize

7- Emotional Reasoning

Making decisions and arguments based on how you feel rather than objective reality. People who allow themselves to get caught up in emotional reasoning can become completely blinded to the difference between feelings and facts.

THE CHALLENGE: See things as they really are, not from a emotionally biased viewpoint.

8- Filtering

When you filter you do two things: First you focus on the negative aspects of your situation and secondly, you ignore or dismiss all the positive aspects.

THE CHALLENGE: Consider the Whole Picture

Ask yourself:

- Am I looking at the negatives, while ignoring the positives?
- Is there a more balanced way to look at this?

9- Unfair to Compare

Another common thinking error is making unfair comparisons between certain individuals and yourself. When you do this, you compare yourself with people who have a specific advantage in some area. Making unfair comparisons can leave you feeling inadequate and not OK.

THE CHALLENGE: Stop Making Unfair Comparisons

Ask yourself:

- Am I comparing myself with people who have a particular advantage?
- Am I making fair comparisons?

10- Labelling

When you use labelling you might call yourself (or other people) names. Instead of being specific (e.g. that was a silly thing to say') you

make negative generalizations about yourself or other people e.g. I am ugly/ dumb/ a loser/ boring; She is failure, He's a complete idiot.

THE CHALLENGE: Is this the whole of me/ the person

Ask yourself:

- Is this all I am/ they are?
- Just because there is something I'm unhappy with, does that mean that I'm totally no good?

5-2: The Effect of Challenging Thinking Errors⁹³

What is the effect of challenging your thinking errors? Does it make you feel better? Does it encourage you to change some of your behavior?

Often it is useful to write down the changes that occur after you have challenged your thinking, as this helps you to see the advantages of working on your thoughts, and motivates you to keep doing so. You could also give ROC a go at Reach Out! Central - This gives you a space to gather evidence that helps you to challenge your negative thinking.

REMEMBER!! Whenever You are Feeling Bad, Try to Become Aware of Your Thoughts. If they are negative or critical, have a go at challenging them. Once you get into the habit of disputing your negative self-talk you'll find it easier to handle difficult situations, and as a result, you'll feel less stressed and more confident and in control.

Write it Down

While you are learning to identify and challenge your negative self-talk it's a good idea to write it all down. Writing down your thoughts and disputing statements in a diary or notebook helps you to develop your skills. Initially it might feel like work, but the more often you do it, the easier it will become, and the better you will feel.

Try it Out

Now that you know a few common thinking errors and how to challenge them, why don't you try it out? It might not be easy at first, and it may take some time. However, the rewards could be huge! People who choose the way they think about things, who are at peace with the past, live in the present, and are optimistic about the future, are generally happier.

⁹³- <https://web3us.com/drupal6/content/top-ten-thinking-errors>

5-3: Logical Fallacies and Cognitive Biases

Logical fallacies and cognitive biases are both failures of reason—errors in thinking that can result in inaccurate perspectives, distorted views, error-filled judgments, and eventually, skewed, irrational beliefs (about one’s self and/or the world around them).

Because the human brain is susceptible to the same kinds of errors and distortions, it (meaning ‘we’ as human beings) makes the same errors so frequently that we have given them formal names (e.g., strawman fallacy, recency bias, etc.)

In this way, they are similar in that each is a common thinking error⁹⁴.

The primary difference between logical fallacies and cognitive biases is that the former are failures of reason that are usually occurring in the moment while the biases represent individual, ongoing pre-dispositions to future errors of reason.

An important difference between fallacies and biases is that biases determine/affect/distort how you evaluate, on an ongoing basis, data, truths, or circumstances. Logical fallacies, however, have more to do with how you make claims and construct arguments⁹⁵.

5-3-1: Logical Fallacies

Logical fallacies are deceptive or false arguments that may seem stronger than they actually are due to psychological persuasion, but are proven wrong with reasoning and further examination.

These mistakes in reasoning typically consist of an argument and a premise that does not support the conclusion. There are two types of fallacies: formal and informal.

- **Formal:** Formal fallacies are arguments that have invalid structure, form, or context errors.
- **Informal:** Informal fallacies are arguments that have irrelevant or incorrect premises.

⁹⁴- Terry Heick., What Is The Difference Between Logical Fallacies And Cognitive Biases?, At: <https://www.teachthought.com/critical-thinking/the-difference-between-logical-fallacies-and-cognitive-biases/>

⁹⁵- Ibid, Op.Cit.

Having an understanding of basic logical fallacies can help you more confidently parse the arguments and claims you participate in and witness on a daily basis- separating fact from sharply dressed fiction⁹⁶.

5-3-2: Common Logical Fallacies and How to Spot Them⁹⁷

1. The Straw Man Fallacy

This fallacy occurs when your opponent over-simplifies or misrepresents your argument (i.e., setting up a "straw man") to make it easier to attack or refute. Instead of fully addressing your actual argument, speakers relying on this fallacy present a superficially similar — but ultimately not equal — version of your real stance, helping them create the illusion of easily defeating you.

Example:

John: I think we should hire someone to redesign our website.

Lola: You're saying we should throw our money away on external resources instead of building up our in-house design team? That's going to hurt our company in the long run.

2. The Bandwagon Fallacy

Just because a significant population of people believe a proposition is true, doesn't automatically make it true. Popularity alone is not enough to validate an argument, though it's often used as a standalone justification of validity. Arguments in this style don't take into account whether or not the population validating the argument is actually qualified to do so, or if contrary evidence exists.

While most of us expect to see bandwagon arguments in advertising (e.g., "three out of four people think X brand toothpaste cleans teeth best"), this fallacy can easily sneak its way into everyday meetings and conversations.

⁹⁶- Karla Hesterberg, 16 Common Logical Fallacies and How to Spot Them, At: <https://blog.hubspot.com/marketing/common-logical-fallacies>

⁹⁷- See:

- Wilson, W. Kent (1999). "Formal fallacy". In Audi, Robert (ed.). The Cambridge Dictionary of Philosophy (2nd ed.). Cambridge University Press, pp. 316–317

- Karla Hesterberg, 16 Common Logical Fallacies and How to Spot Them, At: <https://blog.hubspot.com/marketing/common-logical-fallacies>

- https://en.wikipedia.org/wiki/List_of_fallacies

- Jepson. R.W., Clear Thinking, p. 138-147

Example:

The majority of people believe advertisers should spend more money on billboards, so billboards are objectively the best form of advertisement.

3. The Appeal to Authority Fallacy

While appeals to authority are by no means always fallacious, they can quickly become dangerous when you rely too heavily on the opinion of a single person — especially if that person is attempting to validate something outside of their expertise.

Getting an authority figure to back your proposition can be a powerful addition to an existing argument, but it can't be the pillar your entire argument rests on. Just because someone in a position of power believes something to be true, doesn't make it true.

Example:

Despite the fact that our Q4 numbers are much lower than usual, we should push forward using the same strategy because our CEO Barbara says this is the best approach.

4. The False Dilemma Fallacy

This common fallacy misleads by presenting complex issues in terms of two inherently opposed sides. Instead of acknowledging that most (if not all) issues can be thought of on a spectrum of possibilities and stances, the false dilemma fallacy asserts that there are only two mutually exclusive outcomes.

This fallacy is particularly problematic because it can lend false credence to extreme stances, ignoring opportunities for compromise or chances to re-frame the issue in a new way.

Example:

We can either agree with Barbara's plan, or just let the project fail. There is no other option.

5. The Hasty Generalization Fallacy

This fallacy occurs when someone draws expansive conclusions based on inadequate or insufficient evidence. In other words, they jump to conclusions about the validity of a proposition with some — but not

enough — evidence to back it up, and overlook potential counterarguments.

Example:

Two members of my team have become more engaged employees after taking public speaking classes. That proves we should have mandatory public speaking classes for the whole company to improve employee engagement.

6. The Slothful Induction Fallacy

Slothful induction is the exact inverse of the hasty generalization fallacy above. This fallacy occurs when sufficient logical evidence strongly indicates a particular conclusion is true, but someone fails to acknowledge it, instead attributing the outcome to coincidence or something unrelated entirely.

Example:

Even though every project Brad has managed in the last two years has run way behind schedule, I still think we can chalk it up to unfortunate circumstances, not his project management skills.

7. The Correlation/Causation Fallacy

If two things appear to be correlated, this doesn't necessarily indicate that one of those things irrefutably caused the other thing. This might seem like an obvious fallacy to spot, but it can be challenging to catch in practice — particularly when you really want to find a correlation between two points of data to prove your point.

Example:

Our blog views were down in April. We also changed the color of our blog header in April. This means that changing the color of the blog header led to fewer views in April.

8. The Anecdotal Evidence Fallacy

In place of logical evidence, this fallacy substitutes examples from someone's personal experience. Arguments that rely heavily on anecdotal evidence tend to overlook the fact that one (possibly isolated) example can't stand alone as definitive proof of a greater premise.

Example:

One of our clients doubled their conversions after changing all their landing page text to bright red. Therefore, changing all text to red is a proven way to double conversions.

9. The Texas Sharpshooter Fallacy

This fallacy gets its colorful name from an anecdote about a Texan who fires his gun at a barn wall, and then proceeds to paint a target around the closest cluster of bullet holes. He then points at the bullet-riddled target as evidence of his expert marksmanship.

Speakers who rely on the Texas sharpshooter fallacy tend to cherry-pick data clusters based on a predetermined conclusion. Instead of letting a full spectrum of evidence lead them to a logical conclusion, they find patterns and correlations in support of their goals, and ignore evidence that contradicts them or suggests the clusters weren't actually statistically significant.

Example:

Lisa sold her first startup to an influential tech company, so she must be a successful entrepreneur. (She ignores the fact that four of her startups have failed since then).

10. The Middle Ground Fallacy

This fallacy assumes that a compromise between two extreme conflicting points is always true. Arguments of this style ignore the possibility that one or both of the extremes could be completely true or false — rendering any form of compromise between the two invalid as well.

Example:

Lola thinks the best way to improve conversions is to redesign the entire company website, but John is firmly against making any changes to the website. Therefore, the best approach is to redesign some portions of the website.

11. The Burden of Proof Fallacy

If a person claims that X is true, it is their responsibility to provide evidence in support of that assertion. It is invalid to claim that X is true

until someone else can prove that X is not true. Similarly, it is also invalid to claim that X is true because it's impossible to prove that X is false.

In other words, just because there is no evidence presented against something, that doesn't automatically make that thing true.

Example:

Barbara believes the marketing agency's office is haunted, since no one has ever proven that it isn't haunted.

12. The Personal Incredulity Fallacy

If you have difficulty understanding how or why something is true, that doesn't automatically mean the thing in question is false. A personal or collective lack of understanding isn't enough to render a claim invalid.

Example:

I don't understand how redesigning our website resulted in more conversions, so there must have been another factor at play.

13. The "No True Scotsman" Fallacy

Often used to protect assertions that rely on universal generalizations (like "all Marketers love pie") this fallacy inaccurately deflects counterexamples to a claim by changing the positioning or conditions of the original claim to exclude the counterexample.

In other words, instead of acknowledging that a counterexample to their original claim exists, the speaker amends the terms of the claim. In the example below, when Barbara presents a valid counterexample to John's claim, John changes the terms of his claim to exclude Barbara's counterexample.

Example:

John: No marketer would ever put two call-to-actions on a single landing page.

Barbara: Lola, a marketer, actually found great success putting two call-to-actions on a single landing page for our last campaign.

John: Well, no true marketer would put two call-to-actions on a single landing page, so Lola must not be a true marketer.

14. The Ad Hominem Fallacy

An ad hominem fallacy occurs when you attack someone personally rather than using logic to refute their argument. Instead they'll attack physical appearance, personal traits, or other irrelevant characteristics to criticize the other's point of view. These attacks can also be leveled at institutions or groups.

Example:

Barbara: We should review these data sets again just to be sure they're accurate.

Tim: I figured you would suggest that since you're a bit slow when it comes to math.

15. The Tu Quoque Fallacy

The tu quoque fallacy (Latin for "you also") is an invalid attempt to discredit an opponent by answering criticism with criticism — but never actually presenting a counterargument to the original disputed claim.

In the example below, Lola makes a claim. Instead of presenting evidence against Lola's claim, John levels a claim against Lola. This attack doesn't actually help John succeed in proving Lola wrong, since he doesn't address her original claim in any capacity.

Example:

Lola: I don't think John would be a good fit to manage this project, because he doesn't have a lot of experience with project management.

John: But you don't have a lot of experience in project management either!

16. The Fallacy Fallacy

Here's something vital to keep in mind when sniffing out fallacies: just because someone's argument relies on a fallacy doesn't necessarily mean that their claim is inherently untrue.

Making a fallacy-riddled claim doesn't automatically invalidate the premise of the argument — it just means the argument doesn't actually

validate their premise. In other words, their argument sucks, but they aren't necessarily wrong.

Example:

John's argument in favor of redesigning the company website clearly relied heavily on cherry-picked statistics in support of his claim, so Lola decided that redesigning the website must not be a good decision.

As you can see, there are many different types of fallacies. Informal fallacies are particularly complex because layers of subcategories exist within them. Now that you know what some of the most prevalent fallacies look like, you'll be able to identify these lapses in logic right away! Take a look at these examples of logic to keep your reasoning as reasonable as possible.

5-3-3: Common Cognitive Biases⁹⁸

Cognitive biases are systematic patterns of deviation from norm and/or rationality in judgment. They are often studied in psychology, sociology and behavioral economics.

While people like to believe that they are rational and logical, the fact is that people are continually under the influence of cognitive biases. These biases distort thinking, influence beliefs, and sway the decisions and judgments that people make each and every day.

Sometimes these biases are fairly obvious, and you might even find that you recognize these tendencies in yourself or others. In other cases, these biases are so subtle that they are almost impossible to notice.

Why do these biases happen? Attention is a limited resource. This means we can't possibly evaluate every possible detail and event when forming thoughts and opinions. Because of this, we often rely on mental shortcuts that speed up our ability to make judgments, but sometimes lead to bias.

⁹⁸ - See:

- Kendra Cherry , List of Common Cognitive Biases, THEORIES, COGNITIVE PSYCHOLOGY, Updated on January 20, 2021, At: <https://www.verywellmind.com/cognitive-biases-distort-thinking-2794763>
- Terry Heick., What Is The Difference Between Logical Fallacies And Cognitive Biases?, At: <https://www.teachthought.com/critical-thinking/the-difference-between-logical-fallacies-and-cognitive-biases/>
- https://en.wikipedia.org/wiki/List_of_cognitive_biases

The following are just a few of the different cognitive biases that have a powerful influence on how you think, how you feel, and how you behave.

The Confirmation Bias

The confirmation bias is the tendency to listen more often to information that confirms our existing beliefs. Through this bias, people tend to favor information that reinforces the things they already think or believe.

Examples:

- Only paying attention to information that confirms your beliefs about issues such as gun control and global warming
- Only following people on social media who share your viewpoints
- Choosing news sources that present stories that support your views
- Refusing to listen to the opposing side.
- Not considering all of the facts in a logical and rational manner

There are a few reasons why this happens. One is that only seeking to confirm existing opinions helps limit mental resources we need to use to make decisions. It also helps protect self-esteem by making people feel that their beliefs are accurate.

People on two sides of an issue can listen to the same story and walk away with different interpretations that they feel validates their existing point of view. This is often indicative that the confirmation bias is working to "bias" their opinions.

The problem with this is that it can lead to poor choices, an inability to listen to opposing views, or even contribute to othering people who hold different opinions.

1- The Hindsight Bias

The hindsight bias is a common cognitive bias that involves the tendency to see events, even random ones, as more predictable than they are. It's also commonly referred to as the "I knew it all along" phenomenon.

Some examples of the hindsight bias include:

- Insisting that you knew who was going to win a football game once the event is over

- Believing that you knew all along that one political candidate was going to win an election
- Saying that you knew you weren't going to win after losing a coin flip with a friend
- Looking back on an exam and thinking that you knew the answers to the questions you missed
- Believing you could have predicted which stocks would become profitable

The hindsight bias occurs for a combination of reasons, including our ability to "misremember" previous predictions, our tendency to view events as inevitable, and our tendency to believe we could have foreseen certain events.

The effect of this bias is that it causes us to overestimate our ability to predict events. This can sometimes lead people to take unwise risks.

2- The Anchoring Bias

The anchoring bias is the tendency to be overly influenced by the first piece of information that we hear.

Examples:

- The first number voiced during a price negotiation typically becomes the anchoring point from which all further negotiations are based.
- Hearing a random number can influence estimates on completely unrelated topics.
- Doctors can become susceptible to the anchoring bias when diagnosing patients. The physician's first impressions of the patient often create an anchoring point that can sometimes incorrectly influence all subsequent diagnostic assessments.

While the existence of the anchoring bias is well documented, its causes are still not fully understood. Some research suggests that the source of the anchor information may play a role. Other factors such as priming and mood also appear to have an influence.

Like other cognitive biases, anchoring can have an effect on the decisions you make each day. For instance, it can influence how much you are willing to pay for your home. However, it can sometimes lead to poor choices and make it more difficult for people to consider other factors that might also be important.

3- The Misinformation Effect

The misinformation effect is the tendency for memories to be heavily influenced by things that happened after the actual event itself. A person who witnesses a car accident or crime might believe that their recollection is crystal clear, but researchers have found that memory is surprisingly susceptible to even very subtle influences.

Example:

- Research has shown that simply asking questions about an event can change someone's memories of what happened.
- Watching television coverage may change how people remember the event.
- Hearing other people talk about a memory from their perspective may change your memory of what transpired.

There are a few factors that may play a role in this phenomenon. New information may get blended with older memories.⁶ In other cases, new information may be used to fill in "gaps" in memory.

The effects of misinformation can range from the trivial to much more serious. It might cause you to misremember something you thought happened at work, or it might lead to someone incorrectly identifying the wrong suspect in a criminal case.

4- The Actor-Observer Bias

The actor-observer bias is the tendency to attribute our actions to external influences and other people's actions to internal ones. The way we perceive others and how we attribute their actions hinges on a variety of variables, but it can be heavily influenced by whether we are the actor or the observer in a situation.

When it comes to our own actions, we are often far too likely to attribute things to external influences.

Example:

- You might complain that you botched an important meeting because you had jet lag.
- You might say you failed an exam because the teacher posed too many trick questions.

When it comes to explaining other people's actions, however, we are far more likely to attribute their behaviors to internal causes.

Example:

- A colleague screwed up an important presentation because he's lazy and incompetent (not because he also had jet lag).
- A fellow student bombed a test because they lack diligence and intelligence (and not because they took the same test as you with all those trick questions).

While there are many factors that may play a role, perspective plays a key role. When we are the actors in a situation, we are able to observe our own thoughts and behaviors. When it comes to other people, however, we cannot see what they are thinking. This means we focus on situational forces for ourselves, but guess at the internal characteristics that cause other people's actions.

The problem with this is that it often leads to misunderstandings. Each side of a situation is essentially blaming the other side rather than thinking about all of the variables that might be playing a role.

5- The False Consensus Effect

The false consensus effect is the tendency people have to overestimate how much other people agree with their own beliefs, behaviors, attitudes, and values. For example:

- Thinking that other people share your opinion on controversial topics
- Overestimating the number of people who are similar to you
- Believing that the majority of people share your preferences

Researchers believe that the false consensus effect happens for a variety of reasons. First, the people we spend the most time with, our family and friends, do often tend to share very similar opinions and beliefs. Because of this, we start to think that this way of thinking is the majority opinion even when we are with people who are not among our group of family and friends.

Another key reason this cognitive bias trips us up so easily is that believing that other people are just like us is good for our self-esteem. It allows us to feel "normal" and maintain a positive view of ourselves in relation to other people.

This can lead people not only to incorrectly think that everyone else agrees with them—it can sometimes lead them to overvalue their own opinions. It also means that we sometimes don't consider how other people might feel when making choices.

6- The Halo Effect

The halo effect is the tendency for an initial impression of a person to influence what we think of them overall. Also known as the "physical attractiveness stereotype" or the "what is beautiful is 'good' principle" we are either influenced by or use the halo to influence others almost every day.

Example:

- Thinking people who are good-looking are also smarter, kinder, and funnier than less attractive people
- Believing that products marketed by attractive people are also more valuable
- Thinking that a political candidate who is confident must also be intelligent and competent

One factor that may influence the halo effect is our tendency to want to be correct. If our initial impression of someone was positive, we want to look for proof that our assessment was accurate. It also helps people avoid experiencing cognitive dissonance, which involves holding contradictory beliefs.

This cognitive bias can have a powerful impact in the real world. For example, job applicants perceived as attractive and likable are also more likely to be viewed as competent, smart, and qualified for the job.

7- The Self-Serving Bias

The self-serving bias is a tendency for people tend to give themselves credit for successes but lay the blame for failures on outside causes. When you do well on a project, you probably assume that it's because you worked hard. But when things turn out badly, you are more likely to blame it on circumstances or bad luck.

Example:

- Attributing good grades to being smart or studying hard
- Believing your athletic performance is due to practice and hard work
- Thinking you got the job because of your merits

The self-serving bias can be influenced by a variety of factors. Age and sex have been shown to play a part. Older people are more likely to take credit for their successes, while men are more likely to pin their failures on outside forces.

This bias does serve an important role in protecting self-esteem. However, it can often also lead to faulty attributions such as blaming others for our own shortcomings.

8- The Availability Heuristic

The availability heuristic is the tendency to estimate the probability of something happening based on how many examples readily come to mind.

Example:

- After seeing several news reports of car thefts in your neighborhood, you might start to believe that such crimes are more common than they are.
- You might believe that plane crashes are more common than they really are because you can easily think of several examples.

It is essentially a mental shortcut designed to save us time when we are trying to determine risk. The problem with relying on this way of thinking is that it often leads to poor estimates and bad decisions.

Smokers who have never known someone to die of a smoking-related illness, for example, might underestimate the health risks of smoking. In contrast, if you have two sisters and five neighbors who have had breast cancer, you might believe it is even more common than statistics suggest.

9- The Optimism Bias

The optimism bias is a tendency to overestimate the likelihood that good things will happen to us while underestimating the probability that negative events will impact our lives. Essentially, we tend to be too optimistic for our own good.

For example, we may assume that negative events won't affect us such as:

- Divorce
- Job loss
- Illness
- Death

The optimism bias has roots in the availability heuristic. Because you can probably think of examples of bad things happening to other people it seems more likely that others will be affected by negative events.

This bias can lead people to take health risks like smoking, eating poorly, or not wearing a seat belt. The bad news is that research has found that this optimism bias is incredibly difficult to reduce.

There is good news, however. This tendency toward optimism helps create a sense of anticipation for the future, giving people the hope and motivation they need to pursue their goals.

Finally, the cognitive biases above are common, but this is only a sampling of the many biases that can affect your thinking. These biases collectively influence much of our thoughts and ultimately, decision making.

Many of these biases are inevitable. We simply don't have the time to evaluate every thought in every decision for the presence of any bias. Understanding these biases is very helpful in learning how they can lead us to poor decisions in life.

Chapter Six

Critical Thinking in Everyday Life

To practice critical thinking in everyday life, take a close look at your group of friends. Are there things that are “forbidden” in your social circle? Are you expected to act a certain way, dress a certain way?

Think a certain way?

It’s natural that when a group defines something as “cool”, all the people in the group work to fit into that definition. Regardless of what they individually believe.

The problem is that virtually every situation can be defined in multiple ways. What is “dumb” to one person may be “cool” to another.

Develop your ability to redefine the way you see the world around you. On your own terms.

Find a time when your friend group sees the negative in a situation. Is there a positive way to view it instead? Or at least a way that makes it seem not quite so bad?

You may not be ready to speak up with your independent view. And that’s ok. Just practice thinking differently from the group to strengthen your mind.

6-1: Applying critical thinking skills in everyday life

There was a book available in the 1920s which taught children to swim without them ever having to get into water. It did this by showing them all the strokes that were needed for both arms and legs, strokes that they were asked to practice whilst lying on the bedroom carpet. The assumption which is crucial to this teaching technique is that the skills learned on the bedroom floor are able to be transferred to the rather different reality of the swimming pool. There is little point in being able to execute a perfect breaststroke on the bedroom carpet if all is forgotten in two meters of water.

In the same way, this book will not have achieved its purpose if, having worked through it, you cannot apply in your own work the skills it has tried to give you. In other words, when you have to write an essay or report, when you have to give a presentation, when you have to assess information for whatever purpose, you should do it using your critical thinking skills.

1- asking the right questions

When you are assessing a passage which contains at least some argument, you need to ask the right evaluative questions. But before you can do this, you need to work out what the argument is:

- What conclusion does the author come to?
- What reasoning does the author use to support this conclusion?
- What assumptions are necessary for this conclusion to be drawn?

These are the basic questions which you need to ask before you can begin to evaluate the argument. Unless you can see what the argument is, you can't assess its strengths and weaknesses. Having found the argument, now ask questions to evaluate it:

- Does the reasoning support the conclusion?

This is a general question, one which you will always have to be asking. In practice, this general question will become a series of specific questions:

- Does the evidence have the significance that the author intends?
- Are there explanations for the evidence which would change its significance for the argument?
- If the author uses any analogies, do they work?
- What happens if different assumptions are made? What sort of evidence would strengthen the argument?
- What sort of evidence would weaken the argument?
- Does the reasoning support a different conclusion?

Try this questioning technique with the following short arguments. Though they have the same heading, they are very different arguments. Read version 1 first and think about its strengths and weaknesses before you read version 2.

Version 1: Some smokers have tried to get compensation from the tobacco companies on the grounds that smoking has damaged their health.

Given that smoking is addictive and that the tobacco companies knew that it was, they should have done something to reduce the addictive nature of cigarettes. Instead, they controlled the level

of nicotine in cigarettes in order to keep smokers hooked. Not only that, since the publication of the report by the Royal College of Physicians in 1962 it has been known that there are serious dangers with smoking. Manufacturers of any product have a legal duty to minimize risks to their customers. In that tobacco has been known to be both addictive and harmful, the tobacco companies should compensate smokers who have become ill as a result of smoking.

Version 2: Some smokers have tried to get compensation from the tobacco companies on the grounds that smoking has damaged their health

The tobacco companies have responded by arguing that people who smoke choose to smoke. Nobody is forced either to start or, having started, to continue. Furthermore, half of all smokers manage to give up smoking. In addition, given that it has been known for many years that smoking is harmful - since the Royal College of Physicians report in 1962 - smokers should have given up smoking. All the tobacco companies were doing was responding to a demand from smokers. If smokers can get compensation from tobacco companies, what comes next? Lawsuits against drinks manufacturers over cirrhosis of the liver? An action against the dairy industry by heart-disease sufferers? Clearly, people who smoke should not be given any compensation⁹⁹.

2-Looking at the significance of evidence

As you can see, these two arguments come to completely opposite conclusions. But, in doing so, they used some reasoning which was common to both. This is the 1962 report of the Royal College of Physicians which highlighted the dangers involved in cigarette smoking. In the first version, the author used the report to argue that manufacturers shouldn't have produced cigarettes; in the second, it's used to argue that people shouldn't have bought cigarettes. Can this evidence be used for such completely different purposes? The answer is 'yes, it can'.

The 1962 report does support both arguments in that, if the knowledge about the effects of smoking was widespread, then we can argue that both

⁹⁹- Roy Van Den Brink-Budgen, Critical Thinking for Students; Learn the skills of critical assessment and effective argument, 3rd edition, How to Books, Spring Hill House, Spring Hill Road, Begbroke, Oxford, 2000, pp.99-101

manufacturers and smokers were at fault for ignoring this information. Thus this evidence is a good example of how one can provide more than one significance for it. In consequence, an argument which was based on no more than such a piece of evidence is weakened by our being able to show the other significance.

What about some of the other reasoning used? In version 1, we find the claim that 'smoking is addictive', whereas in version 2 we find 'Nobody is forced to either start or, having started, to continue. Furthermore, half of all smokers manage to give up smoking.' Does the evidence in the second version overwhelm the evidence in the first? Or does that in the first significantly weaken the significance of that in the second? They both have the effect of weakening each other, and provide good examples of how one can think of responses to evidence¹⁰⁰.

3- Checking analogies

What about the analogies used in the second version? Do they work? Can you think of any analogies that would work for the first version?¹⁰¹

4- Thinking of further reasoning

Can you think of further reasoning for both versions? In addition, can you think of how you could extend the conclusions. of each version into a further argument? For example, there has been a suggestion that people who smoke shouldn't be given free health care on the grounds that they knowingly caused their ill-health. How does this fit with version 2? What about the argument that people who are damaged in some way after having taken a medical drug should be able to make a claim against the manufacturer of the drug? How does this fit with version 1? What about illegal drugs?¹⁰²

5- Rehearsing different scenarios

As you can see, the evaluation of arguments is essentially an imaginative enterprise. All the time, you are coming up with different possibilities, rehearsing different scenarios, looking at alternative lines of

¹⁰⁰ - Ibid., p.102

¹⁰¹ - Roy Van Den Brink-Budgen, Critical Thinking for Students; Learn the skills of critical assessment and effective argument, p.102

¹⁰² - Ibid., pp.102-103

reasoning, and seeing where small changes to the reasoning might lead. This imaginative quality should also be applied to your own work. Use the same questioning approach¹⁰³.

6- Asking evaluative questions

- Looking at the evidence that you have collected, what conclusion can it support?
- What further evidence is needed to produce a stronger conclusion?
- What assumptions do you have to make about the significance of the evidence you're using?
- If you know the sort of conclusion you want to be able to draw, what sort of evidence do you need which would do that?
- What possible counter-arguments can you think of which would seriously threaten your argument?
- How can you weaken these counter-arguments?¹⁰⁴

7- Ordering your material

As you now will see, by its emphasis on the rehearsal of alternative scenarios (what if things were different...?), critical thinking encourages imagination in your work. But it encourages something else as well: the good ordering of your material. By focusing your attention on the nature of argument, it requires you to have regard to the sequence of your material. Again certain questions need to be asked. The main question, however, is a simple one:

- What is the best sequence of reasoning for your material?

This question includes a number of sub-questions:

- (a) Does the reasoning build up its case in an effective sequence, each part adding something which is not already established?
- (b) If there are intermediate conclusions, do they fit as a useful sequence heading towards the main conclusion?
- (c) Is there a more effective way of presenting the argument, such that some parts should be expanded and others contracted?

¹⁰³- Ibid., p.113

¹⁰⁴- Roy Van Den Brink-Budgen, Critical Thinking for Students; Learn the skills of critical assessment and effective argument, p.114

(d) As you read through what you have written, can you see that what you are trying to argue - what you are trying to show or prove - is actually argued for? Does it read in a convincing way?¹⁰⁵

Being a critical thinker doesn't just mean being able to identify the strengths and weaknesses in other's arguments; it also means being able to produce greater strengths and avoid weaknesses in your own. If you can do both, you have learned to swim not only on the bedroom carpet but also in the imaginative possibilities of any ocean¹⁰⁶.

6-2: Practical Critical Thinking Examples in Everyday life¹⁰⁷.

Everyone knows that being a critical thinker is important, but what does that really mean? These practical Critical Thinking examples will demonstrate what it means to make informed choices, analyze information, and solve problems.

1-Critical Thinking on the Internet

The internet is a great place to practice critical thinking, since readers are constantly inundated with information and others' viewpoints. Deciding what to think and why you think it means you must analyze what you see and determine its source. Is it fake news? Consider these examples.

Politicians and Dead Elephants on Social Media

On social media, a friend shares a photo of a political candidate standing over a dead elephant. Your friend is outraged at the idea that this politician killed an elephant. It's tempting to take the picture at face value and share in your friend's emotional reaction.

However, as a critical thinker, you ask some important questions:

- Is this an opportunity to avoid groupthink, the tendency for a group of

¹⁰⁵ - Ibid., pp.114-115

¹⁰⁶ - Ibid., p.115

¹⁰⁷ - See:

- Kate Miller-Wilson, Practical Critical Thinking Examples in Everyday Life, At: <https://examples.yourdictionary.com/practical-critical-thinking-examples-in-everyday-life.html>

- <https://studiousguy.com/critical-thinking-examples-in-real-life/>

- <https://numberdyslexia.com/critical-thinking-examples-in-real-life/>

people to lose objectivity and think as one mind?

- Is this photograph manipulated? You know it is easy to change a photograph these days.
- Is there a reason someone would want you to think something negative about this politician?
- Does your friend usually check the validity of things before posting them?

A quick web search reveals that the photo was manipulated by the opponent of the political candidate. Your critical thinking saved you from spreading misinformation.

A Desperate Plea From a Friend

You open your email and discover a desperate letter from a friend you haven't talked to lately. In the letter, your friend says she was on vacation in Africa and ran into legal trouble. The authorities there are holding her prisoner, and if she can't find the money to pay the bail, she risks lifelong imprisonment. She begs you to help by sending money to a certain address.

Fortunately, you are a critical thinker and ask some questions before rushing to her aid:

- Is your friend even in Africa? You can easily call her or her family to find out.
- Does this email look like your friend's writing style? When you analyze it, you see there are many grammar errors and other mistakes.
- Who owns the address where you would send the money?

You search online and find out this is a phishing scheme to get money and personal information from people. Your friend isn't in Africa at all. Because you were a critical thinker and analyzed the email, you avoided losing money.

2- Examples of Critical Thinking in the Workplace

At work, critical thinking is essential for solving problems. Whether you work alone or with a team, you need to observe and analyze the issues you encounter. Then, you can come up with ways to improve the situation. These workplace critical thinking examples can show you how.

Not Enough Supply

Your small company makes custom notebooks for bird watchers with inserts designed for specific parts of the country. You promote your product as a great gift idea, and your holiday orders break your previous sales record. The problem is you don't have enough materials to fulfill your orders. You ask yourself some questions:

- What information is important here? You realize you are only missing the dividers for the notebooks.
- What can you infer? You remember that you heard about another supplier for the dividers.
- Will communication help? You call the other supplier.

After calling the other supplier, you find you can get the dividers you need to fulfill your holiday orders. You used critical thinking skills to solve the problem.

Product Launch Problems

You're a project manager at a pharmaceutical company, and you are managing the launch of a new product. The new equipment for producing the medication needs to be ready for production in a week, but the regulatory group doesn't want to sign off on the documentation until you do more testing. You're getting pressure from the directors to make sure everything is ready for the launch. You apply critical thinking practices:

- What is the root problem? The regulatory group wants more testing, but the team doesn't have time to get everyone to sign the documents again.
- Will communication help? You talk to the regulatory group and figure out exactly what kind of testing they need.
- How can you save time? You could call a meeting to have everyone sign the documents at once after the testing has been done.

You conduct the testing the regulatory group needs, call a meeting for everyone to sign, and meet your goal of launching the product on time. Your critical thinking skills helped you overcome this challenge.

3- Thinking Critically in the Classroom

Teaching critical thinking is especially important, and these examples can also function as lesson plans. There are lots of opportunities to help students learn to think like problem solvers.

Crazy Fashion Trends

Throughout time, people have chosen to follow fashion trends. Work with the class to list some of the crazy fashion trends that have come and gone, such as corsets, hoop skirts, poisonous makeup, and outlandish hairstyles. Ask them some important questions to encourage critical thinking:

- These trends seem silly now, but why did people engage in them at the time?
- Can students think of any trends like this that might be happening today?
- What are some ways to decide whether a trend is dangerous, harmful, or simply inconvenient in some way?

Fashion trends are a great example of bandwagon fallacy, the tendency for people to believe something is a good idea just because it is popular.

Truth in Advertising

Play a popular soft drink commercial for the students. Give everyone a sample of the soft drink in the ad and encourage them to think about how drinking it may or may not have changed their lives. Then, encourage critical thinking:

- What did the commercial say directly about the soft drink? What did it imply?
- Did the soft drink live up to the expectations laid out in the commercial?
- What is the main purpose of the advertisement?

As students answer these questions, they learn to be critical thinking consumers. They can also apply these skills to make informed decisions about news stories and other information they encounter.

4- Critical Thinking in Problem Solving

Suppose your manager asks you to find an effective solution to a problem that is affecting the business. What would be your first step? Like most people, you may also start looking for potential solutions to deal with that situation. Well, one requires the use of critical thinking here. Before looking for the solution one needs to take a step back and try to understand the cause of the problem first. One should ask for the opinions

of the other people that how does this particular problem impact them and the overall business. If you arrive at a solution, you should not only just rely on one solution, instead, you should always have various backup plans in case the first solution does not work as expected. Most people feel that they are great at problem-solving, but if one is not following all these above discussed steps before making a final judgement, he/she is not a critical thinker. Critical thinking allows people to find the best possible solution to any problem. Critical thinking is an important factor of problem-solving skills, one needs to look at any situation from multiple perspectives because in some cases, your decisions not only impact you but also the people in your surrounding.

5- Critical Thinking in Analysing Risks

Risk assessment is another important factor, which requires the use of critical thinking. Risk assessment is required in various sectors, from children analysing the impact of eating junk food on their health to large businesses in analysing the impact of certain policies on the growth of the company. Let us understand the implication of critical thinking in analysing the risks with some examples.

- While constructing a building, the engineers need to evaluate all the potential risks or hazards that could occur on the construction site to make sure that the workers can do their work safely. If the engineers or the project managers do not use critical thinking for analysing the potential risks, the chance of injuries or deaths of the workers is high, which may negatively impact the workforce and the reputation of the project managers.
- Before implementing certain rules or regulations, the government has to understand the various aspects such as the impact on people and the economy of the country due to that decisions. Decisions that may seem easier on paper may be a lot more difficult to implement in the real world and may lead to bad consequences if critical thinking is not used.
- In the financial sector, the authorities have to assess the influence of the current or the newly implemented policies on the clients. This requires various skills of critical thinking such as creativity to imagine the various scenarios that may arise, analysis of different laws and policies, and evaluating the responses of the existing clients to formulate better policies.

If the banks or the insurance companies do not use critical thinking, this may result in huge losses.

6- Critical Thinking in Hiring Employees

The ability to objectively view any situation without getting influenced by your personal beliefs or thoughts is one of the important characteristics of critical thinking. In business, the hiring managers require critical thinking to evaluate a large number of resume's to choose the suitable candidates for the required position. Critical thinking here enables the hiring managers not to hire a candidate on the basis of various factors like gender, age, religion or country, these factors may influence the hiring managers unconsciously. The hiring manager may tend to choose the candidate on his/her subjective beliefs if he/she does not use critical thinking. Hence, critical thinking can help HR's to hire the best employees that may eventually lead to the growth of the company.

7- Promoting the Teamwork

In a team, every individual is unique and has his/her different ideas to tackle the proposed problem. It is the responsibility of the team leader to understand the perspective of each member and encourage them to work collectively to solve the common problem. You may find the opinion of the other members of your team as ineffective, but instead of straightway denying their opinions one should logically analyse their suggestions and try to put your point of view regarding the problem in an effective and calm manner. If the team leader does not use critical thinking, instead, he/she boost his/her opinions on others, the team is sure to collapse.

8- Critical Thinking in Self-Evaluation

Critical thinking plays a major role in self-evaluation. The knowledge of critical thinking skills allows you to accurately analyse your performance by controlling various subjective biases. People should always evaluate their reactions towards any situation and the way they think, this may help them to get a deep insight into their thought processes, hence improving their thinking abilities to take accurate decisions. Self-evaluation is very important in professional life too. Suppose your manager has set a new target for the company. Every employee is thus required to analyse his/her contribution to the company and try to accomplish the set target. If you know your contribution to the company, it will help you to analyse your performance, and you can try to improve your performance in the areas where you lag.

9- Critical Thinking in Choosing the Career

Almost all of us face various dilemmas in our lives such as choosing the stream, the type of job, choosing between the regular college degree or the online programme. Whatever you choose, every option has its pros and cons. However, critical thinking allows us to accurately weigh the positives and negatives of each option and choose the one that offers more benefits than drawbacks. The best way to do this is to make a list of the pros and the cons and then analyse. Well, this is not just limited to choosing the career path, it can be used in other situations also such as professionally, and financially. One can list the pros and cons of selecting to work in a specific company or choosing the right insurance plan. It is often seen that our choices are greatly influenced by the choices of our friends or known, but one should understand that every individual's beliefs, desires, and ambitions are different so, if the particular career or job is best for the others it does not mean that it would be the best option for you also. Hence, to choose the right career path, one requires critical thinking.

10- Critical Thinking in Time Management

Time is the most valuable asset that we have, hence utilizing it appropriately is very crucial. Critical thinking in time management helps you to wisely plan your schedule according to the importance of the particular task or the activity. For example, if the task to which you devote most of your time, is not giving you much return then you need to reconsider your schedule and should devote more time to the tasks that give you high returns.

11- Critical Thinking in Data Analysis

Whether analysing the performance of the children in the schools or analysing the business growth of a multi-national company, the skill of data analysis is very crucial. In today's era, almost every sector demands experts that can accurately evaluate the available data or information and draw out effective conclusions from it. With the rise in technology, the various tasks of the data analysis such as finding profit and loss, creating balance sheets, and issuing invoices are done with the help of various software, but it does not mean that human skill is not required. Various kinds of software can just convert a large amount of data into some simpler and readable format, but it is the critical thinking of the humans

that is required to effectively interpret the data and apply the obtained insight for the benefits. The data analysis can even help us to estimate the future trends and potential risks of taking any decisions.

12- Critical Thinking in Analysing the Fake News

Suppose, one of your friends shares a piece of news with you. Do you bother to analyse that whether this piece of news is real or not? Many of us just believe in the news and shares this with others too without thinking that this can be fake news too. A study conducted by Stanford University showed that around 82 per cent of the teenagers failed to distinguish between the real news and the advertisement with the ‘sponsored content’ label. This problem arises because the standard education curriculum does not emphasise much on critical thinking skills much because of the assumption that critical thinking is inbuilt in every person. By introducing certain lessons or activities that may help to increase the knowledge or overall thinking skills, the critical thinking of the children can be improved. Well, it is also seen that not only children, but adults also fall for these fake news and articles that circulate on various social media platforms. Before believing any piece of information, one should think of various questions like the source of the publication, the intention of the article, the author of the article, and the agenda behind the article. Critical thinking helps us to precisely evaluate any information before straightway believing it.

13- Critical Thinking in Distinguishing between Right and Wrong

Most people, especially teenagers are very much conscious about what their friends or relatives think of their behaviour. You may have had been through the situation, wherein if your friends think that certain behaviour is cool then you start acting in that way to fit in your friend’s circle without even considering that what you are doing is good or bad, and is your actions are related to your beliefs or not? One should understand that if a certain behaviour seems cool to some people, it may also seem bad to some others. One should not change his/her actions depending upon the approval of certain people, rather one should look at the broader aspect and should deeply analyse that whether their actions are morally right or wrong.

14- Critical Thinking in Decoding Fashion Trends

Nowadays, some people are so crazy about following the latest fashion trends, they start following every trend that some popular actor, actress, or fashion influencer suggest. If you are a critical thinker you may have had thought of the questions like why the particular trend that was so popular a few years back seems foolish now? why does a particular trend that does not even look good is so popular? Do the particular fashion trend that suits the other person suits yourself or not? Critical thinking helps people from falling victim to the bandwagon fallacy; it is fallacy in which people starts believing a particular thing or idea as good or bad if the majority of the population thinks so. Fashion trends are a common example of bandwagon fallacy.

15- Critical Thinking in Choosing the Suitable Diet and Exercise

You must have heard of various types of diets such as the Keto diet, Whole 30 diet, Gluten-free diet, Vegan diet and so on. It seems complex to choose the diet that is best for you. What people usually do is that they search online, go through several videos and choose the diet that showed the best results to the person in the video. Well, this is not the right approach, choosing the best diet for yourself requires critical thinking. People who use critical thinking evaluate the pros and cons of the particular diet on their own body, they generally ask about the suitable diet from professional dieticians rather than just following the advice of a random person online. Like choosing a suitable diet, choosing a suitable exercise also demands critical thinking. For example, What are your goals? How can you achieve this? At what time you can do exercise? Do you have any injuries that may get affected by the particular exercise? People who use critical thinking tend to ask all these questions, and then by utilizing the knowledge they have and the following routine for a few weeks, and by analyzing the results they are getting from it, they finally plan a proper schedule for them.

16- Critical Thinking in Online Shopping

In today's digital era, online shopping is preferred by most people. However, there are various tactics and psychological tricks such as the anchoring effect, Stroop effect, and Serial position effect that are used by the various e-commerce websites, which makes the customers buy more things or things that they don't even need. Critical thinking can help

people to smartly buy items without falling victim to all these effects or tactics. While making the purchase you should focus on the price that you are paying for the particular item rather than the discount you are getting on that item because the chances are that the price that you are paying for that item is not worth paying even after the discount.

17- Critical Thinking in Job Search

Critical thinking plays an important role in the Job search. If you are applying for a job, you may consider the following points to get the desired job.

Use of Keywords in Resume: One should always understand the job post and its requirements before straightaway applying for the job. It is important to update your resume according to the job and add some keywords (mentioned in the job requirements) into your resume to get the job. If you possess some critical thinking skills such as problem-solving, analytical, communication, or creativity skills, it is better to put that in your resume. However, one should always restrain from adding any random critical thinking skills that you do not possess.

Cover Letter: Hiring managers receive hundreds of resumes daily, hence the chances that they will read every resume are quite less. Well, you can make your resume different from others by adding a good cover letter. You can add some of the critical skills that you have to your resume, it is better to explain a little about the tasks or activities where you showed these skills in your previous jobs or work experiences rather than just simply writing the skill. This assures the recruiter that you are not randomly writing the skills and you possess these qualities.

Interviews: Nowadays, some interviewers present the interviewees with hypothetical stories to check their critical thinking skills. You may be asked to explain what you think of the given situation or your first reaction after looking at the given image. You are required to solve any random problem, and then you have to explain to the recruiter about your thought processes. The interviewer here is more focused on the way you reach the conclusion rather than the conclusion itself. Your thought process helps the interviewer to analyse and evaluate the way you approach various problems

Therefore Critical thinking involves stopping to consider a situation before acting or forming a judgement. This can include problem solving, recognizing your value in a situation, and even healthy skepticism. People who practice critical thinking skills are taking an active role in the decisions they make.

6-3: Critical thinking For Problem Solving and decision making.

Thinking often begins with the emergence of a problem, or a dilemma related to one's biological, psychological or social side. We do not think about our stomach, usually, unless we feel pain in it. And the children alone are thinking about how to tie their shoes, and adults do this job without thinking about, until the shoelace is broken or lost. We think about our bank account when this account is broken or when we tell the bank's management that we are withdrawing more money than our balance. Thinking begins when the issue requires a response, or when the problem requires a solution or making a decision.

Human activity if directed to reach a certain goal, and then found a barrier to prevent him from reaching his goal, and did not have a response to prepare to face such a situation, we say that he has a problem. In our daily lives, we often face many situations in which we find some obstacles that impede the fulfillment of some of our motives or impede the fulfillment of some of our desires. Since man is always exposed to many such frustrations in his daily life, a large part of his daily behavior is usually directed to solving his problems.

In general, Problem solving and making a decision are generally regarded as the most important cognitive activities in everyday and professional contexts. The problem solving process consists of a sequence of stages that fit together depending on the type of problem to be solved. But whatever the problem, theoretical or practical grave or trivial, the thinking processes essentially the same and usually passes through the following stages that help you to express problems clearly and help you identify solutions:¹⁰⁸

2. ***Problem definition (Interest)***: the thinker becomes aware of the problem and his interest is aroused.
3. ***Problem analysis (Attention)***: the problem is formulated and the relevant data collected and examined.
4. ***Generate possible solutions (Suggestions)***: possible solutions to the problem begin to suggest themselves to the thinker.

¹⁰⁸- Jepson. R.W., Clear Thinking, p. 11-13

<https://www.ourcivilisation.com/smartboard/shop/jepsonrw/chap2.htm>

5. **Analyzing the solutions (Reasoning):** the consequences of each suggested solution are worked out.
6. **Selecting the solution (Conclusion):** the most satisfactory solution is adopted.
7. **Test:** the adopted suggestion is submitted to trial.

Here is a trivial situation which illustrates the process at work.

1. Jones looks at his watch. "Heavens, I shall be late for the meeting."
2. "How can I get to the Hall in time? It's now six o'clock and pouring with rain. The buses are full. Look at that long queue at the bus-stop. There's not a taxi in sight. Hallo, there's a subway to the Tube across the road."
3. "Train? Bus? Taxi? Tube?"
4. "Train? Shall I make a dash for it? No, I can't catch the 6.5 and I shall get wet. Bus or taxi? It looks pretty hopeless. Tube seems more promising."
5. "Tube it shall be."
6. "Here goes," and he dives down the subway.

Here is another example — this time a more serious problem presented to a medical officer. As you read it, try to pick out the same six stages in the development of its solution.

"A medical officer is summoned to investigate an epidemic of scarlet fever in a town of 20,000 inhabitants. His object is to discover the cause of the outbreak, in order if possible to remove it. He first has a list made of all the cases, with the addresses of the patients and the dates of their coming under medical supervision. There are in all 530 cases. These are not confined to one quarter of the town, but certain streets suffer very severely, although widely separated, while other streets close to one another scarcely suffer at all. Houses seem to be attacked rather than single individuals. There are many houses in which nearly every inmate, with the exception of those immune through having had the disease before, has fallen a victim. A fortnight before there were no cases at all in the town; for the last four days they have been occurring at the rate of over 80 a day."

[Such is the evidence before the Medical Officer. It has been collected by his co-workers. If he doubts either the capacity or the honesty of any one of them, he will, of course, first verify all the testimony received from him. In this case, we will assume that such verification is unnecessary.]

The officer now proceeds to frame a tentative or working hypothesis. Is it an instance of simple infection from patient to patient? This hypothesis is at once rejected because of the officer's past experience and the knowledge he has gained from the experience of other observers. It does not account for the suddenness of the outbreak, nor yet for the simultaneous seizure of whole families. An epidemic caused by repeated contact would be gradual, and would probably spread from district to district surely but slowly. The swift onslaught of the epidemic under consideration points to a cause affecting large numbers of people at one and the same time. So the officer frames another hypothesis. He has heard that at a village five miles away scarlet fever has occurred several times during the last few months. Once more the evidence is but testimony depending upon the authority of others, but there seems to be no reason to distrust it. This village sends milk to one of the chief milk distributors of the town. Accordingly the new hypothesis is that the epidemic is due to contaminated milk. The officer knows that outbreaks are often caused in this way. This hypothesis is tested by a deduction which will correspond to facts if the hypothesis be correct. If milk be the cause of the outbreak, the 'fever niap' will correspond to the 'round' of some milkman. Investigation shows that the infected houses are in every case supplied by the milkman who gets his milk from the infected village. The hypothesis is now almost certainly correct, but in order to be quite sure of his ground the officer makes inquiries at the suspected village, and finds one of the chief milkers suffering from scarlet fever in its most infectious stage. This man is isolated, the supply of milk from the village is suspended and the epidemic rapidly declines."

It should not have been difficult to follow the course of that investigation. I propose now to consider each stage in the thinking process separately and in greater detail:¹⁰⁹

• **STAGE I.** The first stage, in which the thinker's interest is aroused, is an indispensable preliminary to all purposive thinking. Mere curiosity is not enough to stimulate constructive thought. For example, we may

¹⁰⁹ - Jepson. R.W., Clear Thinking, p. 13-21

hear a strange sound which causes momentary curiosity, but our interest may not be aroused and we may dismiss the occurrence from our minds as being of no consequence to us. In these circumstances no thinking follows. Interest also is the secret of effective observation: it adds point to what we see; and the preexistence of interest is necessary to the acquisition and retention of any new knowledge.

STAGE 2. In the second stage the first step the thinker takes is to analyze the situation — to break it up into its constituent elements in order to separate those that do and those that do not present any difficulty. Then he proceeds as it were to crystallize the problem and to put it into words in the form of a question or in the case of a complicated problem of a series of questions. It is essential to the success of the whole operation that questions should be framed as clearly, as definitely, and as precisely as possible. Indeed in many problems this may be the crucial stage; for very often when we have got down to the heart of the problem and propounded the *fundamental* question which is causing perplexity, the solution will be reached without difficulty. Asking ourselves vague, indeterminate questions will lead us nowhere.

It is also very easy to confuse two questions that are rather like each other on the surface but fundamentally are very different. If, for example, we were interested in the problem of William Joyce ("Lord Haw-Haw") and wondered whether he was really guilty of high treason, we should be careful not to confuse that question with whether or not he deserved to be hanged, for that is really another matter. We should also beware of asking a question framed in such a way that it takes for granted the answer to another question which may in reality be the fundamental one. Until it has been proved beyond doubt that a man has been murdered, it will not lead a detective very far in the investigation of the cause of his death if he propounds to himself the question "*Who was the murderer?*" Complex questions should therefore be avoided. Again in some problematic situations, the question may be framed for us, and here it is essential that we should spend a little time in pondering over the terms carefully and in finding out exactly what is required. Examination candidates have often been known to come to grief because of failure or neglect to discover the point of a question, with the result that their answers are irrelevant, i.e., they collect the wrong data. Indeed, the data to be collected in the second part of this stage are the data which bear upon the question in which the problem has been formulated: facts acquire significance and importance *relative* to the questions asked. It is possible, however, that the significance of a fact does not appear until stages 3 and 4, when a

tentative solution or hypothesis may send the thinker back to stage 2 for a fact he has overlooked, or even to search for evidence that was not then apparent. For example, the medical officer, when reasoning out his second hypothesis, remembered that he had heard of cases of scarlet fever in a village five miles away from the town, and this fact immediately acquired significance in the light of this hypothesis. In *The Memoirs of Sherlock Holmes* there is an occasion when the famous detective poked about in the mud and unearthed a half-burnt wax vesta which proved to be the vital clue. The police inspector could not think how it had escaped him; but Holmes said he saw it only *because he was looking for it*. This is another example of the importance of knowing what we are looking for when we are collecting data — not only as here when we are relying upon personal observation, but also when, as we often have to do, we tap the experience of others by interrogating them in person or by referring to their written works. In either case ability to ask the right questions will serve us well in eliciting the relevant information we require. For example, in C. K. Chesterton's story, *The Invisible Man*, referred to on p. 109, if the question asked of the four observers had been more explicitly framed in this way, "*Has anyone, I do not mean anyone whom you suspect, but anyone at all, entered or left?*", then the answers might have been different. It is important, too, that when we have occasion to consult books of reference we should have very clearly at the back of our minds the purpose we have in view and the points on which we require enlightenment.

Fruitful discussion and argument depend largely on sticking to the point, and a necessary preliminary is the careful and precise definition of the issue in dispute. When the issue is formulated in words, it is important to avoid using vague, ambiguous or loose terms, or, if this is not possible, to define strictly the sense and application of such terms for the purpose of the discussion in hand. When the preliminary ground has been thus cleared, very often the cause of a dispute will disappear. It is no less important to see that the question in dispute when formulated does not rest on assumptions that one party or the other is not prepared to accept; for again very often the radical cause of difference may lie, not in the question itself, but in the assumptions on which it is based.

When the medical officer has propounded the problem, he proceeds to collect, or to have collected by his assistants, all the relevant information bearing on it — the number of cases, their geographical distribution, the

dates on which the cases were notified, etc. If necessary he would take steps to see that the information was verified; for he knows how essential it is that it should be based on facts and should be the result of accurate and objective observation. He would probably have the information classified, arranged and tabulated, and a large-scale map of the infected area made showing the distribution of the cases: he would thus have the data in a handy and accessible form for reference and consideration. As to what facts are relevant, his previous knowledge and experience of similar situations will have guided him. He knows, for instance, that the Christian names and surnames of the victims are not likely to have any significance, nor the fact that one infected district is a continuous row of houses with basements and another a tree-lined avenue of semidetached villas. He also realizes the importance of *negative* evidence, e.g., information about areas not visited by the epidemic.

In thus selecting the data for examination, the clear thinker is guided by two primary considerations — they must be based upon objective fact and they must be relevant. He does not allow his personal feelings to enter into his choice. He does not, after a casual glance at the evidence, jump to any conclusion, nor does he approach the problem with a preconceived opinion, with the result of confining his attention to those data only which seem to point to this conclusion or to confirm this opinion. In other words, he is not actuated by *prejudice*, but by a genuine desire to get at the truth. This second stage in the process of thinking is often made ineffective by prejudice, for prejudice tends to concentrate attention in one direction and to inhibit attention in others. The prejudiced person selects facts, not for their relevance, but because they fit in with preconceived opinion; and he shuts his eyes to inconvenient facts. Prejudice, too, may be operative at this stage in affecting the thinker's power of objective observation under its influence he may see, not what really exists, but what he wants to see; and his interpretations of his sense impressions will be coloured or distorted by his feelings.

In selecting data for examination we must also beware of other possible irrational influences. In much of our thinking, we are necessarily dependent on second-hand sources of information — on what we read in books or newspapers, on what we hear on the wireless, or on what we see on the cinematograph screen. Judging the value and validity of such evidence is no easy matter. To doubt everything and to believe everything we read, hear or see in these ways are equally convenient but equally irrational solutions, as both dispense with the necessity for reflection and circumspection. Nevertheless we need to be aware of the human

susceptibility to suggestion and reiteration which are part of the stock-in-trade of propagandists and used by them to influence our choice of facts and the course of our thinking generally.

I have mentioned two possible sources of data — the raw material, so to speak, used in the thinking process. There is a third — the knowledge stored in the mind and accumulated in the course of experience — the records not only of past personal observation, but of previous teaching, reading, study, and interchange of knowledge and ideas with others in the way of conversation and discussion. The value of such data will depend upon their reliability and that of the memory, for memory can magnify, minimize and distort. And their availability for use will depend upon the efficiency of the power of recall, on the way they are organized in the mind, and the kind of associatory links connecting them.

The thinker will also be able to put to use the judgments he has previously made: his previous experience will have furnished him with a number of general rules, formulae or principles which enable him not only to choose relevant data, but also to draw inferences from them and to extract *meaning* out of them, either taken separately or in conjunction. A detective, for example, in the course of his inquiries (*i.e.*, collection of data) has learnt that the man whose death he is investigating was an autocrat. From his experience he has formed a judgment or opinion of the sort of behavior to expect of an autocrat, *e.g.*, that he likes his own way, does not suffer fools gladly, is inconsiderate of other people's feelings, resists stubbornly when attacked, brooks no opposition, and so on. He says to himself, "Autocrats, from my knowledge and experience, act in such and such a way: the dead man was an autocrat; therefore probably he acted in one or other of these ways. Similarly a broken vase may mean to a detective that it had been knocked over by accident, or smashed in the course of a scuffle, or carelessly dislodged by a maid-servant, or hit by a ricochet bullet, or blown over by a sudden gust of wind. All these possibilities of meaning occur to him as a result of judgments he has made from previous experience, in which he has noted, not only facts, but also causes and effects, similarities, contrasts, degrees, differences, incompatibilities and relationships of all kinds. Which of these *meanings* is to be attached to the object in the particular case under investigation will depend upon other data and other judgments. One of the latter may have been, "Results such as the rucking of the carpet, the over-toppling of a chair, the spilling of ink, the disarrangement of papers, etc., frequently

follow scuffles in rooms like this one." If these phenomena were present as well as the broken vase, then he might make the inference that probably the vase was broken in the course of a scuffle. But he will not rule out the possibility that *all* these things were caused either by someone, perhaps the criminal, acting deliberately to cover up his tracks, or by a raving lunatic who had nothing whatever to do with the crime.

The processes just described are two: judgments, generalizations, formulae, principles, etc., are *arrived at* by INDUCTION, *i.e.*, the extraction of a general rule from a number of particular instances, and *applied* by DEDUCTION to the particular circumstances under investigation. There are two possibilities of error: if the generalization is based upon limited experience, it may be unreliable and thus diminish the reliability of deductions made from it; and if the generalization is incorrectly applied, the conclusions drawn will not be warranted and may be untrue. But the oftener a generalization is correctly applied and the conclusion drawn turns out to be true, the more reliable the generalization becomes, and, of course, vice versa.

Let me now sum up Stage 2. It can be called the *analytic* stage: the situation out of which the difficulty arises is broken up; the problem is isolated and formulated; the various facts and conditions bearing upon it are collected, verified, sorted, arranged, and examined; and their significance, singly or in groups, assessed in the light of previous judgments.

STAGE 3 The third stage is reached when possible solutions to the problem begin to suggest themselves to the thinker; but these will only occur after prolonged consideration of the data and their implications. In fact this and the previous stage tend to merge: data give rise to suggestions, and suggestions often cause the thinker to make further inquiries with the object of securing more data.

STAGE 4 There may also be considerable interplay between these last two stages and Stage 4, when the thinker reasons out the consequences of each suggestion in turn; for some suggestions may be dropped almost as soon as they occur, as happened to the suggestion that first occurred to the medical officer. The characteristic that marks Stage 4 is that it involves the use of a hypothetical form of argument. This begins with a supposition, *i.e.*, "*If X is true, then a, b, c, d, e, etc., follow.*" X is a suggestion that merits consideration as a possible solution and is now called a hypothesis. If the a, b, c, d, e, etc., that follow correspond with all the relevant data, and if the hypothesis covers and accounts for all the

perplexing elements which appeared when the situation was analyzed in Stage 2, then that hypothesis is worthy of acceptance in Stage 5 as a reasoned solution of the problem.

It is at this and the following stages that prejudice and other irrational influences may again be operative, both in the choice of hypotheses to be considered and in the final selection for acceptance. The clear thinker will choose a solution according to its tenability in relation to the facts and its power to account for them. The prejudiced person, on the other hand, is influenced by his feelings to choose the most agreeable or the most comfortable solution and to discard that which he dreads or dislikes. Other irrational people are apt to be influenced by all sorts of irrelevant considerations — they may, for example, choose a solution because it is novel, arresting, or sensational, or merely because it resembles other solutions recently arrived at in different situations, or because it exhibits striking coincidences, or because it seems to confirm suspicions widely spread or popularly held at the moment, or because it is in keeping with some pet superstition.

Thus at these stages also it is necessary to issue a warning against '*jumping to conclusions.*' It is true, as has already been pointed out, that sometimes the satisfactory solution may suggest itself unexpectedly; but judgment on a hypothesis thus suggested should be suspended until its consequences have been reasoned out in the way described in Stage 4.

STAGE 5 This stage is reached when the thinker is able to put together all the pieces of the jig-saw puzzle, so to speak, to create out of them a composite and meaningful whole, and thus to '*make sense*' of what at first was a perplexity or mystery. Hence it can be called the *synthetic* stage. It is at this stage that the detective reconstructs the crime he has been investigating, and in stories of detection he often combines it with Stage 6; *i.e.*, he assembles the persons involved, including the suspected culprit, to witness or hear his reconstruction and obtains confirmation of his solution when the guilty one confesses and is arrested, or commits suicide to avoid arrest.

STAGE 6: This procedure on the part of a detective is analogous to a 'controlled' experiment in a scientific laboratory, *i.e.*, an experiment in which all the ingredients and conditions of a problem are exactly reproduced to see if the same original situation is repeated. Failing the successful issue of such a test in actual experience there is no certitude

that the solution arrived at is the correct one. The greatest uncertainty will prevail where human beings and human relationships provide the raw material of the problem confronting the thinker, for not only are they infinitely variable and difficult to analyze or classify exhaustively, but they are not easy to weigh, calculate or assess with objective exactitude. No generalization concerning them can ever be otherwise than incomplete or at best more than a roughly approximate guide to future behavior or happenings. In human affairs the incalculable is always to be reckoned with and any general rules and principles can only be applied with allowances and reservations.

This uncertainty is often made an excuse for not coming to a conclusion at all, or for refusing to put a conclusion rationally reached to a practical test. Some people when faced with a choice of alternatives will not commit themselves to one or the other, either because they fear the unpleasant consequences of being wrong, or because they mistake the attitude of '*sitting on the fence*' for one of commendable impartiality. Others when faced with the consequences of a conclusion that appears to follow from a rational examination of the available facts shrink from putting it to a practical trial on the ground that '*it's all very well in theory, but it won't work in practice.*' If such are the results of '*thinking*' for such people, then it would be better if they saved themselves the trouble; for unless a conclusion is reached and used as the basis of subsequent action or further experiment, thinking is not complete and its primary object unattained. Those who suspend judgment indefinitely because immediate certainty is not attainable are waiting for the Greek Calends. The clear thinker suspends his judgment only as long as the circumstances of his problem permit, and no longer: when the time comes to act, he will act with courage and firmness, even if only on a balance of probabilities. He may be wrong, but it is better to be wrong than perpetually indecisive; and if he is wrong then, as Huxley says, some day he will be lucky enough to knock his head against a new fact that will set him right again. The clear thinker knows his task is never finished. He knows that there is no contradiction involved in making decisions and at the same time preserving an open mind. He knows that his judgments will have to be submitted to the test of new facts and new experience as they come along and be strengthened, modified, or abandoned accordingly.

Thus however careful, conscientious, and thorough the thinker's investigation may be, he may not arrive at the truth; but his solution may contribute to ultimate truth in one or other of the following ways: it may provide a further verification of an existent theory; it may modify or

correct such a theory in some detail; or it may prove to be the first step in the evolution of a new theory and thus make a new contribution to human knowledge. Clear thinking may not succeed in arriving at the truth; but the truth cannot be arrived at without clear thinking. Clear thought is not necessarily creative thought, but it is the first step and the indispensable preliminary to it.

Familiarity with the nature of thinking and what it involves is necessary not only that we may practice it ourselves in trying to solve the problems that confront us, but also that we may follow with understanding and critical appreciation the course and results of the thinking of others — especially of those whose discoveries and achievements in scholarship, philosophy and science have added to human knowledge and have been recorded for our use and benefit in the books they have written. When we read and study their works, we shall do so with better advantage, if we realize that their results have been achieved by the exercise of the same powers, though perhaps in a greater degree, as those which we seek to acquire in order to make the management of our own ordinary affairs more effective; and we shall be in a better position to evaluate their achievements, if we can follow closely in the tracks of the thinking by which they were arrived at.

Thinking process is not restricted to any particular field of study.

We should also realize and make use of the fact that the thinking process just described is not restricted to any particular field of study, but is an element common to all. Thinking follows the same lines, whether in Geometry or Geography, in Science or History, in Biology or Sociology, in the lecture room or in the laboratory; the procedures of induction and deduction apply equally to all; and 'hypothesis' and are not terms peculiar to the natural sciences. It is a great mistake to regard any of the processes of constructive thought as being the proprietary characteristic of any particular branch of learning or research. Knowledge is all one: thinking is the interchangeable handle to the tools used in its various branches; and the attainment of human welfare is the common integrating aim¹¹⁰.

¹¹⁰ - Jepson, R.W., Clear Thinking, p. 17

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