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CRITICAL THINKING IN SCIENCE AND HUMANITIES

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CRITICAL THINKING IN SCIENCE AND HUMANITIES

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Учебное пособие формирует базовые теоретические знания о научном мышлении, способствует расширению теоретических знаний и развитию практических навыков критического мышления посредством чтения, письма и коммуникации на английском языке в научной сфере.

Пособие предназначено студентам всех направлений подготовки и специальностей, обучающихся в магистратуре и изучающим английский язык в профессиональных целях. Пособие также рекомендовано студентам как гуманитарных, так и естественно-научных специальностей для развития навыков профессиональной коммуникации на английском языке в рамках спецкурсов по научной речи.

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Introduction

The purpose of this methodological publication is to develop critical thinking skills in students facing today's world of intercultural and professional communication with its rapidly increasing amount of information.

In the current sociocultural environment there is a demand for the formation of the ability to think clearly, accurately and logically, taking into account the opinions of other participants in discourse space.

This book serves as a manual aimed at developing automatizing reading, writing and communication skills in English in scientific and professional spheres.

The book contains three parts and an appendix. The first part includes theoretical information about the concept of *critical thinking*, its structure and specifics. The second and third parts present a generalized view of the two main divisions of the language of science – the exact sciences and the humanities – and offer a concise and systematized presentation of the material on the issues. The appendix consists of texts in English with assignments to reinforce theoretical material and to maintain final control.

The book is accompanied by the list of References in English and Russian.

Part I. Critical Thinking

1.1. Philosophy and Logical Reasoning

Since children's natural learning state is a philosophical attitude, by the time we start elementary school, we already have a few years of philosophical thinking under our belt. Unfortunately, the philosophical attitude is not always sustained beyond this point. Over time, we stop clarifying ideas because we might get discouraged from asking or we just get tired or complacent. We then begin to accept everything that we are told or shown by those around us, including what we watch on television or learn through social media. Once we stop filtering what we accept by means of questions, as we did when we were very small children, we become vulnerable to manipulation and deceit.

When we stop using questions to rationally discern among alternatives or to make judgments concerning disputed social problems, we begin to rely entirely on emotions or on past experience as the basis for our decisions and judgments. Asking questions to clarify ideas or seek the truth is fundamental to engaging in philosophy.

Although emotions are valid and worthwhile too, they can also be unreliable or lead us to make rash decisions. This may be somewhat inconsequential if we are simply buying something on impulse at the mall. But if we make judgments based purely on fear or anger, then emotions have much more dire consequences, perhaps causing us to mistreat or discriminate against others.

Past experience can also be misleading. Consider Jay, a university student, who has done very well in his first four university courses. He has found the courses relatively easy and not very demanding, so he assumes that all university courses are easy. He is then surprised when he discovers that Introduction to Physics is a challenging course, when he should have rationally recognized that undertaking a university education is a challenging task. Asking himself questions about the past courses – subject matter, professor, and so on – may help Jay adjust his expectations.

In short, the important points that we have discussed so far are:

1) philosophy is an activity of clarifying;

2) the goal of philosophy is to seek truth about all phenomena in our experience;

3) logic provides us with an effective method for undertaking the task of philosophy and discovering truths.

This view has thus remained mainstream in Western philosophy. When we think philosophically with regard to our mundane practical purposes, logic offers us the tools to break the habit of relying on our emotions, feelings, or our past experiences exclusively for making our decisions. Arriving at this recognition alone in your own case will be part and parcel of your journey [Postigo, Hardy, Foster 2015, эл. ресурс].

1.2. What is Critical Thinking

Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from various sources such as observation, experience, reflection, reasoning, or communication.

There are many different definitions of critical thinking as complex and multifaceted cognitive process. Here we list some of the well-known ones. It can be seen that they all emphasize the importance of clarity and rationality.

Critical thinking is often described through "reflective thinking": the ground or basis for a belief is deliberately sought and its adequacy to support the belief examined. This process is called reflective thought; it alone is truly educative in value.

In a seminal study on critical thinking and education in 1941, Edward Glaser defines critical thinking as follows “The ability to think critically, as conceived in this volume, involves three things:

1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences;

2) knowledge of the methods of logical inquiry and reasoning;

3) some skills in applying those methods.

Critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends. It also generally requires ability to recognize problems, to find workable means for meeting those problems, to gather and marshal pertinent information, to recognize unstated assumptions and values, to comprehend and use language with accuracy, clarity, and discrimination, to interpret data, to appraise evidence and evaluate arguments, to recognize the existence (or non-existence) of logical relationships between propositions, to draw warranted conclusions and generalizations, to put to test the conclusions and generalizations at which one arrives, to reconstruct one's patterns of beliefs on the basis of wider experience, and to render accurate judgments about specific things and qualities in everyday life" [Defining Critical Thinking, эл. ресурс].

The authors of a well-known psychological test of critical thinking ability (Watson-Glaser) define critical thinking as a composite of attitudes, knowledge and skills. This composite includes:

1) attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true;

2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; 3) skills in employing and applying the above attitudes and knowledge» [Psychometric Properties of Watson-Glaser Critical Thinking Appraisal for a Sample of Education Majors 2003, эл. ресурс].

A very well-known and influential definition of critical thinking is given by Robert Ennis: "critical thinking is reasonable reflective thinking that is focused on deciding what to believe or do [Ennis 2011, эл. ресурс].

One more definition comes from a statement written in 1987 by Michael Scriven and Richard Paul, National Council for Excellence in Critical Thinking, an organization promoting critical thinking in the US: "Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. It entails the examination of those structures or elements of thought implicit in all reasoning: purpose, problem, or question-at-issue, assumptions, concepts, empirical grounding; reasoning leading to conclusions, implications and consequences, objections from alternative viewpoints, and frame of reference. It entails the examination of those structures or elements of thought implicit in all reasoning: purpose, problem, or question-at-issue; assumptions; concepts; empirical grounding; reasoning leading to conclusions; implications and consequences; objections from alternative viewpoints; and frame of reference. Critical thinking – in being responsive to variable subject matter, issues, and purposes – is incorporated in a family of interwoven modes of thinking, among them: scientific thinking, mathematical thinking, historical thinking, anthropological thinking, economic thinking, moral thinking, and philosophical thinking.

Critical thinking can be seen as having two components:

1) a set of information and belief generating and processing skills;

2) the habit, based on intellectual commitment, of using those skills to guide behavior.

It is thus to be contrasted with:

1) the mere acquisition and retention of information alone, because it involves a particular way in which information is sought and treated;

2) the mere possession of a set of skills, because it involves the continual use of them;

3) the mere use of those skills ("as an exercise") without acceptance of their results.

Critical thinking varies according to the motivation underlying it. When grounded in selfish motives, it is often manifested in the skillful manipulation of ideas in service of one's own, or one's groups', vested interest. As such it is typically intellectually flawed, however pragmatically successful it might be. When grounded in fairmindedness and intellectual integrity, it is typically of a higher order intellectually, though subject to the charge of "idealism" by those habituated to its selfish use.

Critical thinking of any kind is never universal in any individual; everyone is subject to episodes of undisciplined or irrational thought. Its quality is therefore typically a matter of degree and dependent on, among other things, the quality and depth of experience in a given domain of thinking or with respect to a particular class of questions. No one is a critical thinker through-and-through, but only to such-and-such a degree, with such-and-such insights and blind spots, subject to such-and-such tendencies towards self-delusion. For this reason, the development of critical thinking skills and dispositions is a life-long endeavor" [Defining Critical Thinking, эл. ресурс].

Critical thinking is also possible to define as:

1) purposeful, reflective, reasonable, and self-regulatory process of thinking out possible explanations for findings and outcomes and determining how compatible the explanations are, with attention to the evidential, conceptual, methodological, "criteriological" and contextual considerations upon which judgment is based.

2) the art of analyzing and evaluating thinking with the intention of improving it.

3) discerning judgment.

One more idea comes from Peter A. Facione's report for the American Philosophical Association: "We understand critical thinking to be purposeful, self-

regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. Critical thinking is essential as a tool of inquiry. As such, critical thinking is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, critical thinking is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing critical thinking skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society" [Facione 1990, эл. ресурс].

Another brief conceptualization of critical thinking was given by Linda Elder, in 2007: “Critical thinking is self-guided, self-disciplined thinking which attempts to reason at the highest level of quality in a fair-minded way. People who think critically consistently attempt to live rationally, reasonably, empathically. They are keenly aware of the inherently flawed nature of human thinking when left unchecked. They strive to diminish the power of their egocentric and sociocentric tendencies. They use the intellectual tools that critical thinking offers – concepts and principles that enable them to analyze, assess, and improve thinking. They work diligently to develop the intellectual virtues of intellectual integrity, intellectual humility, intellectual civility, intellectual empathy, intellectual sense of justice and confidence in reason. They realize that no matter how skilled they are as thinkers, they can always improve their reasoning abilities and they will at times fall prey to mistakes in reasoning, human irrationality, prejudices, biases, distortions, uncritically accepted social rules and taboos, self-interest, and

vested interest. They strive to improve the world in whatever ways they can and contribute to a more rational, civilized society. At the same time, they recognize the complexities often inherent in doing so. They avoid thinking simplistically about complicated issues and strive to appropriately consider the rights and needs of relevant others. They recognize the complexities in developing as thinkers, and commit themselves to life-long practice toward self-improvement. They embody the Socratic principle: the unexamined life is not worth living, because they realize that many unexamined lives together result in an uncritical, unjust, dangerous world" [Defining Critical Thinking, эл. ресурс].

Critical thinking should not be confused with being argumentative or being critical of other people. Although critical thinking skills can be used in exposing fallacies and bad reasoning, critical thinking can also play an important role in cooperative reasoning and constructive tasks. Critical thinking can help us acquire knowledge, improve our theories, and strengthen arguments. We can use critical thinking to enhance work processes and improve social institutions.

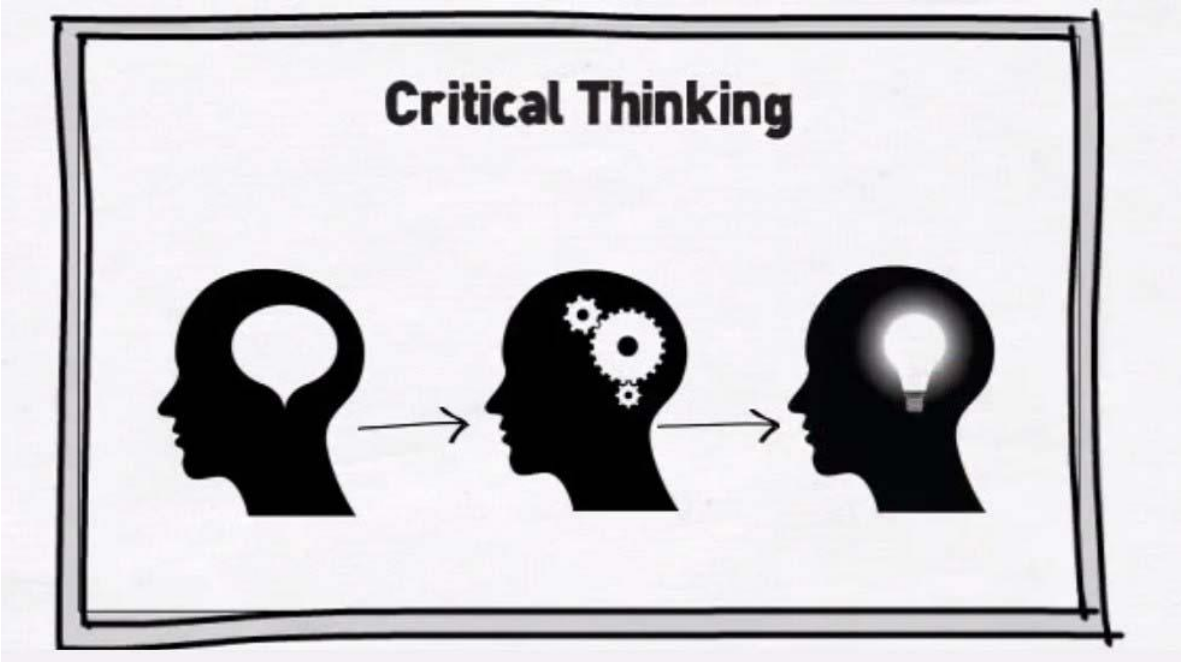
Some people believe that critical thinking hinders creativity because it requires following the rules of logic and rationality, but creativity might require breaking rules. This is a misconception. Critical thinking is quite compatible with thinking "out-of-the-box", challenging consensus and pursuing less popular approaches. If anything, critical thinking is an essential part of creativity because we need critical thinking to evaluate and improve our creative ideas.

In other words, critical thinking is:

1) analytical, judgmental, and selective: when you are thinking critically, you are making choices;

2) generative, nonjudgmental, and expansive: when you are thinking creatively, you are generating ideas;

3) a valuable part of thinking (see Picture 1).



[https://www.rpcleadershipassociates.com/index.php/blog/i-can-explain-it-to-you]

1.3. The Importance of Critical Thinking

Why should you care about critical thinking? What can it offer you? Suppose you must make an important decision – about your future career, the person with whom you might want to spend the rest of your life, your financial investments, or some other critical matter. What considerations might come to mind? Perhaps you would wonder whether you need to think about it at all or whether you should just, as the old saying goes, "follow your heart." In doing so, you are already clarifying the nature of your decision: purely rational, purely emotional, or a combination of both.

Critical thinking involves carefully assessing information and its sources. In following this proccess you are already starting to think critically. First you started by asking questions. Once you examine the answers, you would then assess whether this information is sufficient, and perhaps proceed to research further information from reliable sources. Note that in all of these steps, you are making distinctions: You would distinguish between relevant and irrelevant questions, and from the relevant questions, you would distinguish the clear and precise ones from the others. You also would distinguish the answers that are

helpful from those that are not. And finally, you would separate out the good sources for your research, leaving aside the weak and biased ones.

Making distinctions also determines the path that your examination will follow, and herein lies the connection between critical thinking and logic. If you decide you should examine the best reasons that support each of the possible options available, then this choice takes you in the direction of logic. One part of logical reasoning is the weighing of evidence. When making an important decision, you will need to identify which factors you consider favorable and which you consider unfavorable.

Consider the following scenario. You are 1 year away from graduating with a degree in business. However, you have a nagging feeling that you are not cut out for business. Based on your research, a business major is practical and can lead to many possibilities for well-paid employment. But you have discovered that you do not enjoy the application or the analysis of quantitative methods – something that seems to be central to most jobs in business. What should you do?

Many would seek advice from trusted people in their lives – people who know them well and thus theoretically might suggest the best option for them. But even those closest to us can offer conflicting advice. A practical parent may point out that it would be wasteful and possibly risky to switch to another major with only 1 more year to go. A reflective friend may point out that the years spent studying business could be considered simply part of a journey of self-discovery, an investment of time that warded off years of unhappiness after graduation. In these types of situations, critical thinking and logical reasoning can help you sort out competing considerations and avoid making a haphazard decision.

We all find ourselves at a crossroads at various times in our lives, and whatever path we choose will determine the direction our lives will take. Some rely on their emotions to help them make their decisions. Granted, it is difficult to deny the power of emotions. We recall more vividly those moments or things in our lives that have had the strongest emotional decision while you were experiencing strong emotions? Relying on our emotions to make decisions undermines

our ability to develop confidence in our rational judgments. Moreover, emotional decisions cannot typically be justified and often lead to regret.

Many interpret gut feelings as revelations of what they need to do. It is thus easy to assume that emotions can lead us to truth. Indeed, emotions can reveal phenomena that may be otherwise inaccessible. Empathy, for example, permits us to share or recognize the emotions that others are experiencing.

The problem is that, on their own, emotions are not reliable sources of information. Emotions can lead you only toward what feels right or what feels wrong – but cannot guarantee that what feels right or wrong is indeed the right or wrong thing to do. For example, acting selfishly, stealing, and lying are all actions that can bring about good feelings because they satisfy our self-serving interests. By contrast, asking for forgiveness or forgiving someone can feel wrong because these actions can unleash feelings of embarrassment, humiliation, and vulnerability.

Sometimes emotions can work against our best interests. For example, we are often fooled by false displays of goodwill and even affection, and we often fall for the emotional appeal of a politician's rhetoric.

The best alternative is the route marked by logical reasoning, the principal tool for developing critical thinking. The purpose of this book is to help you learn this valuable tool. You may be wondering, "What's in it for me?" For starters, you are bound to gain the peace of mind that comes from knowing that your decisions are not based solely on a whim or a feeling but have the support of the firmer ground of reason. Despite the compelling nature of your own emotional barometer, you may always wonder whether you made the right choice, and you may not find out until it is too late. Moreover, the emotional route for decision making will not help you develop confidence in your own judgments in the face of uncertainty.

In contrast, armed with the skill of logical reasoning, you can lead a life that you choose and not a life that just happens to you. This power alone can make the difference between a happy and an unhappy life. Mastering critical

thinking results in practical gains – such as the ability to defend your views without feeling intimidated or inadequate and to protect yourself from manipulation or deception. This is what's in it for you, and this is only the beginning [Postigo, Hardy, Foster 2015, эл. ресурс].

Now let's move towards the parameters that prove the importance of critical thinking:

- **Critical thinking is a domain-general thinking skill**. The ability to think clearly and rationally is important whatever we choose to do. If you work in education, research, finance, management or the legal profession, then critical thinking is obviously important. But critical thinking skills are not restricted to a particular subject area. Being able to think well and solve problems systematically is an asset for any career.

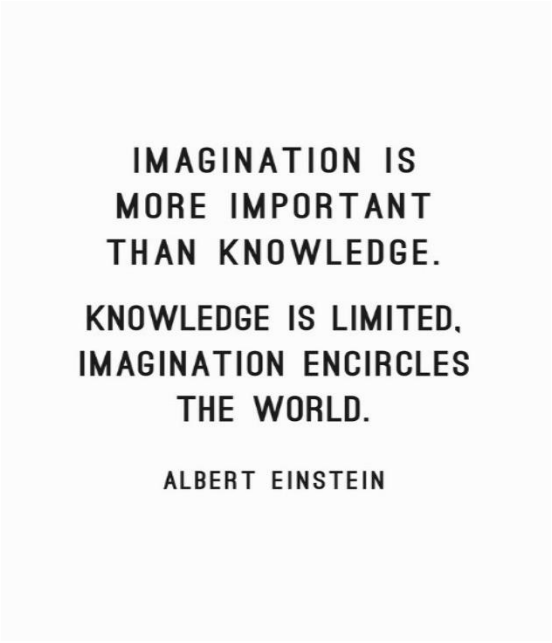
- **Critical thinking is very important in the new knowledge economy.** The global knowledge economy is driven by information and technology. One has to be able to deal with changes quickly and effectively. The new economy places increasing demands on flexible intellectual skills, and the ability to analyze information and integrate diverse sources of knowledge in solving problems. Good critical thinking promotes such thinking skills, and is very important in the fast-changing workplace (see Picture 2).

Picture 2

[https://www.freepik.com/premium-ai-image/decoding-global-economy_147624641.htm]

- **Critical thinking enhances language and presentation skills**. Thinking clearly and systematically can improve the way we express our ideas. In learning how to analyze the logical structure of texts, critical thinking also improves comprehension abilities.
- **Critical thinking promotes creativity**. To come up with a creative solution to a problem involves not just having new ideas. It must also be the case that the new ideas being generated are useful and relevant to the task at hand. Critical thinking plays a crucial role in evaluating new ideas, selecting the best ones and modifying them if necessary (see Picture 3):

Picture 3



[https://www.photocircle.net/eu/photos/photocircle-/119358-Imagination-is-more-important-than-knowledge]

- **Critical thinking is crucial for self-reflection**. In order to live a meaningful life and to structure our lives accordingly, we need to justify and reflect on our values and decisions. Critical thinking provides the tools for this process of self-evaluation.
- **Good critical thinking is the foundation of science and democracy**. Science requires the critical use of reason in experimentation and theory confirmation. The proper functioning of a liberal democracy requires citizens who can

think critically about social issues to inform their judgments about proper governance and to overcome biases and prejudice.

Everyone thinks: it is human's nature to think critically. But much of our thinking, left to itself, is biased, distorted, partial, uninformed or down-right prejudiced. Yet the quality of our life and that of what we produce, make, or build depends precisely on the quality of our thought. Shoddy thinking is costly, both in money and in quality of life. Excellence in thought, however, must be systematically cultivated.

Critical thinking is that mode of thinking – about any subject, content, or problem – in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them.

Critical thinking is, in short, self-directed, self-disciplined, self-monitored, and self-corrective thinking. It presupposes assent to rigorous standards of excellence and mindful command of their use. It entails effective communication and problem-solving abilities and a commitment to overcome our native egocentrism and sociocentrism [Defining Critical Thinking, эл. ресурс].

1.4. The Structure of Critical Thinking

Critical thinking can be characterized by the following features:

1) **Inquisitiveness and Curiosity**: Asking questions and seeking new information. Both curiosity and inquisitiveness refer to a strong desire to learn, explore, and understand new information or experiences. They are often used interchangeably and share the common trait of eagerness to acquire knowledge. Curiosity is often characterized as the motivation or desire to acquire worthwhile epistemic goods. It is more about the internal drive to learn and understand, rather than the specific actions taken to satisfy that drive. Curiosity can be seen as a passive state of wanting to know more. Inquisitiveness is more actively oriented

and involves the action of questioning and investigating. Inquisitiveness is about engaging in activities such as asking questions, seeking answers, and exploring subjects of interest. It is a more active and engaged form of curiosity

2) **Clarity and Precision**: Expressing thoughts and ideas clearly and precisely. Clarity and precision are the cornerstone of effective communication. They ensure that the message is conveyed accurately and understood by the audience without ambiguity.

3) **Logical Coherence**: Maintaining logical consistency in arguments and reasoning. Logical coherence refers to the quality of being logically integrated, consistent, and intelligible. It involves the logical connections and consistency within a set of ideas, statements, or propositions. This means that the elements of the text or argument must fit together well to form a unified whole. Logical coherence is about ensuring that ideas, statements, or propositions are logically connected, consistent, and intelligible, whether within a small section of text or across the entire work. This concept is vital for effective communication, clear thinking, and the construction of robust arguments. Logical coherence is crucial in various fields, including literature, philosophy, and communication. It ensures that arguments are well-structured, clear, and persuasive.

4) **Tolerance for Ambiguity**: Dealing with ambiguity and doubt as part of the critical thinking process. Tolerance for ambiguity is a psychological construct that describes an individual's ability to cope with and navigate situations characterized by uncertainty, complexity, and a lack of clear information or structure. Tolerance for ambiguity refers to the ability to accept and function effectively in situations marked by uncertainty, complexity, and ambiguous information. It involves the capacity to perceive ambiguous situations as desirable or at least manageable, rather than as threats or sources of discomfort. Individuals with high tolerance for ambiguity tend to exhibit positive outcomes such as increased creativity, better teamwork, and greater adaptability. Conversely, those with low tolerance often experience anxiety, interpret ambiguity as a threat, and

may exhibit prejudicial beliefs and rigid thinking. In summary, tolerance for ambiguity is a valuable trait that enables individuals to navigate complex and uncertain situations effectively, fostering a more open-minded, adaptable, and inclusive approach to various aspects of life and work.

Next, the key components of critical thinking are:

1. **Questioning and Analysis**: Critical thinking involves questioning assumptions, analyzing information, and breaking down complex problems into manageable components. Effective questioning is a crucial strategy in education and critical thinking, and it involves several key components and techniques to foster deep understanding, critical thinking, and active learning. Analysis is a comprehensive and detailed examination of complex information or data to understand its nature, identify patterns, and draw meaningful conclusions. In short, analysis is a multifaceted process that can be approached through various types and methodologies, each serving different purposes and offering unique insights into complex data or information.

2. **Evaluation**: It requires evaluating arguments, evidence, and justifications to form sound conclusions or informed choices. This includes detecting inconsistencies and common mistakes in reasoning. Evaluation is a systematic process used to assess the merit, worth, or significance of various entities, such as programs, interventions, educational systems, or policies.

3. **Reflective Thinking**: Critical thinkers reflect on their own thought processes, actions, and outcomes to gain deeper understanding and improve future performance. This involves critically examining one's own assumptions and cognitive biases. Reflective thinking (also known as reflective practice or critical reflection) is a process of intentional and systematic examination of one's own thoughts, experiences, and actions to gain deeper insights and improve future decision-making. Reflective thinking involves consciously analyzing and evaluating one's own thoughts, experiences, and actions. It is a dynamic process that helps individuals make sense of their experiences, identify strengths and weaknesses, and plan for future improvements.

4. **Synthesis**: Critical thinking involves synthesizing information from various sources to form a coherent understanding of a problem. synthesis is a powerful thinking skill that enables individuals to create new meanings, structures, and solutions by integrating various elements. It is essential in education, design thinking, and academic writing, and it requires flexible, creative, and original thinking.

We should note that critical thinking is not about being negative or argumentative; it is about making reliable judgments based on reliable information. Critical thinking is not synonymous with good thinking or having a good memory; it involves a specific set of skills and attitudes.

Critical thinking is not limited to academic contexts but is essential in everyday life, higher education, and professional settings. It helps in making informed decisions, improving problem-solving skills, and enhancing data-driven decision-making abilities.

In summary, critical thinking is a disciplined and systematic approach to evaluating and analyzing information to form sound judgments and make informed decisions.

1.4. A Critical Thinker

Critical thinking is the ability to think clearly and rationally about what to do or what to believe. It includes the ability to engage in reflective and independent thinking.

Someone with critical thinking skills is able to do the following:

- understand the logical connections between ideas;
- identify, construct and evaluate arguments;
- detect inconsistencies and common mistakes in reasoning;
- solve problems systematically;
- identify the relevance and importance of ideas;
- reflect on the justification of one's own beliefs and values.

Critical thinking is not a matter of accumulating information. A person with a good memory and who knows a lot of facts is not necessarily good at critical thinking.

A critical thinker is able to deduce consequences from what he knows, and he knows how to make use of information to solve problems, and to seek relevant sources of information to inform himself (see Picture 4):

Picture 4

[https://www.istock-photo.com/ru/%D0%B8%D0%BB%D0%BB%D1%8E%D1%81%D1%82%D1%80%D0%B0%D1%86%D0%B8%D0%B8/logic-thinking]

A well-cultivated critical thinker:

1) raises vital questions and problems, formulating them clearly and precisely;

2) gathers and assesses relevant information, using abstract ideas to interpret it effectively;

3) thinks open-mindedly within alternative systems of thought, recognizing and assessing as need be assumptions as well as implications and consequences from interpretations and inferences;

4) comes to well-reasoned conclusions, testing them against relevant criteria and standards;

5) communicates effectively with others to figure out solutions to problems.

The following skills and abilities are necessary for a critical thinker:

• **Analytical Thinking**: Evaluating data from multiple sources, identifying patterns and trends, and recognizing cause-and-effect relationships.

• **Problem-Solving**: Solving problems systematically and making use of information to deduce consequences and solve issues.

• **Argumentation**: Identifying, constructing, and evaluating arguments, including recognizing the relevance and importance of ideas.

• **Open-Mindedness and Skepticism**: Being open to different perspectives, valuing fair-mindedness, and respecting evidence and reasoning [How to think effectively: Six stages of critical thinking, эл. ресурс].

Becoming a Critical Thinker

By now it should be clear that critical thinking is an important life skill, one that will have a decisive impact on our lives. It does not take luck or a genetic disposition to be a critical thinker. Anyone can master critical thinking skills. So how do you become a critical thinker?

Logical reasoning is described as the main tool for critical thinking. Thus, the most fundamental step in becoming a critical thinker is to recognize the importance of reason as the filter for your beliefs and actions. Once you have done this, you will be in the right frame of mind to start learning about logic and identify what tools of logic are at your disposal.

It is also important to note that becoming a critical thinker demands intellectual modesty. We can understand intellectual modesty as the willingness to put our egos in check because we see truth seeking as a far greater and more satisfying good than seeking to be right. Critical thinkers do not care about seeking approval by trying to show that they are right. They do not assume that disagreement reflects a lack of intelligence or insight. Being intellectually modest

means recognizing not only that we can make mistakes, but also that we have much to learn. If we are:

(a) aware that we are bound to make mistakes and that we will benefit when we recognize them;

(b) willing to break old habits and embrace change; and, perhaps most importantly;

(c) genuinely willing to know what others think, then we can be truly free to experience life as richly and satisfactorily as a human being can [Postigo, Hardy, Foster 2015, эл. ресурс].

1.5. Critical Thinking VS Scientific Thinking

Thinking deeply about things is a defining feature of what it means to be human, but, surprising as it may seem, there isn't just one way to 'think' about something; instead, humans have been developing organized and varied schools of thought for thousands of years.

Discussions about morality, religion, and the meaning of life often drive knowledge-seeking inquiry, leading people to wonder what the difference is between critical thinking and Scientific Thinking.

Critical thinkers prioritize objectivity to analyze a problem, deduce logical solutions, and examine what the ramifications of those solutions are.

While scientific thinking often relies heavily on critical thinking, scientific inquiry is more dedicated to acquiring knowledge rather than mere abstraction.

There are a lot of nuances between critical thinking and scientific thinking, and most of us probably utilize these skills in our everyday lives. The rest of this article will thoroughly define the two terms and relate how they are similar and different.

What Is Critical Thinking?

Critical thinking is a mindset— a lens, if you will, through which one may view the world. Critical thinkers rely on a lot of introspection, constantly self-evaluating how they came to a conclusion, and what that conclusion naturally entails.

A critical thinker may discern what they already know about a subject, what that information suggests, why that information is relevant, and how that information could be linked to further lines of inquiry. Critical thinking is, therefore, simply the ability to think clearly and logically.

Systematic reasoning is prized over gut instinct, and determining relevance is crucial to parsing out useful data from extraneous information.

Naturally, the ability to think critically is highly prized in an academic setting, and most educators seek to enable their students to think critically.

What is the link between the styles and motivations of these two Romantic era poets? How can your current understanding of algebra be applied to geometry? How does our understanding of this historical figure influence our understanding of social life at the time?

So much information can be interlinked to develop our understanding of the world, and critical thinking is the basis for using objectivity to not only establish likely outcomes to a scenario, but also inquire on the repercussions of that outcome and reflect on the process by which one came to that conclusion.

What Is Scientific Thinking?

The objective of scientific thinking is the acquisition of knowledge. The more we know, the more we can hope to know.

Scientific thinking begins by imagining what the outcome of a problem may be, observing the situation, and then making notes and changing the initial hypothesis.

The commonly used scientific method is as follows:

1. Define the purpose of the experiment.
2. Formulate a hypothesis.
3. Study the phenomenon and collect data.
4. Draw results.

As you might imagine, this process can be repeated ad infinitum. So, you draw a conclusion that's scientifically verifiable? Great! Now you can take that conclusion and use it as a basis for a new experiment. Of course, the scientific method has limits.

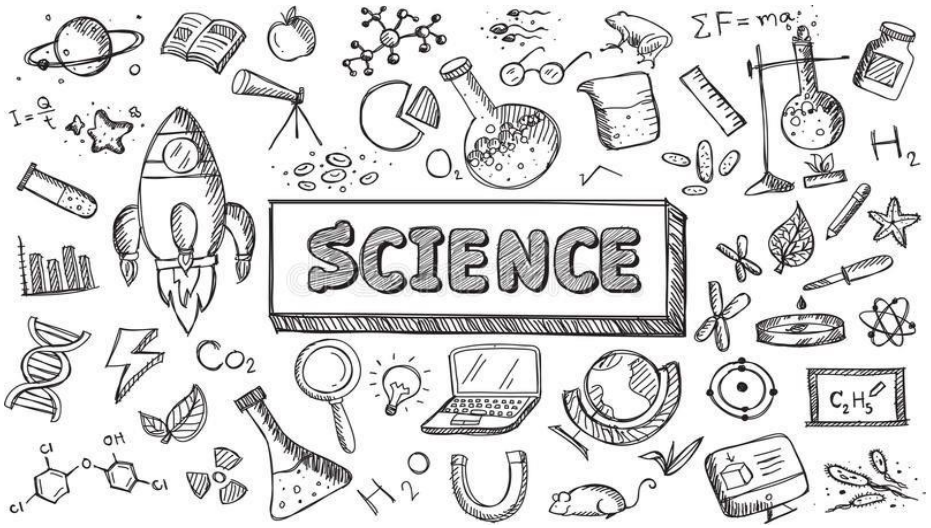
It's hard to apply the scientific method when it comes to morality or religious beliefs. A revelation of a prophet cannot be empirically verified.

We can't go inside said prophet's mind and see exactly what neurons were firing to recreate the conditions under which the vision was made, and even if we could, the nature of such a revelation is spiritual and immaterial.

It's impossible to influence the supernatural in the material world, and as such, creating a test that relies on changing something to see the outcome is impossible. Where scientific thinking does excel is in the fields of math and, well, science.

Physics is known as the perfect science because the forces that comprise our world are well understood and don't tend to exhibit anomalies, making the empirically verified scientific method perfect for improving our understanding of the natural world (see Picture 5).

Picture 5



[https://fi.pinterest.com/pin/276127020892389398/]

How Are Critical Thinking and Scientific Thinking Similar and Different?

Both critical and scientific thinking rely on the use of empirical, objective evidence. Thinking scientifically or critically relies on using the data available and following it to its likely conclusion.

Scientific thinking can be seen as a stricter, more regulated version of critical thinking. It takes the tenets of critically thinking and narrows the focus.

Both fields of study eschew personal bias and gut instinct as both unreliable and unhelpful.

The main difference between the two, however, is the goal of each discipline. While both prioritize learning and using data to make hypotheses, critical thinking is prone to much more abstraction and self-reflection.

With little variation in the scientific method, there's not really any need to reflect on how those conclusions were drawn or if those conclusions are a result of any kind of bias. It's just not useful information.

For a critical thinker, however, self-reflection is key to identifying inconsistencies and refining one's argument.

Both scientific thinking and critical thinking tend to draw links between concepts, evaluating how they are related and what knowledge may be gleaned from that connection.

While critical thinking can be applied to most concepts, even those of morality and anthropology, scientific thinking is often problem oriented. If a problem exists, scientific inquiry attempts to gain the necessary information to solve it, overcoming obstacles along the way.

To conclude, both critical thinkers and scientific thinkers may very well end up at the same conclusion – they will just draw those conclusions differently. Critical thinkers are concerned with logic, order, and rational thinking.

Establishing already-understood information, applying that information to a query, and then establishing a defensible argument on the accuracy and relevance of the conclusion is the trademark of a critical thinker. Scientific thinkers, on the other hand, work towards solving knowledge almost exclusively through the acquisition of knowledge through the scientific method.

Scientific thinkers develop a hypothesis, test it, and then rinse and repeat until the phenomenon is understood. As such, scientific thinkers are obsessed with why questions. Why does this phenomenon happen? Why does matter behave like this? In the end, both schools are thought have a lot of interesting ideas guiding them, and most of us probably use them throughout our daily lives [What's the Difference Between Critical Thinking and Scientific Thinking, эл. ресурс].

1.6. Critical Thinking VS Creative Thinking

When it comes to critical thinking and creative thinking, there seems to be a lot of confusion about what the two actually are. Most people view critical and creative thinking as the same thing. However, this is not true.

Critical thinking is essential for making sound decisions in the workplace and personal life.

Creative thinking is important for coming up with new ideas and solutions.

The Difference between Critical and Creative Thinking: If you ask two different people to define critical thinking and creative thinking, you will likely get two very different answers. This is because critical thinking and creative thinking are two very different things.

Critical thinking is the ability to analyze a situation and make a judgment based on facts and data. Creative thinking on the other hand refers to the ability to come up with new ideas or rather solutions.

Critical thinking is focused on logic and reasoning, while creative thinking is more about imagination and innovation. Critical thinking is analytical, while creative thinking is intuitive. Critical thinkers are often skeptical and questioning, while creative thinkers are more open-minded.

Essentials of Critical and Creative Thinking

There are certain essentials that are needed for critical and creative thinking. Some of the essentials of critical thinking include:

- The ability to think logically and critically about a situation.
- The ability to identify bias, fallacies, and other forms of error in reasoning.
- The ability to make sound judgments based on facts and data.
- The ability to think objectively and see both sides of an issue.

Some of the essentials of creative thinking include:

- The ability to come up with new ideas or solutions.
- The ability to think outside the box.
- The ability to be open-minded and embrace change.
- The ability to take risks.

Why Critical and Creative Thinking Are Important in the Workplace?

Critical thinking and creative thinking skills are more important than ever before. In a rapidly-changing business world, employers need employees who can think outside the box and come up with new ideas.

With critical thinking skills, employees will be able to analyze data and make sound decisions. With creative thinking skills, employees will be able to come up with new solutions to problems.

Both critical thinking and creative thinking are important for success in the workplace. Employers should look for candidates who have both critical and creative thinking skills.

It may not be too surprising to learn that some of the most successful people in the world are also critical and creative thinkers. Some examples of critical thinkers include:

- Steve Jobs: He was able to see beyond what was currently possible and create products that changed the world.
- Bill Gates: He was able to analyze data and make sound business decisions that made Microsoft one of the most successful companies in the world.
- Warren Buffett: He is able to see beyond the current trends and make investment decisions that have made him one of the richest people in the world.

Some examples of creative thinkers include:

• J.K. Rowling: She was able to develop an imaginative story that has captivated millions of people around the world.

• Elon Musk: He was able to develop new ideas that have revolutionized the transportation industry.

• Steve Wozniak: He was able to design products that changed how we use computers.

To conclude, critical and creative thinking skills are essential for success in any field. If you want to be successful, you need to learn how to think both critically and creatively [Critical Thinking VS Creative Thinking, эл. ресурс].

Part II. Critical Thinking in Science

This part reviews some of the most critical issues in science in terms of scientific thinking, and reasoning. Many students arrive at college poorly prepared to function in the typical science class and encounter a good deal of difficulty. This information regarding critical thinking skills delves into some specific realms that need investigation and formative evaluation.

Many students do not understand the language, the concepts; the importance of these words, or confuses the terms and have forgotten some of the most salient, critical terms. These shall be reviewed below:

a) **Variable** – any item of interest, any factor of interest, any specific thing or element that could have an impact on the outcome of an experiment. It is important in scientific thinking to consider all variables that could have an impact on the experiment, or the outcome of the experiment.

b) **Independent Variable** – this is the variable that is going to be manipulated. This is the variable that might be increased or decreased as the experiment continues, or a specific factor that needs to be examined to see its impact on another variable that will be examined or measured in some way, shape, manner, fashion or form. It needs to be clearly understood that in some instances, this is your "treatment". In science and in other areas of research, the "treatment" could consist of a number of tings – such as the passage of time, as well as vitamins, nutrients, proteins, minerals and the like.

c) **Dependent Variable** – This is the outcome or something to be measured to ascertain the impact of the independent variable. This variable needs to be measured precisely, exactly, specifically, and concisely in order to determine if there is some impact of the independent variable on this dependent variable.

Many beginning scientists have trouble or difficulty clearly indicating how the dependent variable is going to be measured, evaluated or assessed – either formally or informally.

d) **Hypothesis** – This is the scientist's hunch or guess, or impression about the impact of an independent variable on another dependent variable. Often this is couched in very specific language such as a Main hypothesis or alternative hypothesis. On occasion, we have a hypothesis that something will increase or decrease – or that there will be no difference whatsoever.

e) **Alternative Hypothesis** – We have a "back up hypothesis" so to speak on the off chance that the independent variable will not cause any change in the dependent variable. So, we often write out an alternative hypothesis, keeping in mind, that the strength of our treatment or independent variable may not bring about any change or impact it to a statistically significant degree.

f) **Control group** – In some experiments, we have a group that does not receive the independent variable – or they could receive what is often terms a "placebo" or inert sugar pill. This is to determine if the passage of time perhaps caused the increase or decrease or change in the dependent variable, or to determine if there is some other factor or variable at work in our design.

g) **Control** – By control, we mean that we are trying to keep conditions as standardized as possible. The temperature of the room, for example, the amount of medication or vitamin being administered, or the amount of sunlight in certain plant experiments may also need to be controlled as a variable of interest.

h) **Environment** – In some scientific experiments we have a certain environment that needs to be kept sterile, and the room temperature or amount of sunlight or even air needs to be meticulously controlled in the environment in which the study is being conducted.

i) **Time** – The measurement of time is of particular importance in many experiments. The amount of time that the subjects will be receiving the treatment or the independent variable is of paramount importance. The amount of time it takes a subject to perform a certain physical task and the amount of time that the scientist projects for the experiment is important to note. We need to keep meticulous attention to these details as time can be a salient, relevant variable.

j) **Treatment** – In medical and educational research, there are attempts to ascertain the treatment effects of a certain factor – in medicine, a new anti-biotic may yield a better treatment result than other older antibiotics. In education, a new approach to reading could bring about a statistically significant improvement in reading rate, comprehension or other aspect of reading. In some realms, it is difficult to quantify "treatment" as counseling for example could be seen as a form of "treatment", and it is difficult to ferret out or separate what exactly is bringing about emotional or cognitive or behavioral change.

k) **Multiple Variables** – Sadly, this is a complex world and quite often we need to examine more than one variable as possibly operative in any experiment. Scientists would do well not to think univariately in a multi-variate world. As we begin to explore more and more variables, we see that there could be other factors or variables that are operative in an experiment.

k) **Theory** – While there are certain laws in science, there are many theories that need to be examined, explored and verified. The law of gravity is one that holds true on earth, but may not be operative on Mars.

l) **Statistics** – In order to mathematically and empirically prove a hypothesis, based on a theory, we have to conduct a controlled experiment, in which we examine numbers and utilize the realm of statistics to prove or disprove a theory or a hypothesis. There are various forms of statistics-parametric and non-parametric and various other realms of statistics, and it is incumbent on the scientist to utilize the correct statistics to ascertain if the treatment was in fact effective and to ascertain if their hypothesis was accepted or rejected.

f) **Equipment** – On most college campuses, there are several "basic" instruments of science that need to be utilized for the learning of science. While most students encounter these in high school biology or chemistry, these are the basic tools of the scientist. The microscope enables students to perceive and observe what is not available to the naked eye. The microscope allows students to visually scan and examine various elements and things that may be written about in textbooks – but are not seen in operation so to speak. The Petri Dish – One of

the most basic, yet one of the most valuable components of a science lab, the Petri dish serves as a veritable environment for experimentation, observation and preservation on occasion of samples. Test Tubes – the real touch of a test tube remains a staple of laboratory experimentation. The student can observe chemical reactions, watch things change and observe interactions Bunsen Burner-Perhaps anachronistic, the Bunsen burneris perhaps used in some places, by some scientists with admirable results for good teaching and experimentation in labs. Heat, as a variable, as a factor needs to be continually examined and explored in terms of chemical reactions.

g) **Past Investigations** – A good literature review can provide a wealth of information for the serious scientist and save a good deal of time effort and energy. The Internet or World Wide Web allows scientists now availability to a number of journal articles in their field of interest and a cursory review or skimming of the abstract will allow the critically thinking scientist to determine if their study has already been conducted by some other fact seeking, fact checking scientist.

Many students have not been adequately trained to write a good, cogent, coherent literature review. Obviously, reading other good literature reviews is another important part of the process, and instructors should make good literature reviews available to students as templates or models of exemplary literature review, synthesis and integration.

All too often, pupils lack the foundational knowledge of prior scientific explorations. Certainly, most student know about the laws of gravity. However, the construct of combustion may not have been specifically discussed. Photosynthesis may have been cursorily reviewed but an in-depth understanding as to what occurs at the molecular level has not been forthcoming. The people – the scientists, the researchers, the leaders in the field that have investigated certain domains should be delineated so as to provide a comprehensive overview of the realm of science in which they are working.

Thinking Precisely as a Part of Critical Thinking

High school students typically arrive at college lacking a certain precision of thinking. They tend to make vague, nebulous, global, imprecise statements and generalities or engage in what is often referred to as: "Shot gun empiricism".

Part of their training should be to assist them in focusing and utilizing very exact, precise, terms and terminology. Students need to read, write, speak and think using scientific terms and modalities.

Time is an issue in terms of training pupils to speak, think, and write as scientists or at least using scientific terms and terminology. Time must be allocated so that students can in fact reflect on what they have to say, and how they are going to write and communicate in a professional scientific manner.

The issue of operational definition is an important one. This is a concept that is often lost on the murky thinking of college students. The idea behind an "operational definition" is to allow scientists to communicate and facilitate replication. An "operational definition" is one that allows scientists to communicate and understand each other and to "have a handle" on what other people are investigating.

Sometimes a broad general construct such as "alcoholism" is too broad and general, and we need to specify, how we are going to identify such individuals and how we are going to diagnose or label these individuals.

The Laboratory As a Critical Part of Scientific Thinking

It is essential for science students to perform science experiments in the labs. In this way, they assimilate the procedures, observe processes and make at least preliminary inferences.

Therefore, the following five skills are important to them when they obtain information from their experiments:

1) **Interpretation:** students must have the ability to understand the information they have received.

This may include observational inferences, this may include procedural inferences and this may include results and the summarizing of results.

2) **Evaluation:** they should be able to evaluate the credibility of the information they have received.

Herein, they have to think logically, rationally, reasonably, scientifically, empirically and vigorously. And this is something that they may not have engaged in during past years or past semesters.

3) **Analysis:** they need to assess the logical interrelationship among the facts from various experiments.

The emphasis here is on facts, data, information and conclusions drawn from specific facts and information. The student must analyze and perhaps even write down their analytic procedures for the instructor or a colleague to review.

4) **Inference:** they need to have the ability to perceive any implications from the information. While some would refer to this as a conclusion, it is predicated on the hypothesis and the results and the observations that have occurred. There is obviously no 100 percent sure conclusion that can be reached unilaterally, but inferences can be drawn and summarized from the data.

5) **Explanation:** they need to develop the ability to restate the information and present it to others in an understandable way. This skill overlaps with communication and writing. The student needs to be able to clearly, and succinctly write in a scientific manner and communicate and explain what exactly has transpired.

Three key words are relevant here. The three words are: face to face. The lab provides an exceptional opportunity for instructors to gauge student understanding of material, processes and procedures. Further face-to-face exploration assists in comprehension of material and understanding of complex intricate constructs, terms and details.

Exploratory Thinking

There is a sub-theory of intellectual giftedness which is most applicable to scientific thinking and reasoning and which is applicable to scientists insight skills, learning and ability to formulate new hypotheses and relevant experiments.

These insight skills are indicated to be of three different kinds and will be discussed in depth.

The first is termed "selective encoding" and while some may disagree with our definition and interpretation, this is the process by which salient, germane information is learned, and in a sense focused on. Excellent scientists determine what is relevant, and what is relevant in much the same way that good readers determine what is most important in any given paragraph and in any given chapter and in any given book. In a sense, the good scientist is also able to determine relevant information, and relevant feedback from irrelevant information and tangential, superfluous information.

The second methodology of processing is called "selective combination". The scientist that excels is able to sort through a lot of rich, robust, relevant information and then combine it in new, novel and perhaps divergent ways, or ways that will lead us to new hypotheses or perhaps to new vistas of research. The good researchers and scientists are combining variables that are relevant. They are combining procedures that are applicable and which have shown promise in the past. These scholars are the ones that take from various past researchers and past published works and have synthesized and integrated the ideas of some of them most productive individuals doing research for decades. They are more productive in their fields of endeavor due to these skills and combinations.

There is an "aha" effect much the same as past researchers have been enlightened by the falling of an apple or something that occurred to them in a dream or in a bathtub.

The last skill is selective comparison and in this information processing model, new information is linked to old or established information in a new or divergent or flexible or novel way too old, previously established published or well-known information.

These skills are difficult to quantify and difficult to replicate. We can study the theory of these ideas but it is more difficult to teach these patterns of thinking.

Only through ongoing experimentation, and on-going supervision, and discussion can these ideas really be integrated into the mind of novice scientists.

In Depth Thinking

Science students think differently than the more sophisticated "expert" researcher, and the expert researcher has obviously more statistical acumen at their disposal than the novice. The expert is aware of various different methodologies and the correct machinery that may expedite and facilitate their research.

Scientists should not be thinking univariately in a multivariate world. Scientific thinking reflects a true understanding of the nature of science. There is no superficial thinking, but we face in-depth reasoning, critical thinking and higher order thinking about variables and the control of variables. It can be argued that scientific thinking should include argumentation – that a true scientist must be ready, willing and able to debate, discuss and argue their point of view and be prepared to confront colleagues that may not necessarily agree with their premises or ideas.

Students should develop the ability to identify key aspects of published papers and to measure critical thinking skills used to evaluate scientific validity.

Obviously, time is a factor and ample time for reflection, perhaps discussion and review of relevant, salient factors is important. Today's students often need to allocate an adequate amount of time to simply study, review, examine and explore what they are doing and what they are trying to attempt.

Key Critical Thinking Abilities

The proficient, experienced scientist has the following abilities (in terms of their cognitive structures and cognitive abilities):

1) **Ability to make logical conclusions based on evidence.**

They think logically, rationally, reasonably and process information quite systematically and look for the data, the evidence, the proof and the final numbers (if there are any).

2) **Ability to logically apply methods to evaluate hypotheses.**

In a sense, these scientists are juggling two disparate skills. They know exactly what type of methodology to use in order to procure the answer to their questions, and they are able to both verbally and in writing, articulate their specific hypothesis that is testable, reasonable, rational, logical and systematic, and also worthy of investigation.

3) **Ability to interpret, analyze and evaluate new information.**

The expert scientist is able to interpret data-from beginning to middle to end of the experiment, analyze the results (in light of past literature, and in light of the results procured and then are able to integrate and analyze new information and new theories, and perhaps even integrate this new information into their constructs and on-going theory development).

4) **Simultaneous identification of problems and their corresponding effective solutions.**

As expert scientists build on solid foundations of past research and build on past evidence and research.

They are able to simultaneously identify new challenging problems and concerns and then hypothesize perhaps plausible, effective solutions, or at the very least, new experimentation that would shed light on the problem and present at least tentative solutions to the problem.

5) **Ability to logically formulate a hypothesis based on previous knowledge.**

At the foundation of all scientific research is the need to have a clear hypothesis, based on previous research, based on the literature, and based on past results (which may or may not have been shared by colleagues in print or in presentation modality. Previous knowledge, or what is often called "world knowledge" or "general information" is imperative here. The expert scientist has a rich robust storehouse of background knowledge and information about their field, and are able to sift through past research to find the relevant, salient, appropriate domains to investigate or at least explore.

6) **Ability to identify the importance of a scientific field.**

The master scientist looks carefully at the field and is able to discern where the field is going at that particular point in time. Some scientists simply keep up with the literature, while others attend conferences to ameliorate their knowledge base and find out what is transpiring in the field, while others simply have an uncanny knack for seeing where the field is going- be it biology, chemistry, physics, or whatever. They realize the importance of their field and how it fits into the big picture.

7) **Ability to analyze and objectively evaluate data for determination of its validity.**

Objectivity, neutrality, and the ability to withhold judgment until the appropriate time is imperative for science, and scientists in general. The master scientists know how to analyze data as well as disaggregate the data when appropriate. The key words of validity, and reliability are scorched into their minds as key constructs of the scientific method.

8) **Ability to recall and understand knowledge.**

Since the field is changing ever so rapidly, the master scientist must be able to understand and grasp new concepts, new ideas, new constructs, and new knowledge- or at least be able to ascertain where to get the information so as to be able to understand new discoveries.

9) **Ability to classify, summarize, and compare theories.**

It is a cognitive processing skill that some have, some develop and some struggle with on an ongoing basis. Some scientists rely on external aids (graphs, charts, pictures) and others seem to automatically process classifications and relevant information.

10) **Ability to understand methods and to apply them to evaluate hypotheses.**

There needs to be a link between methodology and the hypothesis. It is not clear if this connection is always made or if it is after the fact, or if one comes

immediately before the other. Some scientists adhere to one methodology in which they were trained and do not differ from it during their adult lives.

This part has attempted to review the realm of critical thinking in terms of science, science experimentation and the thought processes that go into formulate, conducting, analyzing and synthesizing and integrating the data that emanates from any scientific experiment. Some experiments are formal, and conducted in a highly structured manner, while others are more informal and conducted perhaps in a cursory manner. The teaching of scientific thinking, reasoning, critical thinking and multi-variate thinking is a realm that needs further exploration and analysis as well as critical discussion in the future [Shaughnessy, Varela, Liu 2017, эл. ресурс].

Part III. Critical Thinking in Humanities

Both critical thinking and communication are interconnected with each other. The capability of the critical thinking process is applicable to improving the communication process. The researchers investigate how critical thinking can affect the communication process in humanities and also seek the connected factors with it.

Moreover, this part can help students understand the reasons and applicable tools for identifying the inner connection between critical thinking and effective communication.

Critical thinking and communication are united pieces of the same skeleton which can make a better result. In this recent era, with the constantly developing and shifting environment, critical thinking and powerful communication have a great impact. Critical thinking can be easily taught through an enhanced communication process.

In humanity, every individual sees this whole world from a different perspective, and their decisions are made based on this variety of perspectives. In this regard, with more people interaction can be possible, the quality of critical thinking skills and knowledge will be developed. In this modern world, most people value unique ideas more than normal ideas.

Every step of humanity needs some kind of new ideas and thoughts which make this development more beautiful, effective, and better. Seen differently, critical thinking can help enhance communication methods that are effective for the growth of humanity. Communication and critical thinking both are important and valuable to increase the importance of humanity's development. Nowadays people like to look at everything differently and they want to be more updated and advanced. In this context, there is a need for the continuous practice of criti-

cal thinking and focus on the communication process. The effectiveness of critical thinking and communication for humanity briefly will be discussed in this part.

Humanities and the importance of critical thinking

In the aspect of humanities, the critical thinking process is highly important as it allows an individual to reflect and identify their own value in society. Critical thinking is able to make decisions depending on the requirements of the current social structure. It has been observed in the majority of cases that people who are capable of thinking critically, can lead their lives more meaningfully and fulfilled. In this modern world, keeping pace with the transformation and modification is essential based on the capacity of the critical thinking process. The critical thinking approach is considered able to change both thinkers and the world to explore something new.

In the area of transformative change, critical thinking is also identified as a kind of prediction. Critical thinking is able to boost confidence levels while the communication process.

In fact, the communication system can be more useful and lead to better results. Accompanied by the critical thinking process, an individual can get help to articulate and visualise problems and solutions from different angles. Along with this, the capability of thinking critically and in a more advanced way enables an individual to present contrasting perspectives with confidence. The requirement of the communication process can appear in different fields such as social interaction, meetings, and other business connections. It also has been observed that to assimilate and organise unique thoughts through logical analysis, critical thinking is effective in build humanities.

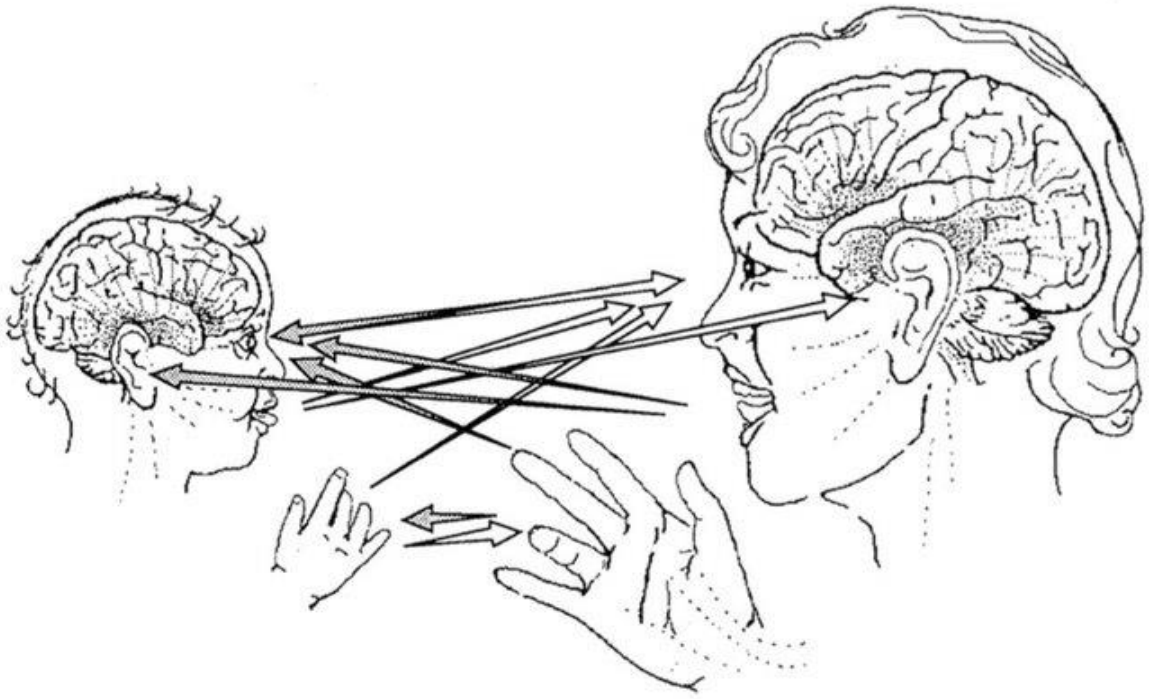
The use of the critical thinking process ensures the improvement of the core work of the humanities. In the humanities, the numerous disciplines display the different types of activities such as how to listen, how to argue, how to analyse, and how to handle the social world. All the activities are able controlled only depending on the critical thinking process. In the humanity course, teaching and

learning "critical thinking skills" remarkably help in decreasing an individual belief in "pseudoscience". In numerous fields of life, having skills and knowledge about critical thinking can make the process easier and simpler. In order to influence others, especially in the business process, by serving something trendy and unique, the critical thinking process is effective and also can secure the growth of humanities in the current society.

The Role of communication in critical thinking

Communication is the framework of a foundation to shape its profit margin and it is possible to get with the collaboration of a critical thinking approach. People who are capable of improving their critical thinking skills in a continuous manner can gain an experience of better communication (see Picture 6).

Picture 6



[https://www.researchgate.net/publication/365592403_Right_brain-to-right_brain_psychotherapy_recent_scientific_and_clinical_advances/figures]

The level, as well as the value of communication in any social activity, is dependent on critical thinking procedures. In this recent business market, the ability to communicate with others has a great influence to impress the opposite individual. While communicating with an individual, a critical thinking process

helps in making something different and influential to observe the opposite individual's thought process. People, who have skills and knowledge of critical thinking, always try to utilise a strong and confident speaking voice during any kind of communication process. They are also able to avoid "filler" words while communicating with others and make the conversation effective to create something pretend.

In addition, a critical thinker is also able to present a clear and easily understandable visual presentation to make a simple and flexible. People who can think critically know very well that the other side will be more influenced if they get things done differently. One of the skills of these people is to think about everything in a completely different way from other ordinary people. It is often seen that in any form of communication the first presentation sets the course for all subsequent presentations. In this area, having communication skills and knowledge of how to develop it is very important to make a positive social impact.

In any communication process, using effective language has a beneficial impact as it is the main key tool that is applicable to impress. In this context also there requires knowledge regarding critical thinking. Since critical thinking teaches people to think differently, it can be easier to determine what kind of language use can more likely be attracted, people. It also has been seen that "critical thinking communication skills" assist an individual to stay on point and prove it till the end.

A critical communicator is always capable of concentrating on the core issues and gives an effort to resolve them by staying on point. It has become easy and simple to establish a belief and reputation as a critical communicator by applying different ideas and concepts.

Critical thinking is the key to effective communication

In order to improve the communication process, critical thinking is identified as the main key tool. A critical communicator works by observing the inherent flaws of a particular subject after a thorough observation of it. Due to creating

social value and social identity, critical thinking skills can manage the entire process very perfectly.

Along with this, the critical thinking procedure is also capable of creating a competitive advantage in this current developing era to prove self-identification and self-power. A crucial quality of critical thinking is the capability of protecting issues and identifying self-knowledge. Identifying the biases and providing better engagement in the process, critical thinkers have a great impact to maintain effectiveness in a positive way.

Critical thinking process is able to increase the possibility of inventing as well as discovering new things which are applicable to impress others. It has been observed that not having knowledge about critical thinking, an individual could not bring any new ideas or concepts to deal with the potential issue in society. Basically, it is a process that can support the development process of the critical situation by providing new concepts and ideas.

Along with this, having critical thinking processes is able to enhance the skill level at high to solve problems also in the workplace to manage the work culture. In order to deal with different negative as well as complex situations, the skill of critical thinking is considered important to reduce the negative impact.

The continuing practice of the critical thinking approach can improve the communication process and make it worthwhile. Accompanied by influencing the normal thinking process and pattern, the practice of critical thinking is capable of increasing the process of building unique ideas and concepts. In addition to this, in making vital decisions regarding any serious condition, the critical thinking technique is able to polish the potential approaches.

However, critical thinking processes can assist any individual in gaining different points of view to make the situation better than expected. In managing the negative impact of any kind of barrier, critical thinking has a great effect on it. Moreover, focusing on continuous improvement of critical thinking can help the process of communication and make it more powerful and effective to sustain for a long-term issue.

Connection between communication and critical thinking to develop humanity's growth

Communication and critical thinking are interconnected with each other and both are dependent on each other. Good communication influences the process of critical thinking which is effective during conversation or any kind of discussion. Both "communication and critical thinking" are attached in several ways which are influencing the growth of humanity. One of the major links between "communication and critical thinking" is the possibility to understand how to observe and identify an individual's "thought process and line of reasoning". Humanity's growth requires many experiences which can only be obtained through communication with other human beings.

The communication method on the other hand requires a critical thinking process. It can be stated easily that communication and critical thinking are closely related to each other. Especially in the process of problem-solving, the development of humanity can be noticed in a greater area. Based on the industrial perspective, the adoption of critical thinking has been identified as appreciable to improve the condition of communication. Critical thinking is an active process that needs constant practice and exercise to modify its shape and effectiveness.

Critical thinking process is able to increase the number of communications and also the opportunity of getting more communications. Accompanied by numerous communications an individual can gain more experience and knowledge regarding different kinds of perspectives. All the knowledge and experience are capable of helping in the development of the human identity level in the current society.

Among the current humanities, the importance of critical thinking has increased a lot as technological advancement is developing day by day. A good critical thinking process is considered as an idea that is applicable to solving any serious issue and serves a better impact by providing the solution. Accompanied by critical thinking, the process of communication can be better and more effective to influence the opposite individual to retain something. Communication can

be effective in the case of having any unique idea and plan. It also assists in building a better approach for the entire humanity and sustaining it for a long-term issue.

Improvement of critical thinking in humanities

Thinking skills are innate in humanity from the time of birth and over time people learn to think more critically. Although this skill requires a fair amount of exercise and practice otherwise it is not possible to increment it properly.

In every step of life, everyone needs to develop the capability of critical thinking. Both skills and knowledge about critical thinking need regular polishing and exercise.

In order to convey information about any topic in any place, it is necessary to have enough knowledge to be able to easily understand what the other individual is trying to say. The more people an individual interacts with, the easier it will be for critical thinking to open up new ideas.

In the case of becoming a good listener, listening to people attentively and noticing the verbal and non-verbal cues also can support the sharping process of critical thinking knowledge and skills. Identify the situations where an individual's opinion is an unconscious issue, then on that situation, observe the situation deeply and identify the prejudices that led to taking an influenced decision.

In addition to that, focusing on emotional intelligence, empathising with people and situations, and becoming self-aware are the beneficial elements to secure the process of communication. In most cases, critical thinking skill is needed to make a fruitful decision on any specific matter.

Most of the time people made their decisions based on different types of perceptions that are not proven right. For this reason, it is very important to make a proper and effective decision by understanding the place and the situation. Observing this present world condition, the more critical thinking is accessible to the human race, the more development there will be and that is a very beneficial thing for the growth of humanity. Moreover, greater exposure to more people

will lead to greater experiences that will sharpen critical thinking skills and also will be proved meaningful to mankind.

Following the above entire analysis, it can be concluded that to make humanity stable and increase growth, having knowledge about critical thinking is essential. In this current developing era with the collaboration of advanced technology, people also need to able to think fast to keep pace with the current age.

The communication method is a very good process for further development of critical thinking efforts which helps this humanity to achieve more success and growth. It is a very common factor that the more people interact with other people, the more their knowledge and experience develop and the more variety they learn about society.

The societal approach is a great way to practice the critical thinking development process to serve a better positive growth to humanity. Accompanied by critical thinking people can easily influence other people about any topic and present new information and ideas more beautifully. Especially it is identified as a good approach for businesses by which anyone can easily maintain competitiveness in this society to sustain security for a long-term issue. Moreover, to build positive growth in humanity, both communication and critical thinking are very essential [Reyes, Cuzzamu 2022, эл. ресурс].

Supplement

Assignment 1

1. Read and discuss 90 famous quotes about thinking process below.
2. Can you find any hidden layer in every quote?
3. Choose top 10 quotes, explain your choice and give a profound interpretation of each quote.

1. Plato is dear to me but dearer still is truth. – *Aristotle*
2. There are no dangerous thoughts; thinking itself is dangerous. – *Hannah Arendt*
3. Absence of thought is indeed a powerful factor in human affairs, statistically speaking the most powerful, not just in the conduct of the many but in the conduct of all. – *Hannah Arendt*
4. To think and to be fully alive are the same. – *Hannah Arendt*
5. It is a strange desire to seek power and to lose liberty. – *Francis Bacon*
6. Read not to contradict and confute; nor to believe and take for granted; nor to find talk and discourse; but to weigh and consider. – *Francis Bacon*
7. If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties. – *Francis Bacon*
8. I carry my thoughts about with me for a long time, often for a very long time, before writing them down. – *Ludwig van Beethoven*
9. The aim of education should be to teach us rather how to think, than what to think – rather to improve our minds, so as to enable us to think for ourselves, than to load the memory with thoughts of other men. – *Bill Beattie*
10. Do not believe in anything simply because you have heard it. Do not believe in anything simply because it is spoken and rumored by many. Do not believe in anything simply because it is found written in your religious books.

Do not believe in anything merely on the authority of your teachers and elders. – *Buddha*

11. Reading without reflecting is like eating without digesting. – *Edmund Burke*

12. An intellectual is someone whose mind watches itself. – *Albert Camus*

13. The fact is that if you have not developed language, you simply don't have access to most of human experience, and if you don't have access to experience, then you're not going to be able to think properly. – *Noam Chomsky*

14. Democratic societies can't force people. Therefore, they have to control what they think. – *Noam Chomsky*

15. Discovery is the ability to be puzzled by simple things. – *Noam Chomsky*

16. To know what you know and what you do not know, that is true knowledge. – *Confucius*

17. To study and not think is futile. To think and not study is dangerous. – *Confucius*

18. Acquire new knowledge whilst thinking over the old, and you may become a teacher of others. – *Confucius*

19. It is all right to say exactly what you think if you have learned to think exactly. – *Marcelene Cox*

20. Thinking is the hardest work in the world; and most of us will go to great lengths to avoid it. – *Louise Dudley*

21. The highest possible stage in moral culture is when we recognize that we ought to control our thoughts. – *Charles Darwin*

22. I think. Therefore, I am. – *Descartes*

23. The most important attitude that can be formed is that of desire to go on learning. – *John Dewey*

24. We only think when we are confronted with a problem. – *John Dewey*

25. We do not learn from experience... we learn from reflecting on experience. – *John Dewey*

26. Education is a social process; education is growth; education is not preparation for life but is life itself. – *John Dewey*

27. Anyone who has begun to think, places some portion of the world in jeopardy. – *John Dewey*

28. Genius was 1 percent inspiration and 99 percent perspiration. – *Thomas Edison*

29. Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius – and a lot of courage – to move in the opposite direction. – *Albert Einstein*

30. I think and think for months and years. Ninety-nine times, the conclusion is false. The hundredth time I am right. – *Albert Einstein*

31. The most incomprehensible thing about the world is that it is comprehensible. – *Albert Einstein*

32. Everything should be made as simple as possible, but not simpler. – *Albert Einstein*

33. To raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advances in science. – *Albert Einstein*

34. Intellect annuls fate. So far as a man thinks, he is free. – *Ralph Waldo Emerson*

35. What is the hardest task in the world? To think. – *Ralph Waldo Emerson*

36. Be careful that you write accurately rather than much. – *Erasmus*

37. The force of the temptation which urges us to seek for such evidence and appearances as are in favour of our desires, and to disregard those which oppose them, is wonderfully great. – *Michael Faraday*

38. If you have knowledge, let others light their candle by it. – *Margaret Fuller*

39. Thinking is the hardest work there is, which is the probably reason why so few engage in it. – *Henry Ford*

40. Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young. – *Henry Ford*

41. All truly wise thoughts have been thought already thousands of times; but to make them truly ours, we must think them over again honestly, till they take root in our personal experience. – *Johann Wolfgang von Goethe*

42. Irrationally held truths may be more harmful than reasoned errors. – *Thomas Henry Huxley*

43. The heart of man is made to reconcile the most glaring contradictions. – *David Hume*

44. There are two ways to slide easily through life: to believe everything or to doubt everything. Both ways save us from thinking. – *Alfred Korzybski*

45. Blind commitment to a theory is not an intellectual virtue: it is an intellectual crime. – *Lakatos*

46. New opinions are always suspected, and usually opposed, without any other reason but because they are not already common. – *John Locke*

47. You see, but you do not observe. – *Sir Arthur Conan Doyle*

48. It is a mistake to confound strangeness with mystery. – *Sir Arthur Conan Doyle*

49. Men are apt to mistake the strength of their feeling for the strength of their argument. The heated mind resents the chill touch and relentless scrutiny of logic. – *William Gladstone*

50. What is written without effort is in general read without pleasure. – *Samuel Johnson*

51. He who has imagination without learning has wings and no feet. – *Joseph Joubert*

52. The ultimate court of appeal is observation and experiment ... not authority. – *Thomas Henry Huxley*

53. A great many people think they are thinking when they are merely rearranging their prejudices. – *William James*

54. Genius means little more than the faculty of perceiving in an unhabitual way. – *William James*

55. A problem well stated is a problem half solved. – *Charles Franklin Kettering*

56. Creativity takes courage. – *Henri Matisse*

57. He who establishes his argument by noise and command shows that his reason is weak. – *Michel Montaigne*

58. As often as a study is cultivated by narrow minds, they will draw from it narrow conclusions. – *John Stuart Mill*

59. The logic of science is the logic of business and life. – *John Stuart Mill*

60. What I understand by 'philosopher': a terrible explosive in the presence of which everything is in danger. – *Friedrich Nietzsche*

61. You need chaos in your soul to give birth to a dancing star. – *Friedrich Nietzsche*

62. I don't know what I may seem to the world, but as to myself, I seem only to have been like a boy playing on the sea-shore and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me. – *Isaac Newton*

63. The great composer does not set to work because he is inspired, but becomes inspired because he is working. – *Ernest Newman*

64. Only the mind cannot be sent into exile. – *Ovid*

65. Who controls the past controls the future: who controls the present controls the past. – *George Orwell*

66. The great enemy of clear language is insincerity. When there is a gap between one's real and one's declared aims, one turns as it were instinctively to long words and exhausted idioms, like a cuttlefish squirting out ink. – *George Orwell*

67. Men never do evil so completely and cheerfully as when they do it from religious conviction. – *Blaise Pascal*

68. Philosophical habits of mind do not come quicker through fiber optics. Clear thinking is not aided by better dot resolution. Understanding ourselves and feeling for others does not come with a software upgrade. – *Linda Ray Pratt*

69. All life is problem solving. – *Karl Popper*

70. No rational argument will have a rational effect on a man who does not want to adopt a rational attitude. – *Karl Popper*

71. Good tests kill flawed theories; we remain alive to guess again. – *Karl Popper*

72. Problems are to the mind what exercise is to the muscles; they toughen and make strong. – *Norman Vincent Peale*

73. If everyone is thinking alike, then somebody isn't thinking. – *George Smith Patton*

74. Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house. – *Henri Poincarè*

75. Where observation is concerned, chance favours only the prepared mind. – *Louis Pasteur*

76. The artist is a receptacle for emotions that come from all over the place: from the sky, from the earth, from a scrap of paper, from a passing shape, from a spider's web. – *Pablo Picasso*

77. Thinking is like loving or dying. Each of us must do it for himself. – *Josiah Royce*

78. Not to be absolutely certain is, I think, one of the essential things in rationality. – *Bertrand Russell*

79. To understand the actual world as it is, not as we should wish it to be, is the beginning of wisdom. – *Bertrand Russell*

80. The most essential characteristic of scientific technique is that it proceeds from experiment, not from tradition. – *Bertrand Russell*

81. Every man, wherever he goes, is encompassed by a cloud of comforting convictions, which move with him like flies on a summer day. – *Bertrand Russell*

82. We all have a tendency to think that the world must conform to our prejudices. The opposite view involves some effort of thought, and most people would die sooner than think – in fact they do so. – *Bertrand Russell*

83. The great majority of men and women, in ordinary times, pass through life without ever contemplating or criticizing, as a whole, either their own conditions or those of the world at large. – *Bertrand Russell*

84. Without effort and change, human life cannot remain good. It is not a finished Utopia that we ought to desire, but a world where imagination and hope are alive and active. – *Bertrand Russell*

85. Even when all the experts agree, they may well be mistaken. – *Bertrand Russell*

86. Good reasons must, of force, give place to better. – *William Shakespeare*

87. The unexamined life is not worth living. – *Socrates*

88. False words are not only evil in themselves, but they infect the soul with evil. – *Socrates*

89. The advantage of the incomprehensible is that it never loses its freshness. – *Paul Valery*

90. One original thought is worth a thousand mindless quotes. – the Greek philosopher *Diogenes the Cynics*

Assignment 2

1. Study the data in Table 1 below.
2. Spot the changes in thinking skills in 2015 and 2020.
3. Trace the tendencies in thinking skills and explain them.
4. Make predictions about thinking skills in the nearest future.

Table 1

Top 10 skills

in 2020	in 2015
1. Complex Problem Solving	1. Complex Problem Solving
2. Critical Thinking	2. Coordinating with Others
3. Creativity	3. People Management
4. People Management	4. Critical Thinking
5. Coordinating with Others	5. Negotiation
6. Emotional Intelligence	6. Quality Control
7. Judgment and Decision Making	7. Service Orientation
8. Service Orientation	8. Judgment and Decision Making
9. Negotiation	9. Active Listening
10. Cognitive Flexibility	10. Creativity

[https://www.researchgate.net/publication/323994818_Exploring_the_Digital_Competency_Profiler_DCP_A_group_based_digital_competency_and_use_assessment_tool/figures]

Assignment 3

1. Read the text "Improve our thinking skills" below.
2. Give your comments about Theory.
3. Give your comments about Practice.
4. Give your comments about Attitudes.
5. Answer the questions from the California Critical Thinking Disposition Inventory.
6. What can you personally do to improve your critical thinking?

Improve our thinking skills

Critical thinking is a metacognitive skill. What this means is that it is a higher-level cognitive skill that involves thinking about thinking. We have to be aware of the good principles of reasoning, and be reflective about our own reasoning. In addition, we often need to make a conscious effort to improve ourselves, avoid biases, and maintain objectivity. This is notoriously hard to do. We

are all able to think but to think well often requires a long period of training. The mastery of critical thinking is similar to the mastery of many other skills. There are three important components: theory, practice, and attitude.

Theory

If we want to think correctly, we need to follow the correct rules of reasoning. Knowledge of theory includes knowledge of these rules. These are the basic principles of critical thinking, such as the laws of logic, and the methods of scientific reasoning, etc.

Also, it would be useful to know something about what not to do if we want to reason correctly. This means we should have some basic knowledge of the mistakes that people make. First, this requires some knowledge of typical fallacies. Second, psychologists have discovered persistent biases and limitations in human reasoning. An awareness of these empirical findings will alert us to potential problems.

Practice

However, merely knowing the principles that distinguish good and bad reasoning is not enough. We might study in the classroom about how to swim, and learn about the basic theory, such as the fact that one should not breathe under water. But unless we can apply such theoretical knowledge through constant practice, we might not actually be able to swim.

Similarly, to be good at critical thinking skills it is necessary to internalize the theoretical principles so that we can actually apply them in daily life. There are at least two ways. One is to do lots of good-quality exercises. Exercises include not just exercises in classrooms and tutorials. They also include exercises in the form of discussion and debates with other people in our daily life. The other method is to think more deeply about the principles that we have acquired. In the human mind, memory and understanding are acquired through making connections between ideas.

Attitudes

Good critical thinking skills require not just knowledge and practice. Persistent practice can bring about improvements only if one has the right kind of motivation and attitude. The following attitudes are not uncommon, but they are obstacles to critical thinking:

- I prefer being given the correct answers rather than figuring them out myself.
- I don't like to think a lot about my decisions as I rely only on gut feelings.
- I don't usually review the mistakes I have made.
- I don't like to be criticized.

To improve our thinking we have to recognize that the importance of reflecting on the reasons for belief and action. We should also be willing to engage in debate, break old habits, and deal with linguistic complexities and abstract concepts.

The California Critical Thinking Disposition Inventory is a psychological test that is used to measure whether people are disposed to think critically. It measures seven different thinking habits listed below, and it is useful to ask ourselves to what extent they describe the way we think:

1. **Truth-seeking** – Do you try to understand how things really are? Are you interested in finding out the truth?

2. **Open-mindedness** – How receptive are you to new ideas, even though intuitively they do not agree with you? Do you give them a fair hearing?

3. **Analyticity** – Do you try to understand the reasons behind things? Do you act impulsively or do you evaluate the pros and cons of your decisions?

4. **Systematicity** – Are you systematic in your thinking? Do you break down a complex problem into parts?

5. **Confidence in Reasoning** – Do you always defer to other people? How confident are you in your own judgment? Do you have reasons for your confidence? Do you have a way to evaluate your own thinking?

6. **Inquisitiveness.**

7. **Maturity of Judgment** – Do you jump to conclusions? Do you try to see things from different perspectives? Do you take other people's experiences into account?

Finally, psychologists have discovered over the years that human reasoning can be easily affected by all kinds of cognitive biases. For example, people tend to be over-confident of their abilities, and focus too much on evidence that supports their pre-existing opinions. We should be alert to these biases in our attitudes towards our own thinking.

Assignment 4

1. Read the text **What are the Best Science-Based Strategies for Critical Thinking?** below.

2. Give your comments upon 8 Science-Based Strategies for Critical Thinking.

3. Name top 3 the most effective strategies and explain your choice.

What Are The Best Science-Based Strategies For Critical Thinking?

Scientific argumentation and critical thought are difficult to argue against.

However, as qualities and mindsets, they are often the hardest to teach to students. Einstein himself said, "Education is not the learning of facts, but the training of the mind to think."

But how? What can science and critical thinking do for students? And further, what can teachers learn from these approaches and take to their classrooms?

Outside of science, people are quick to label those who question currently accepted theories as contrarians, trolls, and quacks. This is, in part, because people are sometimes not aware of how science moves forward.

Interestingly, professional teaching journals point out that a common myth students bring to school is that science is already all discovered and carved in

stone–a fixed collection of knowledge–rather than the simple approach to thinking and knowledge it actually represents.

Below are 8 science-based strategies for critical thinking.

1. **Challenge all assumptions.**

And that means all assumptions. As a teacher, I've done my best to nurture the students' explorative questions by modeling the objective scientific mindset. Regardless of our goals in the teaching and learning process, I never want to squelch the curiosity of students. One way I accomplish this is by almost always refraining from giving them my personal opinion when they've asked, encouraging them instead to tackle the research in order to develop their own ideas.

Students are not used to this approach and might rather be told what to think. But wouldn't that be a disservice to their development, knowing we need analytical minds to create progress? And knowing how fast technology converts science fiction into fact? Concepts that were pure imagination when I grew up, like time travel, have now been simulated with photons in Australia. Could this happen if we never challenged our assumptions?

Question everything. Questions are more important than answers.

2. **Suspending judgment.**

If a student shows curiosity in a subject, it may challenge our own comfort zone. Along these lines, Malcolm Forbes – balloonist, yachtsman, and publisher of Forbes magazine – famously declared, "Education's purpose is to replace an empty mind with an open one."

Although it's human nature to fill a void with assumptions, it would halt the progress of science and thus is something to guard against. Admittedly, it requires bravery to suspend judgment and fearlessly acquire unbiased data. But who knows, that data may cause us to look at things in a new light.

3. **Revising conclusions based on new evidence.**

In adopting student-centered learning, the Next Generation Science Standards feature scientific argumentation. Can we agree that change based on new evidence may be useful in creating a healthier world?

Resisting confirmation bias, scientists are required to revise conclusions – and thus beliefs–in the presence of new data.

4. **Emphasizing data over beliefs.**

In science, 'beliefs' matter less than facts, data, and what can be supported and proven. The development of beliefs based on critical reasoning and quality data is much closer to a science-based approach to critical thinking.

While scientists certainly do 'argue' amongst themselves, helping students frame that disagreement as being between data rather than people is a very simple way to teach critical thinking through science. Seeing people and beliefs and data as separate is not only rational, but central to this process.

5. **The neverending testing of ideas**

At worst, new tests are designed to again test those new conclusions. Theories are wonderful starting points for a process that never stops!

6. **The perspective that mistakes are data.**

Viewing mistakes as data and data as leading to new conclusions and progress is part and parcel to the scientific process.

Just so, one of the fallouts of teaching critical thinking skills is that students may bring home misunderstandings. But exploring controversy in science is the very method that scientists use to propel the field forward.

Otherwise, we would still be riding horses and using typewriters. Did you know that it was once considered controversial to put erasers on pencils? People thought it would encourage students to make mistakes.

7. **The earnest consideration of possibilities and ideas without (always) accepting them.**

However valuable it has proven to explore controversy in science, some students may not be able to wrap their heads around (one of) Aristotle's famous quote about education: "It is the mark of an educated mind to be able to entertain a thought without accepting it."

Without teachers and parents together supporting students through this, children may lose the context of why they should challenge their own assumptions via evidence and analytical reasoning inside and outside of the classroom.

8. **Looking for what others have missed.**

Looking over old studies and data – whether to draw new conclusions or design new theories and tests for those theories – is how a lot of 'science' happens. Even thinking of a new way to consider or frame an old problem–to consider what others may have missed–is a wonderful critical thinking approach to learning [Carroll, Heick 2020, эл. ресурс].

Assignment 5

1. Read the paragraph "Critical Thinking VS Scientific Thinking" above (Part 1, 1.5).
2. What is critical thinking according to the text?
3. What is scientific thinking according to the text?
4. How are critical thinking and scientific thinking similar and different in your opinion?

Assignment 6

1. Read the paragraph "Critical Thinking VS Creative Thinking" above (Part 1, 1.6).
2. Define critical thinking.
3. Define creative thinking.
4. Discuss the essentials of critical thinking.
5. Discuss the essentials of creative thinking.
6. Supply your own real-life examples of critical thinkers.
7. Supply your own real-life examples of creative thinkers.

Assignment 7

1. Study the information about Critical Thinking Core Skills in Figure 1 below.

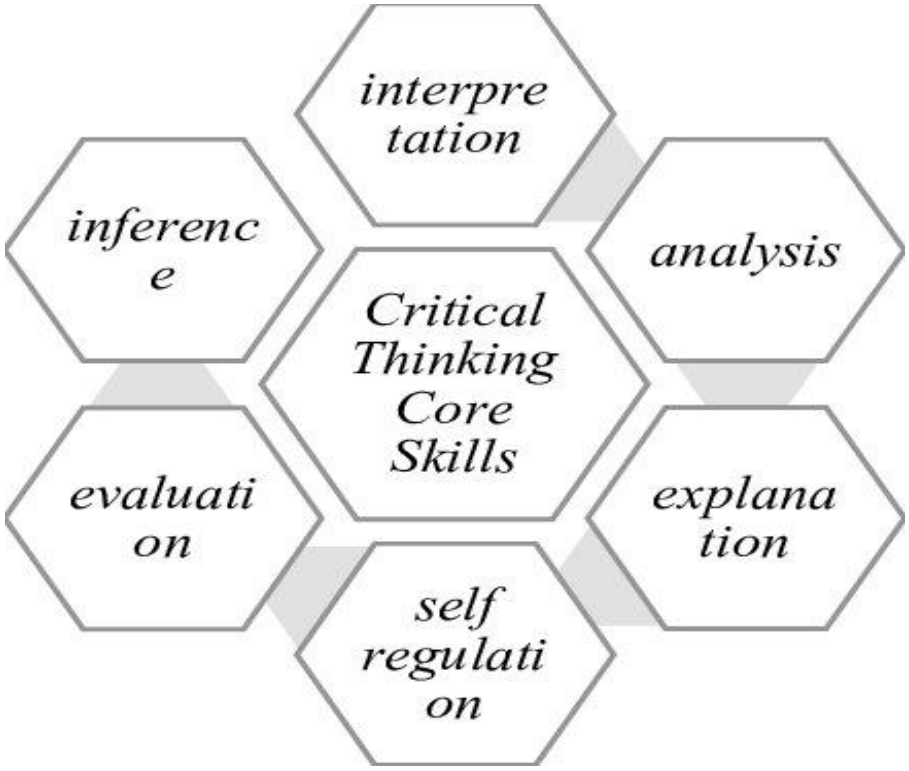
2. Speak about the structure of critical thinking.

3. Are there any more parameters or stages of critical thinking?

4. How do you apply critical thinking in everyday life? Give examples.

5. How do you apply critical thinking in professional / scientific sphere? Give examples.

Figure 1. Critical Thinking Core Skills



[https://www.researchgate.net/publication/340029226_The_potential_of_discovery_learning_models_to_empower_students%27_critical_thinking_skills/figures]

Assignment 8

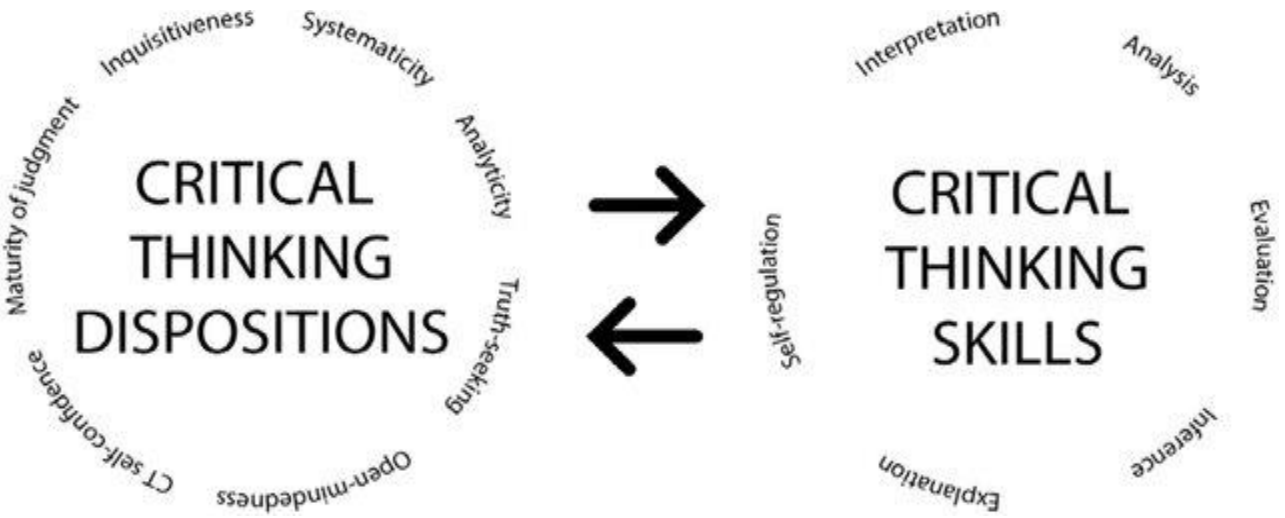
1. Study the information in Figure 2 below.

2. Speak about the Elements of Critical Thinking Skills.

3. Speak about the Elements of Critical Thinking Dispositions.

4. What is the correlation between Critical Thinking Skills and Critical Thinking Dispositions?

Figure 2. Some Elements of Critical Thinking Skills and Critical Thinking Dispositions



[https://www.researchgate.net/publication/385377850_Critical_Thinking_in_the_Iranian_EFL_Context_A_Systematic_Review/figures]

Assignment 9

1. Read the text **Stereotypes** below.
2. Why are stereotypes commonly used by people?
3. Explain why stereotypes are called "substitutes for slow thinking".
4. How is valuable information ignored in stereotypes?

Stereotypes

You approach any topic with certain preliminary beliefs or habits of mind. When we stereotype, we allege that because a person is a member of a particular group, he must have a specific set of characteristics.

Stereotypes are substitutes for slow thinking. Here are a few examples:

1. Men with facial hair are wise.

2. Overweight individuals are jolly.

Japanese are industrious.

4. Young people are frivolous.

5. Women make the best secretaries.

6. Welfare recipients are lazy.

All six of these illustrations pretend to tell us something significant about the quality of certain types of people. If we believe these stereotypes, we will not approach people and their ideas with the spirit of openness necessary for strong-sense critical thinking. In addition, we will have an immediate bias toward any issue or controversy in which these people are involved. The stereotypes will have loaded the issue in advance, prior to the reasoning.

Stereotypes are used so commonly because when they are true, they save us lots of time. If all politicians were indeed manipulative and greedy, it would make us more efficient readers and listeners to bring the stereotype with us when participating in a political conversation.

BUT, rarely is a stereotype safe. Nor is it fair! Each person deserves our respect, and his or her arguments deserve our attention. Stereotypes get in the way of critical thinking because they attempt to short circuit the difficult process of evaluation. As critical thinkers, we want to model curiosity and openness; stereotypes cut us off from careful consideration of what others are saying. They cause us to ignore valuable information by closing our minds prematurely [Browne, Keeley 2015: 15-16].

Assignment 10

1. Read the text Primary Values of a Critical Thinker below.
2. Why are the Primary Values of a Critical Thinker?
3. What is Autonomy?
4. What is Curiosity?
5. What is Humility?
6. What is "managed reasoning"?

Primary Values of a Critical Thinker

As a critical thinker, you will be pursuing better conclusions, better beliefs, and better decisions. Certain values advance your effort to do so; others do not. By knowing

and appreciating the primary values of a critical thinker, you have some mental muscle that you can use to remind yourself of the necessity of your paying close attention to those who do not share your value priorities. Let's examine these primary values.

1. Autonomy. At first this value may seem as if it has little to do with encouraging people to pay attention to those with different perspectives. How does a drive to form one's own conclusions encourage us in any fashion to seek and listen to views that are not our own? Aha! And what raw material should you use in pursuing this autonomy? Surely, we all want to pick and choose from the widest possible array of possibilities; otherwise, we may miss the one decision or option that we would have chosen if only we had paid attention to those who did not share our value priorities. For example, Democrats make a huge mistake if they listen only to other Democrats.

2. Curiosity. To take advantage of the panning-for-gold method of living your life, you need to listen and read, really listen and read. Other people have the power to move you forward, to liberate you from your current condition of

partial knowledge. To be a critical thinker requires you to then ask questions about what you have encountered. Part of what you gain from other people is their insights and understanding, when what they have to offer meets the standards of good reasoning that you will learn in Asking the Right Questions.

3. Humility. Recognizing that even the smartest person in the world makes many mistakes each week provides the ideal platform for engaging actively with other people. Certainly, some of us have insights that others do not have, but each of us is very limited in what we can do, and at honest moments, we echo Socrates when he said that he knew that he did not know. Once we accept this reality, we can better recognize that our experiences with other people can fill in at least a few of the gaps in our present from avoiding a very common obstacle to critical thinking, the belief that "those who disagree with me are biased, but I am not."

Respect for good reasoning wherever you find it. While we want to respect and listen to other voices, all conclusions or opinions are not equally worthwhile. The critical questions you will learn as you study this book will provide a framework to assist you in picking and choosing from among all the people trying to influence you. When you find strong reasoning, regardless of the race, age, political party, wealth, or citizenship of the speaker or writer, rely on it until a better set of reasoning comes along.

By all means, act with confidence based on your beliefs, but hold your conclusions with only that degree of firmness that permits you to still wonder to yourself, "Might I be wrong?" They are your opinions, and you quite understandably feel protective of them. Listen as political satirist Stephen Colbert mocks this attitude of ours: "I'm not a fan of facts. You see, the facts can change, but my opinion will never change, no matter what the facts are."

Anyone determined to keep the conclusions he already has may well use reasons to justify his opinion. However, this kind of reasoning is called "managed reasoning," meaning that the reasoning is being selected so as to reach a particular conclusion [Browne, Keeley 2015: 10-11].

Assignment 11

1. Read the text **What Are the Reasons?** below.
2. Why is identifying reasons an essential step in critical thinking?
3. What are those several characteristics of arguments which grab our attention?
4. Why does Wittgenstein suggest that there is little purpose in rushing critical thinking?

What Are the Reasons?

Reasons provide answers for our human curiosity about why someone makes a particular decision or holds a particular opinion. Consider the following statements:

1. *The government should protect only a select number of endangered species from extinction.*

2. A centipede sting is more dangerous than the bite of most snakes.

3. Schools should have the right to search students' lockers for drugs and weapons.

Those three claims are each missing something. We may or may not agree with them, but in their current form, they are neither weak nor strong. None of the claims contains an explanation or rationale for why we should agree. Thus, if we heard someone make one of those three assertions, we would be left hungry for more.

What is missing is the reason or reasons responsible for the claims. Reasons are beliefs, evidence, metaphors, analogies, and other statements offered to support or justify conclusions. They are the statements that form the basis for creating the credibility of a conclusion.

When a writer has a conclusion he wants you to accept, he must present reasons to persuade you that she is right and to show you why. It is the mark of a

rational person to support his beliefs with adequate proof, especially when the beliefs are of a controversial nature. For example, when someone asserts that China will soon overtake the United States as the dominant country in the world, this assertion should be met with the challenge, "*Why do you say such a thing*?" The person's reasons may be either strong or weak, but you will not know until you have asked the question and identified the reasons. If the answer is "*because I think so*," you should be dissatisfied with the argument because the "reason" is a mere restatement of the conclusion. However, if the answer is evidence concerning the projected military and educational expenditures of the two countries, you will want to consider such evidence when you evaluate the conclusion. Remember: You cannot determine the worth of a conclusion until you identify the reasons.

Identifying reasons is an essential step in critical thinking. An opinion cannot be evaluated fairly unless we ask why it is held and receive a satisfactory response. Focusing on reasons requires us to remain open to and tolerant of views that might differ from our own. If we reacted to conclusions rather than to reasoning, we would tend to stick to the conclusions we brought to the discussion or essay, and those conclusions that agree with our own would receive our rapid agreement. If we are ever to reexamine our own opinions, we must remain curious, open to the reasons provided by those people with opinions that we do not yet share.

Sometimes an argument will consist of a single reason and a conclusion; often, however, several reasons will be offered to support the conclusion. So, when we refer to someone's argument, we might be referring to a single reason and its related conclusion or to the entire group of reasons and the conclusion it is intended to substantiate.

Attention: Reasons are explanations or rationales for why we should believe a particular conclusion.

As we use the terms, argument and reasoning mean the same thing – the use of one or more ideas to support another idea. Thus, when a communication lacks reasons, it is neither an argument nor an example of reasoning. Consequently, only arguments and reasoning can be logically flawed. Because a reason by itself is an isolated idea, it cannot reflect a logical relationship.

Several characteristics of arguments grab our attention:

• They have intent. Those who provide arguments hope to convince us to believe certain things or to act in certain ways. Consequently, they call for a reaction. We can imitate the sponge or the gold prospector, but we ordinarily must respond somehow.

• Their quality varies. Critical thinking is required to determine the extent of quality in an argument.

• They have two essential visible components – a conclusion and reasons. Failure to identify either component destroys the opportunity to evaluate the argument. We cannot evaluate what we cannot identify.

That last point deserves some repetition and explanation. There is little purpose in rushing critical thinking. In fact, the philosopher Wittgenstein suggests that when one bright person addresses another, each should first say "Wait!" Taking the time to locate arguments before we assess what we think might have been said is only fair to the person providing the argument [Browne, Keeley 2015: 33-35].

Assignment 12

PRACTICE EXERCISES

Read three Passages below and answer a critical question: *What are the reasons?*

First survey each passage and highlight its conclusion. Then ask the question, "*Why*?" and locate the reasons. Use indicator words to help. Keep the conclusions and the reasons separate. Try to paraphrase the reasons; putting them in your own words helps clarify their meaning and function.

Passage 1

Popular women's magazines create unfair expectations of beauty for women. Almost all the photos of women featured on the covers of magazines have been digitally enhanced by manipulating the lighting and measurements of the bodies of the women in the photo to look more attractive. Studies have shown that it is impossible for women to mimic some of the physical features represented on magazine covers because these features are literally manufactured by computers. The "beauty" that we see on the cover of a magazine is not realistic, but instead, computerized.

Passage 2

Schools all around the nation are forming community service programs. Should students be required to do community service? There are many drawbacks to requiring such service.

Students will not be able to understand the concept of charity and benevolence if it is something they have to do. Forced charity seems contradictory to the concept of charity. If this concept loses value for the students because the service was not a choice, they will then resent the idea of community service and not volunteer to do so at a later time in life.

Furthermore, because this community service would be coerced, the students may not perform at a high level. They may feel they will do the bare minimum of what is required. The students may also be resentful or rude to the people they are helping, which would also hamper the progress of the community service. As you can see, forced community service may not be the best programming choice for schools.

Passage 3

In high school, men's basketball and men's football usually dominate the Friday-night schedule. Should it be that way? These games are significant to the high school experience, but not at the cost of the other sports in the school. Just because it has been a tradition does not mean that the format has to remain that way.

It is easier for most parents and other fans to make it out to the game on Friday nights. Therefore, it is easier for them to come see the men's basketball or men's football games.

What about the girl's basketball team or the swim team? Their games should not always be stuck on weekday afternoons and evenings. Their families often are not able to make it out to see them because most parents are working during the afternoons. The students who play these "secondary" sports are not getting a fair share of the spotlight; the schedule should change to accommodate these other sports [Browne, Keeley 2015: 10-11].

Assignment 13

1. Read the text **MYTHS** below.
2. Why do myths continue to shape our narratives?
3. What do myths address?
4. Why are myths still pervasive and influential in modern society?
5. Prove that myths play a significant role in contemporary politics and social discourse.

MYTHS

Myths in modern society are more pervasive and influential than often acknowledged, and they manifest in various forms and contexts.

Myths arise from the collective unconscious, as proposed by Carl Jung. These archetypes, such as the mother, father, anima, and shadow, are universal and continue to influence human behavior and storytelling in modern society. Myths address fundamental human fears, anxieties, and uncertainties, making them an integral part of our psychological landscape.

Modern myths are not confined to traditional literary or religious contexts. They permeate popular culture, including films, videogames, body horror, and even scientific narratives. These myths help society frame and come to terms with contemporary issues, such as the human implications of technology and artificial intelligence. They are "promiscuous" in the sense that they inhabit various forms of media and culture, reflecting and shaping societal values and norms.

Modern media and literature continue to draw heavily from ancient mythological themes, adapting them to contemporary contexts. The patterns of ancient myths, such as the hero's journey, are repeated in modern narratives with minor changes to make them fresh and relevant. This is evident in works like the Harry Potter series and the Star Trek franchise, which use mythological archetypes and story structures to engage audiences.

Myths serve as a common ground across cultures, facilitating cross-cultural consciousness and understanding. Modern media, including movies, books, and games, incorporate mythological elements that are universally recognizable, allowing audiences to connect with stories on a deeper level. This shared mythological heritage helps in bridging cultural gaps and promoting a sense of global community.

Myths play a significant role in contemporary politics and social discourse. Charismatic leaders can exploit and propagate myths to mobilize communities

and reinforce cultural complexes. This can lead to the mythologization of leaders and the creation of polarized, factually false narratives that can fracture society. Understanding these myths is crucial for addressing the societal and political issues they generate.

There is a resistance to recognizing modern myths due to several factors, including the misconception that myths must be ancient and literally believed. This resistance also stems from the tendency to view myths as belonging to "primitive" cultures, rather than acknowledging their presence in modern, developed societies. Additionally, the blurring of lines between fiction and myth, as well as the influence of postmodernism and depth psychology, complicates the recognition of modern myths.

In summary, myths in modern society are vibrant, multifaceted, and deeply embedded in our cultural, psychological, and social fabric. They continue to shape our narratives, influence our behaviors, and reflect our collective anxieties and aspirations.

Assignment 14

1. Read 20 famous myths below.
2. Discuss them with your partner.
3. Apply critical thinking to all myths.
4. Prove or disapprove each myth.
5. Give examples of some other popular myths.

1. *MYTH: An apple a day keeps the doctor away.*
2. *MYTH: Ostriches hide by putting their heads in the sand.*
3. *MYTH: Eating chocolate gives you acne.*
4. *MYTH: Natural sugar like honey is better for you than processed sugar.*
5. *MYTH: Eating food within 5 seconds of dropping it on the floor is safe.*
6. *MYTH: Eating ice cream will make your cold worse.*
7. *MYTH: Dogs and cats are colorblind.*

8. MYTH: Eating a lot of carrots gives you good vision.

9. MYTH: Pregnancy gives you "baby brain" and makes you dumb.

10. MYTH: Hair and nails keep growing after death.

11. MYTH: Some people have photographic memories.

12. MYTH: People only use 10% of their brain.

13. MYTH: "Left-brained" people are creative. "Right-brained" people are analytical.

14. MYTH: Shaving makes your hair grow back thicker.

15. MYTH: Taking vitamins will keep you healthy.

16. MYTH: Everyone should drink eight glasses of water a day.

17. MYTH: When you call someone, the signal goes through a satellite.

18. MYTH: There are only 3 phases of matter: Solid, liquid, and gas.

19. MYTH: You can cure a hangover by drinking more.

20. MYTH: Eating before drinking keeps you sober.

Assignment 15

Read and develop the following statements about fact-checking:

1. Fact-checking is the process of verifying the factual accuracy of reporting, statements, or content to ensure that the information presented is correct and reliable.

2. Fact-checking is essential for maintaining the integrity and trustworthiness of the information being disseminated.

3. Fact-checkers cross-reference claims against source material.

4. In addition to text, fact-checkers also verify the accuracy of images, including photographs, illustrations, infographics, and other visual content.

5. FactCheck.org is the organization which monitors the factual accuracy of what is said by major U.S. political players.

6. Based in the UK, Full Fact is another prominent external fact-checking organization.

7. The impact of fact-checking can be influenced by various factors, including preexisting beliefs, ideology, and the timing of the corrections.

8. There is ongoing debate about the effectiveness of fact-checking, particularly in the context of political fact-checking.

Assignment 16

1. Read the text about **Cognitive distortions** below.
2. Have you ever observed them? Which ones? Provide examples.
3. Are there any effective method to manage cognitive distortions?
4. What are they?

Cognitive distortions

Cognitive distortions are biased or inaccurate ways of thinking that can lead to negative patterns in an individual's thought processes. Cognitive distortions are defined as "faulty or inaccurate thinking, perception, or belief" by the American Psychological Association. These distortions can create negative patterns in thinking, affecting how a person views themselves, their life, and their relationships.

Cognitive distortions can arise as a response to stress, negative life events, or gradual smaller negative experiences, such as negative expressions from parents or caregivers. They can contribute to mental health conditions like depression and anxiety by increasing misery, fueling anxiety, and making individuals feel badly about themselves.

The Common Types of Cognitive Distortions are:

1. **All-or-Nothing Thinking.**

This involves viewing things in absolute terms, such as black and white, without considering the nuances or middle ground. For example, "*I'm either a complete success or a total failure*".

2. **Overgeneralization.**

This distortion involves assuming that one negative event will lead to a pattern of negative outcomes in the future. For instance, "*If I failed this exam, I'll never pass any exam*".

3. **Mental Filtering or Negative Filtering.**

This involves focusing exclusively on the negative aspects of a situation while ignoring the positive ones. For example, dwelling on a minor criticism despite receiving many compliments.

4. **Labeling and Mislabeling.**

Assigning negative labels to oneself or others based on a single event or behavior. For example, *"I'm a failure because I didn't get the job*".

5. **Emotional Reasoning.**

Allowing emotions to dictate what one believes as true, regardless of the facts. For instance, "*I feel like a bad person, so I must be a bad person*".

6. **Mind-Reading.**

Assuming one knows what others are thinking without evidence. For example, "*My boss is upset with me because he didn't smile at me today*".

7. **Catastrophizing.**

Expecting the worst possible outcome in any situation. For instance, "*If I'm late for work, I'll be fired and end up homeless*".

8. **Personalization.**

Believing that everything is about oneself, even when it is not. For example, "*Our team lost because of me*".

9. **"Should" Statements.**

Using self-critical language that imposes unrealistic expectations on oneself or others. For example, "*I should have done this differently*".

10. **Jumping to Conclusions.**

Making assumptions without sufficient evidence. This includes "mind-reading" and "fortune-telling," where one predicts negative outcomes without basis.

11. **Magnification and Minimization.**

Exaggerating the negative aspects of a situation while downplaying the positive ones. For example, "*This one mistake ruins everything*".

12. **Control Fallacies.**

Feeling either completely in control or completely out of control of events. For instance, believing one is responsible for everything that happens or feeling powerless to change anything.

13. **Blaming.**

Holding others responsible for one's own feelings or circumstances. For example, "*You made me feel bad today*".

Cognitive Behavioral Therapy (CBT) is an effective method for managing cognitive distortions. CBT involves identifying and challenging these distorted thoughts, helping individuals to reframe their thinking and improve their mental well-being. By recognizing and understanding these cognitive distortions, individuals can take steps to correct their thinking patterns, reduce negative emotions, and enhance their overall mental health [Checklist of Cognitive Distortions, эл. ресурс].

Assignment 17

1. Read the text about **Qualitative argumentation** below.
2. What does qualitative argumentation involve?

3. How can dialectical models be applied in the context of qualitative argumentation?

4. Why is a mixed methods approach valuable?

Qualitative argumentation

Qualitative argumentation involves the construction, communication, and substantiation of arguments using qualitative data, which is often rich in detail and context but lacks the precision of quantitative data.

Qualitative researchers are engaged in producing social explanations or addressing intellectual puzzles. This process involves constructing a perspective, interpretation, or line of reasoning based on the data. The argument must be relational, considering both the audience and the grounds on which the argument stands.

When developing an argument from qualitative data, it is crucial to examine the nuances of the data by asking 'why' questions about trends, anomalies, and interesting cases. This involves interpreting the data, understanding the context, and engaging with the theoretical framework and existing literature to see how the data confirm, challenge, or add to existing knowledge.

It is essential to be honest about what the data actually support and avoid 'armchair theorising' or using buzzwords that are not grounded in the research. The argument should be based on a thorough analysis of the data, and researchers should be aware of their own positionality and biases.

The argument should also be evaluated in terms of its broader significance. Asking 'so what?' helps to determine how the argument sheds light on economic, social, or political issues. This ensures that the research is meaningful and has the potential to influence change.

In some contexts, qualitative reasoning involves using non-numerical descriptions to understand physical or social systems. This approach focuses on

discrete values, relevant qualitative values, and ambiguous results, rather than precise numerical values. It is particularly useful in modeling complex systems where quantitative data may be incomplete or unavailable.

While qualitative and quantitative methods have different epistemological and ontological assumptions, they are not mutually exclusive. A mixed methods approach can be valuable, as it combines the depth of qualitative data with the breadth of quantitative analysis. This can open up new possibilities for interpretation and provide a more comprehensive understanding of the research topic.

In the context of qualitative argumentation, dialectical models can be applied to create qualitative networks that facilitate structured reasoning. This approach involves engaging with counterarguments and alternative perspectives to strengthen the argument and ensure it is well-substantiated.

By considering these aspects, qualitative researchers can construct robust and convincing arguments that are grounded in their data and contribute meaningfully to the broader research discourse [Farley, эл. ресурс].

Assignment 18

To foster critical thinking in various contexts, here is a list of 100 questions that can be applied across different content areas and situations:

1. What is the purpose, goal, or point of critical thinking?
2. How does critical thinking connect to learning?
3. How strong are the arguments to develop critical thinking?
4. What is critical thinking, and how is it defined?
5. What are the key components of critical thinking?
6. How does critical thinking enhance decision-making?
7. What role does critical thinking play in problem-solving?
8. Why is critical thinking essential for personal success?
9. How does critical thinking contribute to professional success?
10. What skills do critical thinkers possess?

11. How do critical thinkers identify and address biases?
12. Why is it important to teach critical thinking skills in education?
13. How can individuals develop and improve their critical thinking skills?
14. How does critical thinking help in identifying and combating misinformation?
15. In what ways does critical thinking foster creativity and innovation?
16. How does critical thinking contribute to being a better citizen?
17. What is the role of critical thinking in promoting self-reflection and personal growth?
18. Why is critical thinking crucial for economic growth and innovation?
19. How might education influence critical thinking?
20. What if we had unlimited resources to develop critical thinking skills?
21. What insights have you gained about critical thinking?
22. Why is critical thinking important?
23. What is the difference between critical thinking and scientific thinking?
24. What is the difference between critical thinking and creative thinking?
25. What are the causes and effects of applying critical thinking?
26. What is innovative thinking?
27. What role does creativity play in application of critical thinking skills?
28. What are the key characteristics of a critical thinker?
29. How does curiosity contribute to critical thinking?
30. Why is humility important for critical thinkers?
31. What role does objectivity play in critical thinking?
32. How do critical thinkers approach problem-solving?
33. What is the importance of analytical thinking in critical thinking?

34. How do critical thinkers assess relevance and significance in information?

35. Why is open-mindedness crucial for critical thinkers?

36. How do critical thinkers handle conflicting viewpoints or new information?

37. What is the significance of flexibility in critical thinking?

38. How does active listening contribute to critical thinking?

39. What role does effective communication play in critical thinking?

40. How do critical thinkers engage in introspection and self-reflection?

41. What is the importance of metacognition in critical thinking?

42. How can critical thinking skills be applied in a business or professional setting?

43. What are some strategies for developing and improving critical thinking skills?

44. How do critical thinkers identify and address common thinking errors?

45. What is the role of skepticism in critical thinking?

46. How does critical thinking contribute to personal growth and self-improvement?

47. What are some actionable tips for cultivating critical thinking skills?

48. What is critical thinking defined in the context of humanities?

49. What are the key components of critical thinking in humanities?

50. How do critical thinkers in humanities analyze and evaluate sources of information?

51. What role does skepticism play in critical thinking within humanities?

52. How is critical thinking applied in academic research within the humanities?

53. What are some critical thinking skills necessary for humanities research?

54. How do critical thinkers in humanities identify and address their biases and assumptions?

55. What strategies can be used to mitigate confirmation bias in humanities research?

56. How does critical thinking vary across different disciplines within the humanities (e.g., history, literature, philosophy)?

57. What are some discipline-specific examples of critical thinking in humanities?

58. How is critical thinking taught and cultivated in education?

59. What are the long-term benefits of incorporating critical thinking into humanities education?

60. How does critical thinking in humanities prepare students for real-world challenges?

61. What role does critical thinking play in addressing societal issues and promoting civic engagement in the humanities?

62. What ethical considerations are involved in critical thinking within the humanities?

63. How does critical thinking intersect with philosophical theories and methods in the humanities?

64. What is critical thinking in the context of scientific inquiry?

65. What are the key components of critical thinking in scientific research?

66. How do scientists use critical thinking to analyze and evaluate scientific data?

67. How is critical thinking integrated into the scientific method?

68. What are the steps involved in critically evaluating a scientific hypothesis?

69. How do scientists identify and address their own biases and assumptions in research?

70. How does critical thinking vary across different scientific disciplines (e.g., biology, physics, chemistry)?

71. What are some discipline-specific examples of critical thinking in science?

72. How is critical thinking taught and cultivated in science education?

73. What are the long-term benefits of incorporating critical thinking into science education?

74. How does critical thinking in science prepare researchers for real-world challenges?

75. What role does critical thinking play in addressing scientific controversies and debates?

76. What ethical considerations are involved in critical thinking within scientific research?

77. How does critical thinking intersect with methodological rigor in scientific research?

78. What steps do you take when analyzing information to ensure objectivity and accuracy?

79. Can you describe a time when you had to prioritize multiple factors or criteria in a decision-making process?

80. What is the concept of defeat in qualitative argumentation?

81. How is the burden of proof determined in qualitative argumentation?

82. What are grounded and justifiable arguments in qualitative reasoning?

83. How do you determine if an argument ultimately defeats another in a qualitative network?

84. How do qualitative research questions differ from quantitative research questions?

85. What are some examples of qualitative research questions?

86. What methods are typically used in collecting data for qualitative research?

87. What would happen if it never rained?

88. How would you solve the problem of making £100 or $100 by next week if you wanted to?

89. Is it ever okay to break the law?

90. Do you have reasons for your most strongly held beliefs? To what extent are they based on emotions? Are they based in factual evidence and fair reasoning? Would other people find them convincing?

91. Are there beliefs that others hold that make you upset or angry? Why? How might you change your perspective in order not to react negatively when you hear contradictory beliefs?

92. Is it important to use language clearly? Why or why not? What are some steps that one can take to use language more clearly?

93. What is a logical argument? What role do you think logical argument could play in your life?

94. What are the implications if aliens were to arrive on Earth tomorrow?

95. Can a person be happy and sad at the same time?

96. How would your perspective be different if you were on the opposing side of an argument?

97. What would happen if you suddenly woke up in your favorite book or TV show?

98. Is it possible to think of nothing?

99. What are the conclusions, and do they make sense?

100. What is the meaning of life?

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