Course Overview: Critical Thinking

Thinking may come naturally to us but constructive reasoning certainly does not. None of us are naturally endowed with the ability to think clearly and logically; without learning how and without practicing. Constructive thinking is a skill, the same commitment, training, and practice that is required to be a good golfer, for building houses, or for playing some musical instrument are also required in order to be a good thinker. Critical thinking provides us with the tools to be better thinkers, to better understand the process of reasoning, to identify flaws in our reasoning and that of others and it is the foundations of constructive science.

Critical thinking is a form of metacognition, it is self-directed and self-monitored; it is about developing the conceptual tools to be able to think for oneself. Critical thinking is about trying to understand our processes of reasoning and developing standards for improving them, it is a way of thinking about any subject in which the person improves the quality of their thinking by assessing, analyzing, deconstructing and reconstructing it to try and improve its clarity, accuracy, relevance, depth, breadth and logical consistency.

This course is broken down into four main sections, where we will look at the major themes of cognition, logic, reasoning and argumentation.

The first section looks at human cognition to understand the basic biological and evolutionary constraints placed on us when it comes to effective reasoning. Here we will talk about how the brain works, look at some of the central insights from cognitive science and talk about some of the many limitations and flaws prevalent within human cognition.

In the second section, we will look at logic. Although critical thinking is much more than just logic, reason and logic lay at the heart of constructive thinking. Here we talk about the various different forms of logic, inductive, deductive, formal, informal etc.

In the third section, we will start our discussion on the theme of reasoning, the process through which we take in information and use some logic to infer conclusions. We will take the process apart to understand the elements of effective reasoning. Here we will talk about the standards of reasoning, elements of reasoning, creative thinking and more.

In the final section, we discuss the important topic of argumentation, how people with diverse, or even divergent opinions, come to resolve their differences in order to develop new knowledge, make decisions, or reach consensus on some issue.

This course is based upon the work of the Foundation for Critical Thinking and is designed to provide an overview to critical thinking that should be accessible to all.
Critical Thinking

Critical thinking is the capacity to distinguish between effective and ineffective processes of inference and requires the formation of beliefs based upon sound reasoning. The word critical derives from the Greek word critic and implies a critique; it identifies the intellectual capacity and the means "of judging" and of being "able to discern." Much information and knowledge in everyday life can not be proven to be decisively correct or incorrect; critical reasoning is the capacity for objective analysis and evaluation in order to form a judgment on the process through which knowledge or information was generated. The literature on critical thinking has roots in two primary academic disciplines: philosophy and psychology.

Evaluating Inference
People often react to a piece of information rather than look at the reasoning that created that information. Critical thinking is about evaluating the process used to derive some piece of knowledge or information, rather than simply assessing the end product. Critical thinking involves suspending reactions to phenomena and looking at the process of reasoning and evidence that created that piece of information. Evaluating a piece of information based upon the process of inference that generated it, requires that one can subject oneself (and others) to reason rather than emotional reaction, and preconceived bias towards certain conclusions.

Skills and Characteristics
Critical thinking consists of both a conceptual skill set and a personal attitude. One must both have the thinking skills to evaluate evidence and processes of inference, but also have the will to subject oneself to the conclusions of those inferences. This involves trust in reason and willingness to reconsider our position, or adjust our beliefs and actions according to that which is derived from the most solid foundations of reason. Critical thinking is inward-directed with the intent of maximizing the rationality of the thinker. One does not use critical thinking to solve problems — one uses critical thinking to improve one’s process of thinking. Thus one must be firstly interested in improving one’s cognitive processes.

Personal Characteristic
These dispositions, which can be seen as attitudes or habits of mind, include open and fair-mindedness, inquisitiveness, flexibility, a propensity to seek reason, a desire to be well informed, and a respect for and willingness to entertain diverse viewpoints. Individuals must want to identify floors in their reasoning and assumptions, to seek out knowledge and evidence that is objective even if it refutes their own cherished beliefs. A critical thinker has to be able to not only identify floors in their reasoning but also adapt their behavior and beliefs to it. The relationship between critical thinking skills and critical thinking dispositions is an empirical question. Some people have both in abundance, some have skills but not the disposition to use them, some are
disposed but lack strong skills, and some have neither. One empirical measure of this critical thinking dispositions is the California Measure of Mental Motivation.

Balanced
Critical thinking requires a balance in judgment. Balanced judgment means maintaining different perspectives and inputs on the situation. Egoism can be a primary deterrent of balanced judgment, and thus a degree of self-awareness to identify and counterbalance this is required. Willingness to imagine or to remain open to considering alternative perspectives; willingness to integrate new or revised perspectives into our ways of thinking and acting; and willingness to foster criticality in others.[note]https://goo.gl/ocK1SG[/note]

Critical thinking requires an acceptance that what one considers as knowledge must be testable and explainable to be worthy of serious consideration and that legitimate theories clearly define their scope and the circumstance in which they will concede defeat.

Metalanguage
Critical thinking, before anything involves some degree of awareness of one's own or others processes of reasoning. As such it can be understood as a form of metacognition, in that it tries to identify the process of reasoning behind some inference or the sources behind a piece of information. Critical thinking is not simply knowing a lot it involves the tools for thinking to enable the subject to solve a diversity of problems.

Thinking Skills
Critical thinking involved a number of skills including observation, interpretation, analysis, inference, evaluation, explanation, and metacognition. Edward M. Glaser proposed that the ability to think critically involves three elements: An attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences. Knowledge of the methods of logical inquiry and reasoning. Some skill in applying those methods.[note]https://goo.gl/ocK1SG[/note]

Reason
The ability to reason logically is a fundamental skill of rational actors. Hence the study of the form of correct argumentation is relevant to the study of critical thinking. However, deductive reasoning is not sufficed as other forms of inductive reasoning are often needed. Thus critical reasoning is not the same as "hard" deductive reasoning. As operating in the "real world" means often operating without the certainty of deductive logic. As well as understanding the basics of inductive reasoning, critical thinking often involves the effective use of inductive, abductive or analogical reasoning.

Scepticism
Critical thinking involves the skill and propensity to engage in an activity with reflective skepticism.[note]http://goo.gl/NblUqJ[/note] It involves suspending our judgment about claims that are presented to us, or our own claims, and waiting for sufficient evidence before adopting a new belief. Firstly examining the reasoning, assumptions, and biases behind a position.
The reasoning behind a proposition should be based on sound logic, not on social pressure or emotional persuasion. The truth factor ascribed to statements should not be determined by the emotion that accompanies them or their popularity. [I] Ideas do not become more valid because more people subscribe to them, thus even in the face of popular believes skepticisms is required until appropriate evidence is found. A critical thinker can handle uncertainty, prefers to be aware of their areas of ignorance and can wait for valid evidence.[note]https://goo.gl/VJJq5U[/note]
Cognitive Science

Cognitive science is the interdisciplinary, scientific study of the mind and its processes.[note]http://goo.gl/adpBNX[/note] It examines the nature, the tasks, and the functions of cognition. Cognitive scientists study intelligence and behavior, with a focus on how nervous systems represent, process, and transform information.[note]https://goo.gl/91GbSu[/note]

Human Brain

The human brain weighs approximately 3 pounds (1,300 - 1,400 g). Although it only makes up about 2%[note]https://goo.gl/SMlzVz[/note] of the total body weight of an average adult human, brain tissue consumes a large amount of energy in proportion to its volume. Most of the brain's energy consumption goes into sustaining the electric charge of neurons.[note]http://goo.gl/FRv9o6[/note] Most vertebrate species devote between 2% and 8% of basal metabolism to the brain. In primates, however, the percentage is much higher—in humans it rises to 20–25%.[note]https://goo.gl/OZQP2k[/note]

The mind is a composite of approximately one hundred billion neurons connected together into a neural network. Neural networks are made of neurons and connections between them called axons, with have synapses where the different neurons meet. Neurons generate electrical signals that travel along their axons. When a pulse of electricity reaches a junction called a synapse, it causes a neurotransmitter chemical to be released, which binds to receptors on other cells and thereby alters their electrical activity.[note]https://goo.gl/Q3tS1A[/note]

The property that makes neurons unique is their ability to send signals to specific target cells over long distances. [note]https://goo.gl/CWCB5V[/note] They send these signals by means of an axon, which is a thin protoplasmic fiber that extends from the cell body and projects, usually with numerous branches, to other areas, sometimes nearby, sometimes in distant parts of the brain or body. Each of the one hundred billion neurons has on average 7,000 synaptic connections to other neurons.[note]http://goo.gl/ZzQQ0f[/note]

In its functioning, a neuron is a form of switch i.e. a cell that is either on or off. Any given neuron has a number of inputs from other neurons if those inputs are above a given threshold then it is activated and fires. If a neuron is activated it then sends our signals to other neurons that it is connected to; its output then becomes the input to other neurons. Where the output of one neuron meets the input to another there is a synapse. The synapses change in their chemical composition as one learns in order to create stronger connections. In such a way the cognitive system can adapt and changes over time to form new patterns of neural networks.
Patterns

The brain is physically built as a neural network and cognition happens in patterns. [note]https://goo.gl/QHl91I[/note] Every pattern corresponds to an idea or memory. If two neurons are turned on when a pattern is stimulated then the synaptic connection between them becomes stronger. If they are not on at the same time then the connection becomes weaker. Over time if the same pattern keeps getting excited then the connections get stronger between the neurons that are activated. After a time a pattern can form that remains there even when not excited. By repeating something over and over a pathway is activated to form a pattern. This pattern is a memory or concept that one can then use for cognition.[note]https://goo.gl/QHl91I[/note]

The brain is hardwired to discern patterns. Humans have a well-documented tendency for pattern recognition. It is both a great cognitive strength but also can be a weakness because we may see patterns that do not actually exist. Humans are generally very good at pattern recognition—so good in fact that we may often see patterns that are not actually there.[note]https://goo.gl/oY2WI2[/note] Brain processing is based largely on processes of pattern recognition which matches the underlying biological structure of the brain as a massive parallel processors with many connecting neural networks. One of the advantages of this is our innate strength at making connections between different ideas, visual patterns, words, events, objects etc.[note]https://goo.gl/oY2WI2[/note]

Pattern recognition is filtered through a particular module of the brain that undertakes what is called reality testing. We see many apparent patterns in the world around us, and then we run those patterns through a reality-testing algorithm to decide whether it agrees with our internal model of reality.[note]https://goo.gl/U7ba7c[/note]

Once one has formed a pattern exciting one part of the network may then stimulate the full pattern. For example, a slight aroma of fresh bread in the kitchen can trigger a whole network of connections associated with some memory in a cafe a few years earlier.

We identify and learn about new things in relation to preexisting patterns within our conscious. This means one can only learn something new, or understand something if one can associate it with something already known. If we want to communicate with someone we have to accommodate the fact that what we say has to be associated with something they already know for it to be effectively interpreted.[note]https://goo.gl/QHl91I[/note]

We can learn something new very quickly if we can associate it with other things and fit it into a larger pattern. We can readily identify a new type of dog as an instance of our pre-existing pattern of a generic dog. Likewise, we think and learn by association. For example when explaining something new we typically give an example as this helps to create associations.
Layered

The mind is a hierarchically layered, network structure, with this hierarchy being based on abstraction i.e. more basic patterns on the lower leaves are used as the building blocks for higher, more abstract patterns.[note]https://goo.gl/i7isOx[/note] Abstraction in its main sense is a conceptual process by which general rules and concepts are derived from the usage and classification of more specific examples i.e. concrete forms.

In the development of the brain more basic patterns are formed and then grouped to create higher patterns. The patterns to one layer become the input for another layer. The lowest level of abstraction is connected to the direct senses. Providing the data or facts that are input. We then build up higher level patterns through a process of abstraction and synthesis, abstracting away from specific instances in synthesizing them into generic forms.[note]https://goo.gl/QHI91I[/note]

In an evolutionary sense, our biological brains are a lizard brain, inside of a mammal brain, inside of a primate brain, inside of a human brain, which is the most recently evolved part of our brain, the neocortex.[note]https://goo.gl/oY2Wl2[/note]

It is possible for our brain to hierarchy control lower levels from higher levels, all the way down to the most basic primitive level - down to our brainstem. We can directly control very basic functions within our brain stem, such as the regulation of our breathing and maintenance of balance, from our most abstract and advanced levels of consciousness.

Much of our cognition takes place subconsciously in the more primitive parts of our brain; where the emotions take place. Emotions make quick decisions for us that are mainly adaptive, including such states as fear, lust, hunger, happiness, and sadness. Emotions provide us with a very direct behavior motivation. It is much easier for us to feel repelled by something like a piece of rotten food rather than for us to have to reason through it to generate a response. Without these motions, we would have to reason everything through, but with them, we simply experience the emotion - such as fear when presented with a dangerous predator - and then react.

Our decisions seem to be conscious, but they are often made subconsciously by an evolutionary neurobiological calculus that we are not aware of. Emotions are subconscious and involuntary. We do not choose to feel fear; we just feel fear and then invent a reason to explain why we feel it—with varying degrees of correspondence between the emotional cause and the rationalization.[note]https://goo.gl/oY2Wl2[/note]
Cognition

Cognition is “the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.” Cognition is a word that dates back to the 15th century when it meant “thinking and awareness.” Today the term cognition refers to a diverse collection of psychological activities and encompasses processes such as attention, comprehension, memory, judgment, evaluation, reasoning, decision-making, problem-solving, the usage of language, etc. Cognition within humans may be concrete or abstract, conscious and unconscious, as well as intuitive and conceptual.

Approaches

The science of cognitive – cognitive science – is an interdisciplinary approach that tries to understand the mind, intelligence and the workings of cognition by drawing upon insights from psychology, philosophy, artificial intelligence, neuroscience, linguistics, and anthropology among others. There are a number of different approaches to understanding cognition, but two main paradigms are the computational and evolutionary approaches. The first wave of cognitive science focused on computational processes that generate knowledge about the world by looking at cognition in terms of inputs, processes, and outputs. One of the main tenets of cognitive science since its origins is that thinking can best be understood in terms of representational structures in the mind and computational procedures that operate on those structures.

A more recent approach has been that of evolutionary psychology, which tries to understand human cognition as the product of a set of evolved psychological adaptations to perennial challenges in our historical, social and natural environment. This evolutionary perspective can be seen as the second wave of the cognitive revolution. This second wave views the human brain as composed of evolved computational systems, formed through natural and social selection to use information to adaptively regulate physiology, social and physical behavior. This shift in focus—from knowledge acquisition to the adaptive regulation of behavior—provides new ways of thinking about different areas of cognition.

Structure

One of the primary overarching organizational structures to cognition is its use of abstraction to create a hierarchical structure composed of various levels of abstraction. In an evolutionary sense our biological brains can be seen to be a primitive brain stem, or lizard brain that is wrapped around a mammal brain, inside of a primate brain, inside of a human brain, which is identified as the most recently evolved parts of our brain, specifically the frontal lobe portion of the neocortex. The human brain functions hierarchically in its capacity to modify and control the earlier evolved, more primitive parts of our brain through the more advanced parts. Psychologist Abraham Harold Maslow made a holistic attempt to try and classify this hierarchical structure to the brain and its corresponding needs in what is called Maslow’s hierarchy of needs. Although Maslow’s hierarchy may not define an exact correspondence to the underlying complexity of the brain, it does capture a general hierarchical structure to cognition, motivation and the different emotional needs that people
have. Within this hierarchy of needs, people are seen to have a set of basic physiological needs such as food, sex, sleep etc. But in addition to these basic emotions, we also have a set of higher psychological needs that we seek: desires to be safe, to be loved, to have self-esteem, and to experience what Maslow called self-actualization.

The brainstem is the area associated with the most primitive functions, regulating the most basic bodily requirements, such as regulating one’s heartbeat or limb coordination while walking. Much of our cognition takes place unconsciously in these most primitive parts of our brain which are also where our emotions are housed. These emotions essentially make quick decisions for us that are mostly adaptive, evolved strategies, including fear, lust, hunger, anxiety, disgust, happiness, sadness etc. The idea is that emotions provide a direct, and rapid, behavioral motivation so that we do not have to perform the conscious act of reasoning things through. For example, in calculating the risk of encountering a predator, we simply experience the emotion of fear, and then we act upon that emotion.

The primitive parts of our brain can experience basic emotions like hunger, but only our much more evolved neocortex can experience an emotion like the need for self-actualization. The neocortex, or the frontal part of our brain, has executive function whereas more primitive parts of the brain are the seats of emotion and instinct. The neocortex is involved with social behavior, long-term planning, and inhibition.

Cognitive Dissonance

The brain is not a unified whole with some centralized command center, the perception of it being so is a constructor, in effect, it consists of networks of different functional domains and hierarchical levels. Many different parts are interacting and communicating to, on aggregate, create the illusion of one unified consciousness that we think of as ourselves. But this is simply a construct, the reality involves much tension and conflict between the different brain regions as they each attempt to fulfill their own function and purpose.

This is most explicit in the relationship between the more advanced neocortex, that has executive function, and the more primitive parts through which we experience direct emotions and instincts. The conflict between the different parts creates cognitive dissonance, which is the holding of two or more beliefs or ideas that are manifestly contradictory. We do not like cognitive dissonance and thus are motivated to resolve this conflict.

The individual may resolve this cognitive dissonance in a number of ways. They may exert downward control from the executive part to constrain lower level drives. They may avoid this cognitive dissonance by compartmentalizing beliefs and ideas so as to keep them separate. One instance of this might involve special pleading, which is a form of fallacious argument that involves an attempt to cite something as an exception to a generally accepted rule, principle, etc. without justification for defining it as an exception. In so doing one can keep ideas, beliefs or motives separate from other categories that might create conflict.

Humans are very good at inventing reasons to justify their desired beliefs, what is called rationalizing. Often, rather than imposing these high-level functions on our more primitive desires, the neocortex may rationalize – through the use of special pleading for example – decisions that are made by more primitive regions in order to resolve the cognitive dissonance. The different brain regions come into conflict, and once the conflict is resolved, our brains give us a small amount of dopamine, the reward neurotransmitter, to make us feel
good. When we meet our psychological needs, our brain gives us a reward that makes us feel good. There is a basic reward and punishment system hardwired into the biochemistry of the brain. When we do something that is likely to be advantageous evolutionarily, we feel good, which equates to a release of dopamine to our reward centers. With Functional Magnetic Resonance Imaging (fMRI) and Transcranial Magnetic Stimulation, contemporary neuroscience methods are increasingly finding the neurological correlates to what psychologists have been demonstrating for decades. With these tools, we can now see different brain areas in conflict and the conflict resolution that the individual experience when a decision or rationalization is achieved.

Control

The desire for control, or at least for the sense or illusion of control, is one of the most basic and primitive need that motivates us. We do not like to experience the feeling that we are victims of a whimsical world or that we are helpless in the face of uncertain forces or random events. This desire for control can be seen as a direct product of evolution. Unknown and uncontrollable environments limit our capacity for predictability and security, that threatens our survival. We like to think that we exert some causal control over ourselves, the events that affect us, and over our environment.

One manifestation of this desire for control is a belief in superstitions. We tend to develop beliefs that if we engage in a certain activity, it will protect us or enable us to succeed. Wanting more control or certainty is an important driving force behind most forms of superstition. We invariably look for some kind of a rule, or an explanation for why things happen and feel discontent if we do not find one, leaving us open to the desire of simply creating one.

Superstitious practices give us the illusion that we can exert some control over otherwise random events. We also have a desire for simplicity because the simpler things are, the more control we can have over them. Therefore, we are motivated to oversimplify the things that we are confronted with. We stereotype because it enables us to reduce a potentially complicated set of factors into some simple rules. This can be advantageous when we understand that the rule is just a simplified representation, but often we take the simplified model to be the complex reality that it represents and this leads to errors because the two are different.

Belief

Along with a desire for control, we have an innate desire for meaning in our lives, a sense of unity, a desire for connection with something greater than ourselves. And these are strong motivators towards belief in some supernatural power or forces that fulfill all of these psychological needs. The drive towards belief is very strong in humans, particularly strong towards things that we want to believe in. Not only have we evolved to identify patterns rapidly but we also inherently desire control, a sense of stability order and unity. Many of the things we are driven to believe are so because they provide this sense of unity to our interpretation of the world and relieve the burden of having to make a full inquiry into a complex reality. Added to this may things are beneficial for us to believe. When we have a sense that we are connected to something that is profound, it feels good. This can then be
reinforced by confirmation bias, which involves seeking out data that seems to confirm our beliefs. Beliefs are largely expressive of our emotional state, when we are positive we believe the future will be good, when we are feeling negative we believe the future will be bad. Thus it can be very difficult to change people’s behavior by making a rational argument to them because their behavior is still overwhelmed by their beliefs and by their emotions. However, if one addresses the individual’s emotions, that is much more effective. This has been demonstrated with the success of modern advertising that speaks intentionally to the emotions while largely bypassing reason; knowing this to be more effective for most people

Social

The social brain hypothesis was proposed by British anthropologist Robin Dunbar, who argues that human intelligence did not evolve primarily as a means to solve ecological problems, but rather as a means of surviving and reproducing in large and complex social groups. The development of the human brain can be closely associated with the development of ever more complex social systems; the use of language for communication between members and other socio-economic facts involved in the formation of large formal social organizations.

Social norms, the customary rules that govern behavior in groups and societies, strongly shape individual human behavior. Most people are driven much more by social influence than by reason. Telling someone what others do in a situation is much more effective than telling them what is the logical things to do. For example, telling people that others do not drink and drive is much more effective than telling them the negative implications of such behavior.

Individual humans have a need for self-esteem, people want to feel good about themselves, but just as importantly we want to know that others think positively of us also. People always want to make their behavior and beliefs seem consistent to others. In order to do this, we often rationalize what we want to believe in order to put a socially acceptable spin on our behaviors and behavior. Equally, people do not like to admit that they may be wrong or to admit that we have flaws because that is a threat to our self-esteem.

Change

The brain gives us the experience of free will and control over ourselves, but research overwhelmingly shows that human beings generally have poor self-control. Typically, about 95 percent of the time, people will fail to alter their own behavior through conscious effort alone; for example, to quit some habit. This is due to the fact that this takes significant energy and conscious commitment on the behalf of the individual. The brain is highly adaptive and plastic, meaning its ways of thinking can change over time. Therefore, if we practice and make a concerted effort to behave in certain ways, those behaviors will become inculcated and will become easier over time. Practicing the habit of executive control or executive function over one’s more basic parts of the brain can be a learned capability. This is where critical thinking can be of value, in examining the individual’s behavior carefully, in understanding errors and enabling us to exert an effort to correct flaws.
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Belief

Along with a desire for control, we have an innate desire for meaning in our lives, a sense of unity, a desire for connection with something greater than ourselves. And these are strong motivators towards belief in some supernatural power or forces that fulfill all of these psychological needs. The drive towards belief is very strong in humans, particularly strong towards things that we want to believe in. Not only have we evolved to identify patterns rapidly but we also inherently desire control, a sense of stability order and unity. Many of the things we are driven to believe are so because they provide this sense of unity to our interpretation of the world and relieve the burden of having to make a full inquiry into a complex reality. Added to this may things are beneficial for us to believe. When we have a sense that we are connected to something that is profound, it feels good. This can then be
reinforced by confirmation bias, which involves seeking out data that seems to confirm our beliefs. Beliefs are largely expressive of our emotional state, when we are positive we believe the future will be good, when we are feeling negative we believe the future will be bad. Thus it can be very difficult to change people’s behavior by making a rational argument to them because their behavior is still overwhelmed by their beliefs and by their emotions. However, if one addresses the individual’s emotions, that is much more effective. This has been demonstrated with the success of modern advertising that speaks intentionally to the emotions while largely bypassing reason; knowing this to be more effective for most people

Social

The social brain hypothesis was proposed by British anthropologist Robin Dunbar, who argues that human intelligence did not evolve primarily as a means to solve ecological problems, but rather as a means of surviving and reproducing in large and complex social groups. The development of the human brain can be closely associated with the development of ever more complex social systems; the use of language for communication between members and other socio-economic facts involved in the formation of large formal social organizations.

Social norms, the customary rules that govern behavior in groups and societies, strongly shape individual human behavior. Most people are driven much more by social influence than by reason. Telling someone what others do in a situation is much more effective than telling them what is the logical things to do. For example, telling people that others do not drink and drive is much more effective than telling them the negative implications of such behavior.

Individual humans have a need for self-esteem, people want to feel good about themselves, but just as importantly we want to know that others think positively of us also. People always want to make their behavior and beliefs seem consistent to others. In order to do this, we often rationalize what we want to believe in order to put a socially acceptable spin on our behaviors and behavior. Equally, people do not like to admit that they may be wrong or to admit that we have flaws because that is a threat to our self-esteem.

Change

The brain gives us the experience of free will and control over ourselves, but research overwhelmingly shows that human beings generally have poor self-control. Typically, about 95 percent of the time, people will fail to alter their own behavior through conscious effort alone; for example, to quit some habit. This is due to the fact that this takes significant energy and conscious commitment on the behalf of the individual. The brain is highly adaptive and plastic, meaning its ways of thinking can change over time. Therefore, if we practice and make a concerted effort to behave in certain ways, those behaviors will become inculcated and will become easier over time. Practicing the habit of executive control or executive function over one’s more basic parts of the brain can be a learned capability. This is where critical thinking can be of value, in examining the individual’s behavior carefully, in understanding errors and enabling us to exert an effort to correct flaws.
Cognitive Limitations

Something that we have been trying to emphasize in this section to the course and something that is required to become a better thinking is a recognition to the fact that human cognitive capabilities are significantly constrained in their functioning. What we perceive of as reality is largely an illusion constructed by our brains. Visual perception is highly filtered and constructed by our brain, memories are not only constructed but reconstructed every time we access them, our brains create patterns to information and assigns meaning to those patterns, then abstracts away from the impression to build larger more complex patterns. The end product is that our sense of the world around us and ourselves is primarily a construct of our brains.

Our perceptions are not passive, there are many ways in which the brain constructs these perceptions. In fact, our brains actively construct a picture of what is going on around us based on a tiny fraction of all the sensory information that is received. This results in the opportunity for many potential errors, manipulation, and distortion in the end product that we often unknowingly assume to be “reality.”

Optical illusions are an example of this, representing times when objects either are not stable or are not in line with the broader physical context. This results from the fact that the brain has to make assumptions about what is likely to be true, those assumptions are then used to process sensory information. Typically those assumptions are accurate, but when they are not correct the result is an optical illusion.

Constructed Perception

When our brain is constructing our perception of our environment, it will introduce lines or connections where it thinks they should be, based on a set of assumptions about what it thinks it should be seeing. Our brains will compare different types of sensory input in order to construct one seamless picture. Irrespective of the data provided it will adjust one sense or the other in order to make things match, without one being aware that the original sensory data did not match.

For example, when we look at someone clapping their hands, the two events of what we see and hear appear to be simultaneous to us, when in fact – because light travels much faster than sound – the two events of what we see and hear happen at different times. This is a constructed illusion in the brain, which is working in the background to synchronize the two events because it knows that they should both occur at the same time. As long as the visual and auditory information is within 80 milliseconds of each other, the brain will construct them as being simultaneous.

One of our strengths as cognitive beings is making connections between different events, ideas, visual patterns, or other phenomena. Human cognition is so well designed to see patterns that we sometimes see patterns that are not even present. Brain processing is based largely on pattern recognition most likely because of its underlying structure as a neural network.
Attention

Attention is very significant to our construction of reality because we are constantly overloaded with a vast amount of sensory information, and it is not possible to pay attention to even a significant fraction of it at any given instance. As a result, we place a huge filter on most of the sensory information that reaches us and pay attention to only what our brains see as being important.

We actually pay attention to a very small subset of the available information, which we manufacture into a complete account by adding pieces of information as needed. The end result is a story that is largely constructed by our brain, altered based on comparison with what others believe, and subject to manipulation in order to reduce cognitive dissonance; making it conform with our other beliefs and experience. Likewise, human memory is very much flawed in its workings. Like our perception, our memory is not a passive recorder; instead, our memories are constructed entirely by our brains. In fact, they are very much conditioned and contingent upon everything that we think and our overall conception of reality.

In a study conducted by Ian Skurnik and colleagues in 2007, the researchers showed that as many as 27 percent of young adults incorrectly remembered a false statement as being true only three days after they were told of it, and this increased with age; 40 percent of older adults misremembered a false statement as being true. They remembered that they had heard the statement before, but they did not remember that it was false. We attend to a very small subset of information, which we weave into a complete story by adding constructed pieces as needed. The end result is a story that is largely a product of our cognitive workings where sensory input is constructed into meaningful patterns. Not only are the components of what we perceive constructed, but also how we put our perceptions together into a meaningful way is also constructed. Recognizing these innate fallibilities in human cognition is an essential step toward effective critical thinking.
Logic

In its application to our conception of phenomena, the term logic applies to human reasoning, where it defines thinking according to a set of consistent and coherent rules and the domain of philosophy that studies these principles of correct reasoning.[note]http://goo.gl/odY7im[/note] Likewise, the term may be applied in a more generalized sense to all phenomena, where a logic is any integrated and ordered set of interrelationships between entities that is intelligible, i.e. there is a certain logic to the motion of rush-hour traffic. This is the meaning of the word we are using when we say "that politics has no logic" or "can you see the logic in a cup that can not hold liquid?" The former sense of the term is dealt with in another article on formal logic, while this article deals largely with the term in the later sense.

Systems

A logic is the system or set of principles underlying the arrangement and behavior of elements in a system. All ordered systems have a set of relationships between their parts that defines how the whole system and its parts behave. This set of interrelationships that defines the parts is the logic of the system.

For example, there is a logic to the behavior of a horse, because it is defined and governed by a set of interrelations between its elements and its connections with its broader environment. A horse will exhibit certain behavior as a product of this set of interrelationships. If we give the horse some hay and some meat it will eat the hay not the meat, this behavior to the horse is governed by a logical set of relations between it parts and its environment and this we would say is the logic governing the horse's behavior; in this case the fact that its digestive system is designed to process hay, not meat.

Interrelationships

Logic refers to the interrelationships between things, the fact that there is some order to those interconnections and through them, the behavior and features of the parts are defined by the whole organization and the logic of its interrelationships.

The logic to a shop, and how to run a shop, is governed by the many things that it is interconnected with, customers, suppliers, local and global economy etc. When the shop owner decreases the price of some product, she does this according to some set of logical relationships with the other elements; because she believes it will attract more customers into the shop, or because they have just received a discount delivery, or they are overstocked etc. The shop owner is acting logically because she is acting in accordance with the logic of being a shop own; the set of interrelationships with other things that this entails.

Likewise, all systems have a logic that governs their behavior and it is through that set of interconnections that the parts are defined. For example, we can not understand what a mother is without understanding what a child is. It is the logic between them that defines each and creates a dynamic that drives their behavior. To properly understand what
parenting is one has to in fact understand a whole myriad of things such as at least the idea of a child, the idea of birth, the idea of youth, of responsibility, nurturing etc. One has to understand all of these things to understand the idea of being a mother because the mother’s state and behavior are defined by her interrelationship with all of these other factors and the logical set of interrelationships between them. [note]http://goo.gl/opYZXx[/note]

Logical Domains

This idea that there is a logic behind things is a central premise of critical thinking and science. Science presumes that the things and events in the universe occur in some constant and intelligible patterns that are comprehensible through careful, systematic study. Scientists believe that through the use of reason, and with the aid of instruments, people can discover patterns in all of nature. [note]http://goo.gl/FJLiCL[/note] The fundamental assumption of all of science is that the world around us is logical in some way. That means that there is some pattern to the relationship between things and events that can be understood intelligibly and this forms the logic of a particular domain. We can say then, that it is this logic that researchers within a particular domain are trying to use reason to discover. In this sense, all domains of study and science represent a particular logic. [note]http://goo.gl/opYZXx[/note] A subject then is a set of ideas that are interrelated in a logical way to try and capture the logic behind some system in the world.

Things have a meaning and definition as part of a broader system of logic that defines them. To understand what something means one has to understand the logic governing the broader system it is a part of. In reasoning, one tries to figure out this logic of things, because in a system that exhibits any degree of complexity its dynamics or logic will not be manifest, one will simply see events, possibly some associations will be manifest but not all, and it requires systematic thinking in the form of reasoning to derive the underlying logic. One can say then that learning a body of content, say, an academic discipline, is equivalent to learning to think within that discipline. Hence to learn biology, one has to learn to think biologically. To learn sociology, one has to learn to think sociologically. Biologists are trying to construct the logic of living things, physicists are trying to figure out the logic of physical systems, sociologists are trying to understand the logic behind social systems etc. [note]https://goo.gl/y0Rxrn[/note]

Objective Knowledge

It is in this sense of logic that the idea of objective knowledge can have foundations. To have objective knowledge is to understand how something really works, which is equivalent to understanding the logic of the system under consideration. Knowledge, that is of value is knowledge that is objective, which means that it is relevant within many frames of reference, it stays working under many different circumstances and this can only be achieved by understanding the deep logic to the system. A piece of knowledge that is only applicable under certain circumstances, only applies to certain people, or cultures, is of less value than
knowledge that is relevant to all situations. This more objective knowledge is a product of understanding the broader logic behind the system.
With critical thinking, one is not doing philosophy, in searching for deep metaphysical Truth with a capital T, but like science critical thinking is much more practical, it is in search of knowledge that works and stays relevant independent of place, time, society or culture.
Critical thinking and science are standards and methods for a process of inquiry that will help us develop objective knowledge, knowledge that works and has value independent of anyone's evaluation.
It is by understanding the logic of photons that we can create lasers and any society, anywhere on the planet now can create lasers, by understanding the logic to the human body we can cure diseases, with the logic of energy conversion that is captured in the knowledge of thermodynamics, we can send rockets to the moon.
But in order to understand this objective logic it is required that our subjective conceptions are shaped to conform with the external logic of the systems we are considering, not the other way round. This is - or has in the case of science been - achieved through the application of objective standards and methods.
Induction - Deduction

Overview
Reason is the capacity to think, understand, and form judgments through a process of inference that is guided by some form of logic. It is one of the ways by which thinking leads from one idea to a related idea and generates knowledge that is based upon a coherent set of rules. When looking at the different types of reasoning philosophers have come to define two primary and distinct kinds of reasoning, called deductive reasoning and inductive reasoning.

Induction and deduction differ in both structure and in strength of conclusion. Concerning structure, in a generalized sense, deductive reasoning is reasoning downwards from a premise to a specific conclusion. Whereas inductive reasoning is bottom-up, where we start with a number of specific instances and then more towards a general conclusion. With respect to strength of conclusion deductive reasoning leads to certainty whereas inductive reasoning leads to probability. In deductive arguments, the conclusion is constrained within the premise. This is in a sense a closed system, a form of thinking inside the box, as we follow a well-defined set of steps according to a well-defined set of rules leading directly from premise to conclusion. In contrast, induction is more like thinking outside the box, we are inferring from what we know to what might be.

Deduction
Deduction is a process of reasoning from a given statement to a conclusion through a well-formed set of steps. [note]https://goo.gl/BSmfZ9[/note] It typically involves reasoning from the general to the particular; but not always. For example, our premise might be that good students pass exams and that Kate is a good student, therefore Kate will pass the exam. We can see how the original premise leads directly to the conclusion. In deductive reasoning, the conclusion is derived from the original premise, and thus every deductive argument is either valid or invalid, and this can be mathematically proven. If in the above example the final statement does not prove valid - Kate does not pass the exam - then we would have to go back and check the premise as either one of them must be incorrect.

Proofs
Proofs are examples of deductive reasoning. In mathematics, a proof is a deductive argument for a mathematical statement. In principle, a proof can be traced back to self-evident or assumed statements, known as axioms.[note]https://goo.gl/ZyLB8S[/note] An axiom is a statement or proposition that is regarded as being established, accepted, or self-evidently true. In the argument, other previously established statements, such as
theorems, can also be used. A proof, because it is deductive, must demonstrate that a statement is always true, rather than enumerate many confirmatory cases.[note]https://goo.gl/mzAn8v[/note] An unproved proposition that is believed to be true is known as a conjecture. A classical example of an axiomatic system, Euclid’s method consist of assuming a small set of intuitively appealing axioms, and deducing many other propositions (theorems) from these.

Limitations

Unfortunately, most of the world can not be summed up into nice neat proofs. In the everyday world, deduction involves a requirement for a large amount of general information in order to give one a specific conclusion that may be certain but is often quite obvious and not very helpful. In addition to being able to reason logically from a given statement to another, one also needs to be able to take what one has experienced before and use that to infer general theories to predict what might happen in the future. This is inductive reasoning, and it is the type of reasoning we use all day, every day.

Induction

Induction lends itself to no such analysis as deduction. It is more a process whereby general propositions are established based upon a limited amount of particular instances;[note]https://goo.gl/HYcl56[/note] it typically involves passing from the particular to the general, saying something new based on what we already know. Polling would be a good example of this. We often take polls of a population to draw a conclusion about the whole population. In this process, we are gathering data from a limited number of instances, a small subset of the population, and we then use that data to draw conclusions about the whole population. Because we are generalizing from what we know to what might be true induction can not be certain it can only have varying degrees of strength, which can be interpreted statistically. Inductive reasoning may be almost 100 percent true, but never be proven certain like deductive conclusions. Its application in the world rests on the assumption that there are unchanging effects produced by natural causes, and a general induction is made by discovering apparent uniformities which form the basis of generalizations. It can achieve only probability, never mathematical certainty.[note]http://goo.gl/nDKBWV[/note]

Induction involves taking samples from the past and projecting them onto future events; it is based on the insight that the future often resembles the past. Thus inductive reasoning in its broad sense includes all inferential processes that “expand knowledge in the face of uncertainty”. The process of induction has been the great method of modern science, and by it, many of the celebrated scientific achievements have been made. Thus it was by induction that Newton discovered the principle of gravity and Darwin came to the theory of evolution.[note]http://goo.gl/nDKBWV[/note]
Abductive Reasoning

Sometimes the world works on predictable rules of inference but sometimes is does not, sometimes the future is not the same as the past and unlikely events do occur. To solve this we need a similar but different form of reasoning called abduction. Abductive reasoning is often described as being “inference to the best explanation.” Abductive reasoning is a form of logical inference which goes from an observation to a theory which accounts for the observation. Ideally seeking to find the simplest and most likely explanation and this is the essence of scientific enquiry. It involves the gathering of data and the formulation of theories and conjectures to explain that data. Abduction works by taking in data and ruling out the impossible explanations until one is left with only the most plausible options given the evidence. It is a form of logical inference which goes from an observation to a theory which accounts for the observation, ideally seeking to find the simplest and most likely explanation.

For example, in a billiard game, after seeing the red ball moving towards one, we may abduce that the cue ball struck the red ball. The strike of the cue ball would account for the movement of the red ball. It serves as a hypothesis that explains our observation. Given the many possible explanations for the movement of the red ball, our abduction does not leave us certain that the cue ball, in fact, struck the red ball, but our abduction, still useful, can serve to orient us in our surroundings. Despite many possible explanations for any physical process that we observe, we tend to abduce a single explanation (or a few explanations) for this process in the expectation that we can better orient ourselves in our surroundings and disregard some possibilities.

Abductive reasoning can also be called reasoning through successive approximation. Under this principle, an explanation is valid if it is the best possible explanation to a set of known data. The best possible explanation is often defined with regards to simplicity and elegance. According to Schick and Vaughn, abduction uses five criteria: testability, fruitfulness, scope, simplicity, and conservatism. When figuring out the best explanation, we consider two or more hypotheses, then compare them based on these criteria. Whichever one fits best overall is the best explanation. The difference between abductive reasoning and inductive reasoning is a subtle one; both use evidence to form guesses that are likely, but not guaranteed, to be true. However, abductive reasoning looks for cause-and-effect relationships, while induction seeks to determine general rules.

Analogical reasoning

An analogy is a comparison between two phenomena, which highlights respects in which they are thought to be similar. Analogical reasoning is any type of thinking that relies upon an analogy. An analogical argument is an explicit representation of a form of analogical reasoning that cites accepted similarities between two systems to support the conclusion that some further similarity exists.
Analogical reasoning involves lateral thinking between two distinct things, we are transferring a statement about one distinct phenomenon to another phenomenon. Analogical reasoning is reasoning horizontally. [note]https://goo.gl/vWPZe[/note] Imagine trying to explain to a child what a lion is, one might say it is like a big cat. Thus one is creating an analogy between the two, a horizontal link. We might likewise see this analogical process of reasoning in how a court of law will rule a particular way on a case based upon other similar cases that it has ruled upon in the past.

Analogical thinking is ubiquitous in human cognition and communication where analogies are used in explaining new concepts. Domains such as electricity or molecular motion, which cannot directly be perceived, are often taught by analogy to familiar concrete domains such as water flow or billiard ball collisions. Analogy is a cognitive process of transferring information or meaning from a particular subject (the analogue or source) to another (the target), or a linguistic expression corresponding to such a process. [note]https://goo.gl/RAO5iD[/note] In a narrower sense, analogy is an inference or an argument from one particular to another particular, as opposed to deduction, induction, and abduction, where at least one of the premises or the conclusion is general. Abductive reasoning takes the general form of: 1) A is similar to B in certain respects. 2) A has some further feature Z. 3) Therefore, B also has the feature Z, or some feature Z* similar to Z.
Reason

Reason is the capacity for cognition, understanding, and the formation of judgements based upon logic or simply as the ability to think logically.[note]http://goo.gl/HcpdO7[/note] Reasoning is the capacity or function of a conceptual system to process information and ideas according to an objectively consistent set of instructions. A valid reason is the output of this process. A central characteristic of reasoning, as opposed to other forms of thinking, is that it is based upon a coherent set of objective rules that govern the processing of information or ideas.

Reasoning can be contrasted with cognitive processes governed by a subjective set of rules. Subjective sets of rules are based upon or influenced by personal feelings, tastes, or opinions.[note]http://goo.gl/SmEil8[/note] Subjective rules are dependent on the specific experience of the subject, the individual. A subject is a person or circumstance giving rise to a specified feeling, response, or action. Thus it is specific to that instance. In contrary objective means not influenced by personal feelings or opinions in considering and representing facts, or not dependent on the specific subject for existence or actually.[note]http://goo.gl/X77TEm[/note]
Rational
Whereas the term reasoning refers to a purely conceptual process, the term rationality is the embodiment of this process within some phenomena. Rational means based on or in accordance with reason.[note]http://goo.gl/lC2rUd[/note] Rationality implies the conformity of one’s beliefs with one’s reasons for believing, of one’s actions with one’s reasons for action, or the design of something according to an objective set of instructions.[note]https://goo.gl/d9GFHM[/note]

To illustrate how reason and rationality relate one might think about the so-called Age of Reason. An age in European history that developed during the mid-1600s largely as a product of the new found knowledge deriving from the scientific revolution. This knowledge was based on a relatively objective set of rules, those of mathematics and scientific inquiry, that can be tested by anyone.[note]https://goo.gl/WfaPTY[/note] Based upon this new knowledge European countries developed a whole new set of rational institutions, institutions that are based upon an objective set of instructions such as a constitution or modern legal code. These rules are publicly available for everyone to question and they are thought to derive from a coherent and objective body of knowledge. This may be contrasted with the previous political regime that was based on a more subjective set of rules. The previous institutions of the Middle Ages were based largely upon the rules of an absolute monarchy and aristocracy which are largely subjective interpretations. Equally, the moral code of a religion is often based largely on the subjective revelation of an individual or few individuals. Again this could be contrasted to a moral code based upon reason, as were developed during the Enlightenment such as utilitarianism, that provides a set of rules that are designed to enable the maximum utility for the maximum number of people, which is a logical reason to their foundation and makes them rational institutions.[note]http://goo.gl/mrjij1[/note]
Reason and Faith

Faith and reason are both sources of authority upon which beliefs can be founded. Reason commonly is understood as the principles for a methodological inquiry, it involves some kind of algorithmic process whereby the end product is generated, this process can then be demonstrated. Once demonstrated, a proposition or claim is ordinarily understood to be justified as true or authoritative. Faith, on the other hand, involves a stance toward some claim that is not, at least presently, demonstrable by reason. Thus faith is a kind of attitude of trust or assent. As such, it is ordinarily understood to involve an act of will or a commitment on the part of the believer. Religious faith involves a belief that makes some kind of implicit, or explicit, reference to a transcendent source.[note]http://goo.gl/WaL2la[/note]

Reason and Intuition

Equally, one can contrast reasoning with knowledge or thinking based on intuition and tradition. Trying to validate a concept based on intuition is largely a closed self-referential process. "Why do you believe such and such? Because I feel it is right! Why do you feel it is right? Because it feels right!" With intuition, the insight is subjective and not generalizable in the way that a conclusion drawn through a process of logical reasoning is. The same is true of tradition, with tradition as a foundation for knowledge and practice something is true or justified because it has stood the test of time. However, this conservative logic is a self-reinforcing loop because as long as people are conservative whatever existed in the past will be perpetuated and become more valid without any reason for being so except people's belief in tradition. This logic is not referring to anything outside of itself for validation, and thus it is subjective. Truth cannot be its own validation.

Subjective concepts are relative only to a particular context or environment. For example, the knowledge of many traditional cultures around the world is specific to those cultures. Their knowledge of how to catch fish or why the sky is blue is only applicable or maintainable within their physical or socio-cultural environment. While other cultures have other technical and spiritual beliefs that differ due to their development within a different context.

Arguments

To generate new knowledge, to gain greater insight that is relevant within a broader environment it is necessary to bring disparate insights, opinions or perspectives together and in some way resolve their contradictions and differences to reach a deeper understanding. The process of doing this is called an argument. An argument is a process whereby divergent ideas or opinions are brought into contact and interact with the intent of inferring a conclusive single global outcome. Arguments can take two basic forms, fights or debates, depending on whether they are based on force or the process of reasoning.

Fighting is a form of argumentation that involves the usage of physical force. The use of force can remove all opposition to some kind of subjective concept or opinion through a variety of forms such as physically destroying the dissenters, repression or some form of exclusion so that one side of the argument is not able to be developed or heard. However, this will only temporarily resolve the issue; it has not been overcome by creating a synthesis, the same flaws in one side's argument remain. The result is essentially going round in
circles, using fear, intimidation, and violence to remove dissent and perpetuating the limits in one side’s logic.

Everyone has feelings and opinions, reasoned arguments - what are call debates - though, expose these to a process for finding common ground and consensus without resorting to violence. This illustrates the linkage between reason and democracy. Democracy is designed to create the space for debate without resorting to violence in order to find resolutions to disparate opinions. This is in contrast to authoritarian systems that use the former method, of fear, intimidation, and violence, for removing dissent. Just as reason is a delicate and fragile balancing act, true democracy is likewise. Debates involve members with divergent opinions or perspectives communicating a reason or set of reasons for their opinion with the implicit or explicit aim of persuading others that an action or idea is valid.[note]https://goo.gl/GwNJX[/note]

Dialectic
This form of collective reasoning may also be called a dialect. The dialectical method is a discourse between two or more people holding different points of view about a subject but wishing to establish the truth through reasoned argument.[note]https://goo.gl/RfB6Y[/note] The term dialectic is not synonymous with the term debate. While in theory debaters are not necessarily emotionally invested in their point of view, in practice debaters frequently display an emotional commitment that may cloud rational judgment. Debates are won through a combination of persuading the opponent, proving one’s argument correct, or proving the opponent's argument incorrect. Debates do not necessarily require promptly identifying a clear winner or loser; however clear winners are frequently determined by either a judge, jury, or by group consensus. The term dialectics is also not synonymous with the term rhetoric, a method or art of discourse that seeks to persuade, inform, or motivate an audience.[note]https://goo.gl/Xf8ek[/note]

With reason we are are trying to take what is unknown, or has a number of possible explanations and creating a consensus on what is known, what we call knowledge. In this way trying to develop an integrated picture or explanation for events and in order to do that, we have to recognize disparate knowledge, opinions, and information. Dialectic discourse is one process for doing this as it tries to develop knowledge by synthesizing divergence perspectives.

Open Space
The development of the process of reason requires an open space. Within an individual, this is essentially an acceptance of not knowing, the possibility of a number of plausible explanations and a process of balanced inquiry. Within an organization or society, this requires some form of open public place for communications where diverse opinions and perspectives are encouraged or at least tolerated. The Greece forum being a classical example of this or the rise of public spaces that came about with the modern era and particularly the Age of Enlightenment.

Uncertainty
Reasoning essentially means letting go of what we know and developing a system for generating knowledge based on a coherent and objective set of rules. As such uncertainty plays an important part in this process, in fact, is has to be the initial condition. If we already
know everything there is no point in reasoning. If we want to generate new knowledge we have to be open to uncertainty and not knowing, one has to suspend judgment and "knowing" until we have performed this process of inquiry. As the American philosopher Charles Sanders Peirce stated it "upon this first, and in one sense this sole, rule of reason, that in order to learn you must desire to learn, and in so desiring not be satisfied with what you already inclined to think, there follows one corollary which itself deserves to be inscribed upon every wall of the city of philosophy: Do not block the way of inquiry."

False Reasoning
Because reason is a process that gives some form of objective validation to a statement or way of being, people often desire the end product - that is the objective validation of reason - without conducting the process properly or wholly. Reasoning is a process, processes create, transform or change things in some way. Thus we can not know, or should not know what the outcome to the process of reasoning will be. If we already know the answer, then the process of reasoning is simply a process of looking for validation to the answer that we already have. If we want to use reasoning to create new knowledge, then we can not already know what it is we are looking for. Reason is an open and dynamic form of conceptual system. To reason is to be open to a number of outcomes; it is to conduct an inquiry without knowing what the end result will be.

Fallacy
A fallacy is the use of invalid or otherwise faulty reasoning in the construction of an argument. A fallacious argument may be deceptive by appearing to be better than it really is. Some fallacies are committed intentionally to manipulate or persuade by deception, while others are committed unintentionally due to carelessness or ignorance.[note]https://goo.gl/aPoYB5[/note]

Manipulation
Most of what we think we know is a product of our local environment. People typically adopt the information and knowledge presented to them by their culture with little questioning. People's opinions typically fit in with their environment, and this has many advantages regarding reduction in cognitive workload and reducing social friction. Thus there is always a tension between this open-ended process of reasoning and the existing status quo, of what already exists within our environment, the desire to not diverge from the pre-existing establishment.

The desire for conformity is a primary way that we manipulate the process of reasoning. We limit the set of possible outcomes to those that we desire before engaging in the process. Confirmation bias is a good example of this; we are simply using the process of reasoning to confirm a certain class of outcomes that we already know and thus endorse our preconceptions.

Data
People often use data to support a particular argument by only selecting the particular data, or a particular aspect of it, that will result in the desired outcome. The use of data to simply confirm one's preconceptions is a very common act. This is particularly attractive because it looks highly objective, both the data and the process of reasoning may be valid but still the
process has been manipulated to create a certain result, due to the constraints and limitations on the input to the process. Knowledge can not be established by incorporating it as part of the question - this is called begging the question - in such a case we are simply engaged in a process of maintaining the status quo and using the process of reasoning to do so. This is a highly prevalent phenomenon in our world, particularly in domains where there are deep vested interests, such as politics, business and many areas of everyday life.

Egoism and Reasoning
Reason displaces our subjective interest as being at the center of the world and replaces it with some objective rules defined by our environment. Thus displacing the subject as the central reference point, to becoming merely a part of a larger system. This is most clearly illustrated with the Copernican Revolution at the beginning of the modern era. Which, through observation rather than dogma, displaced humans and planet Earth from the center of the universe. Through careful observation of our broader environment and the rules that govern it we now understand that we are not at the center of the Universe.

Open Enquiry
Reasoning is a commitment to creating justifiable knowledge. True reasoning is a delicate and sensitive balancing process. It requires that one as an individual, community or society adhere to some objective set of rules. The rise of reasoning during the modern era has made everything open to inquiry through thinking, within modern rational societies everything is seen to be subject to reason.

A society or individual governed by reason is one that continuously challenges and tests its most firmly held assumptions. To think and reason is to be on an open-ended journey where anything is open to question, proven or disproven, and if disproven has to be let go. This dynamic open-ended journey is one of the characteristics of the modern era, being one of the hallmarks that distinguish it from previous more traditional societies based on subjective insight. Relative to traditional societies modern societies are highly dynamic. Like science, modern societies are on an open-ended journey, and part of being a modern society is to leave behind the comforts of certainty based upon tradition.
Subjective Thinking

Thinking may be conceived of as being either objective or subjective. Where objective thinking means reasoning according to a set of logically objective standards, while subjective thinking refers to reasoning without objective standards and is thus largely contingent on the nature of the individual subject conducting the process.

A subject is a person or thing, in this context subjective means pertaining to or characteristic of an individual person.[note]http://goo.gl/ytOtI[/note] Likewise it can mean relating to properties or specific conditions of the individual mind as distinguished from general or universal experience.[note]http://goo.gl/ns639u[/note] Subjective thinking is then thinking from a single, subject-centered perspective. An example of subjective thinking would be Eurocentrism, seeing the world from the single subjective perspective of a European person, which can not be generalized to all.

Subject-centric thinking is centered on the individual and specific to that individual, it can not be generalized or made objective because subjective though is thinking based on emotion and personal preference rather than rational logic. A subjective statement is one that has been altered by the specific character of the speaker or writer. It often has a basis in reality but strongly reflects the perspective through which the speaker interprets the world.[note]http://goo.gl/Y9aluP[/note]

Origins

Humans have evolved from creatures whose own survival depended upon being focused on their own interests, often at the expense of others, as is typically the case with animals. Biologically we develop from children that are essentially the center of their own universe with little comprehension for the existence of other entities as in some way separate from them.[note]http://goo.gl/n5MYR[/note] Physiologically we experience the world through our individual body, located in a specific time, place, culture, and society. All of these place a subjective interpretation on the world as a default position to the human condition; a view of the world that is centered around the individual subject.

In this respect one might think of subjective thinking as first-order thinking - as we are all born with it - and objective thinking as a form of second-order thinking in that it is something that must be purposefully developed through standards that we place on ourselves and try to live up to. There is nothing inherently wrong with subjective thinking, we all experience the world as subjects. But subjective thinking is not based on objective standards it is dependent on the nature of the individual, it is conditioned and contingent on the character of the individual. Thus subjective thinking can be positive or negative depending on the subject. Depending on the nature of the individual, subjective thinking can be shaped by an altruistic or egoistic perspective.
Altruism

Altruism or selflessness is the principle or practice of concern for the welfare of others.[note]https://goo.gl/zfmlZf[/note] A belief, thought or behavior may be described as being altruistic when it is perceived to be motivated by a desire to benefit someone other than oneself for that person’s sake.[note]http://goo.gl/MzQgSN[/note] The word was coined by the French philosopher Auguste Comte in French, as altruisme, as an antonym of egoism. He derived it from the Italian altru, which in turn was derived from Latin alteri, meaning "other people" or "somebody else".[note]https://goo.gl/zfmlZf[/note]

Altruism in biological organisms can be defined as an individual performing an action which is at a cost to themselves, but benefits, either directly or indirectly, another third-party individual, without the expectation of reciprocity or compensation for that action. There has been some debate on whether or not humans are truly capable of psychological altruism.[note]https://goo.gl/SbwzI9[/note] Complete altruism may be seen to be as impossible as complete egoism in that no one individual exists independently from all other things - and can thus be solely focused on their individual interests without interest in others - vice versa no individual can exist as completely a part of everything else - being able to be interested in only the whole and others without regard for their own individual interests.

Altruism is a traditional virtue in many cultures and a core aspect of various religious traditions and secular value systems. [note]https://goo.gl/zfmlZf[/note] Altruism is often a core component of a belief/value system's conception of being "good" with acts of altruism endorsing the individual as such. Altruism is often strongly associated with religion or spiritual convictions that the world is good and whole.

This is corroborated in research by Robert D. Putnam in his 1990 book[note]https://goo.gl/zi5fsL[/note] "bowling alone," which demonstrated that those who frequented churches or synagogue were more likely do volunteer work, to give money to charity, donate blood, help the homeless, help a neighbor with housework, spend time with someone who was feeling depressed etc. Religiosity, as measured by church or synagogue attendance is, he found, a better predictor of altruism than other factors such as education, age, income, gender or race.[note]http://goo.gl/a1eNP[/note]

Psychological altruism is contrasted with psychological egoism, which refers to the motivation to increase one’s own welfare.[note]http://goo.gl/nj5bG[/note] The two may often exist in a somewhat reciprocal role of codependency. In the book The Economics of Herbert Spencer[note]https://goo.gl/o03oNd[/note] By W. C. Owen the author writes “From the dawn of life, then, egoism has been dependent upon altruism as altruism has been deepened upon egoism; and in the course of evolution the reciprocal services of the two have been increasing."

Like all forms of subjective thinking, altruism identifies the world with one’s self. Just as with egoism, there is no differentiation between the subjective individual and the objective environment.
Egocentric Thinking

Egocentrism is the incapacity to differentiate between self and other. More precisely, it is the incapacity to untangle subjective schemas from objective reality; an inability to understand or assume any perspective other than one's own.[note]http://goo.gl/vkx0WA[/note]

Egocentric thinking is a way of thinking that is centered around the subject's individual motives, desires, and interests, it is a way of reasoning that places an over-emphasis on the value and importance of the subject doing the thinking. Egocentrism results in a tendency to derive information via referencing oneself and how one is being affected by the world; a tendency to view everything in relationship to oneself, without any real independent objective existence; one's desires, values, and beliefs (seem to be self-evidently correct) are often uncritically used as the norm and standard for interpreting all judgment and experience. [note]http://goo.gl/NKAjBP[/note]

Egocentrism is a product of a failure of psychological differentiation during development, that would result in the capacity for an objective perspective - seeing things as existing, and having value, independently from oneself. The term egocentrism derives from the work of Jean Piaget's a Swiss clinical psychologist known for his pioneering work in child development. His 1950's theory of cognitive development, refers to a lack of differentiation between some aspect of self and other. The classical example is the failure of perspective-taking that is characteristic of young children. Unable to infer accurately the perspective of others, the egocentric child ascribes their own perspective to them instead.

However, egocentrism is a broader concept that encompasses a number of additional features of psychological development, these include realism - the confusion of objective and subjective - animism - a confusion of animate and inanimate - and artificialism - a confusion of human activity or intentions with natural causes. What these forms of egocentrism have in common is the inability to differentiate subjective and objective perspectives. Children project subjective qualities onto external objects or events; are unable to center from their own perspective, or else assimilate objective reality to their subjective schemas, the result being a deformation of reality in some way. [note]http://goo.gl/n5MYR[/note]

Piaget suggested that egocentrism was a primary characteristic of children's thought processes until around six to seven years of age, or when they are able to form objective mental models during attempts to solve problems.[note]http://goo.gl/n5MYR[/note] However, when egoism continues past this level and the child fails to differentiate between self and other this becomes an issue. There is nothing wrong with people following their own objectives, interests, and desires, the problem arises when that is done without regard for others - which is often the case when an objective perspective is not developed in order to give balanced value to others.
Subjective thinking focused on the individual extends to their group, creating ethnocentrism. Which are tendencies to regard one's own social context or culture as central, based on a belief that one's own cultural group is superior to others. Ethnocentrism is a form of egocentrism extended from the self to the group that the individual identifies with. Much non-reflexive thinking is either egocentric or ethnocentric in nature.[note]http://goo.gl/NKAjBP[/note] Egocism, like all exclusively subjective philosophies, is prone to constant self-contradiction because it supports all individuals' self-interests irrespective of any logic.[note]http://goo.gl/c1yJrN[/note] Because individuals develop within different contexts, and thus form different subjective perspectives, the result can be overall disunity.[note]http://goo.gl/c1yJrN[/note]

**Naive Perspective**

Subjective thinking, whether over altruistic or over egoistic, derives from a failure of the individual to differentiate themselves from the objective world. The result is a naive perspective that the world is simply transparent to their conception of it. Subjective thinking is naive in nature in that it lacks the capacity to analyze information according to some set of objective standards that might determine its value or validity. Indeed, subjective thinking, in it different forms, leads to a projection of one's own way of being onto the rest of the world; whether the individual's way of being is seen as positive or negative i.e. altruistic or egoistic. With egoism, this often means naive cynicism. Naive cynicism is a philosophy of mind, cognitive bias, and form of psychological egoism that occurs when people naively expect more egocentric bias in others than actually is the case.[note]https://goo.gl/yuynUq[/note] Likewise, an individual with an altruistic perspective will tend to project their own will onto the world, in trust and faith that others and the world are in some way "good" - the opposite from naive cynicism.

Equally subjective thinking naively leads to the conclusion that one naturally sees the world in some objective way, and that there is only really one perspective on the world. As Piaget noted, "an egocentric child assumes that other people see, hear, and feel exactly the same as the child does."[note]http://goo.gl/YfuBf[/note]

In a social context, subjective thinking leads to people believing what they believe, not because of evidence and reasoning but simply because they have been raised to believe that. This naive perspective is maintained by a lack of exposure to other ways of thinking, by staying within a single culture or society that maintains a single dominant belief or value system - the result being that they believe their cultural perspective is the only correct interpretation of reality.

The idea that people naively believe they see things objectively and others do not has been acknowledged for quite some time in the field of social psychology.[note]https://goo.gl/yuynUq[/note] For example, while studying social cognition, Solomon Asch and Gustav Ichheiser wrote in 1949: "[W]e tend to resolve our perplexity arising out of the experience that other people see the world differently than we see it ourselves by declaring that those others, in consequence of some basic intellectual and
moral defect, are unable to see the things “as they really are” and to react to them “in a normal way.” We thus imply, of course, that things are in fact as we see them and that our ways are the normal ways."[note]http://goo.gl/Ki8nle[/note]

Rationalizing

Subjective thinking uses objective reasoning as a means to justify its own ends to others as being in some way objectively derived. We are motivated to believe especially those things that we want to believe. The default mode of human psychology is to arrive at beliefs for largely emotional reasons and then to employ our reason—more to justify those beliefs than to modify or arrive at those beliefs in the first place.

Subject thinking often results in the process of starting with the conclusion and then figuring out which arguments can be marshaled in order to defend that conclusion. On the other hand, objective reasoning focuses on the process going forward, where the conclusion follows from the logic and not the other way around.
Rationalization is symptomatic of the desire within subjective thinking to make reality fit the subjects desired conception of it, rather than the subject altering their conception in accordance with some objective logic. Because subjective thinking is dependent upon a single perspective or conclusion the thinker will more often alter reality to make it fit their thinking, and will be unlikely to abandon their thinking in the face of a reality that refutes it, until completely necessary.
Objective Thinking

Processes of reasoning may be understood as being on a spectrum from being objective to being subjective. Where objective thinking means reasoning according to a set of logical and objective standards, while subjective thinking refers to reasoning without objective standards. Objective thinking means reasoning that is independent of the specific subjective context, not influenced by personal characteristics, feelings or opinions of the subject.[note]http://goo.gl/8mXGu8[/note] An idea can be said to be objective when it is not conditioned by the subject stating it; when it expresses a reality without subjectively modifying it. Objective thinking implies an impartial and balanced inquiry. In reasoning one has to define what is of value and relevance, in so doing assign weight to the different factors involved. This assigning of importance to the different factors involved then defines much of the context to the following process of reasoning and its outcomes. When this is done subjectively an over emphasis is placed on some factors while others are diminished, depending on the character of the subject doing the reasoning. Objective thinking, however, implies an impartial balanced inquiry that applies relevant weight to the different factors involved in the process.

This objective view of the world does not come naturally to human beings, in fact, quite the contrary, the biological evolutionary context to our condition originates in a very subjective perspective, one which leads to an imbalanced view of the world.

Balance Perspective

Subjective thinking, in the form of egocentric thinking for example, comes natural to humans, we do not have to train people to believe what they want to believe, what one wants to believe is what one will naturally believe. In contrary people need to be trained or train themselves if they want to believe something other than this. Whereas the subjective thinking of altruism and egoism both lead to an imbalanced valorization and emphasis - either on the individual or on others - objective thinking strives to overcome this in order to achieve a balanced judgment.

Objective thinking represents the capacity to experience phenomena as in some way independent from our subjective condition; to be able to regard other entities as existing in and for themselves independent of our own will. As this is not an innate feature of human cognition it involves having to develop a framework based on some objective logic that can define the value of things independently from their significance and value in relation to one's own agendas and desires. It is only in being able to do this that one can ascribe the appropriate significance to things and thus make a balance inquiry that is a central part of critical thinking.

Objectivity thinking is only really achieved by creating standards because the results of one's thinking cannot be any better than the quality of the process by which conclusions are reached.[note]https://goo.gl/59L5e7[/note] With the use of standards one can develop objective thinking; the placing of an objective value on phenomena. Unlike altruism that is
inclined to place an over value on other people and things or egoism that is inclined to place an overemphasis on oneself, objective thinking involves making an assessment to derive the balance value and significance of both.
Differentiation of the individual is an important part of achieving balanced, objective reasoning. Differentiation during the individual's development means the separation of different spheres, in particular, the separation of self from others and other things, so as to not be as psychologically and emotionally attached to them; which results in one placing an over evaluation on them.[note]http://goo.gl/n5MYR[/note]

Systems Environment
This distinction between subjective and objective thinking can be understood as a relationship between a system and its environment.
When something is subjective it is a point of view, it is not based upon some logic within the environment. When thinking is objective it is true regardless of points of view as it is based upon the logical set of relationships within the environment. If one's ultimate aim is not to adapt and conform one's reasoning to some larger logic within the environment then the reasoning will invariably be flawed. Objective thinking is about following standards that will enable us to develop knowledge that reflects the logic of our environment. It does not matter if one makes a mistake during reasoning, what is important is that we have the frameworks in place that make reasoning responsive to some broader environmental context, so that we can identify when our reasoning is misaligned. What is important is that our conceptual system can adapt and change in response to the logic of some broader context. The logic of one's thinking must conform to the logic of the environment for it to be successful and the objective standards of reasoning create the framework for conforming our reasoning to the logic within our broader environment.

A central question in the distinction between objective and subjective thinking is then, whether the individual adapts reality to their thinking or do they accommodate and adapt their thinking to reality? Critical thinking and science aim to create standards so that we accommodate our thinking to the logic of the world around us, not the other way round; because this is the only effective solution in the long term. Trying to shape reality to fit into our misconstrued conception of it will only last for a certain period of time as the conceptual system at some stage will be forced to deal with the reality of its environment.

This can be understood with reference to systems theory. All systems are dependent on their environment in some way, when the individual misconstructs the environment they degrade its state and that degradation over time leads to a reduction in the required input for the system, which ultimately means that it will not have the resources required to sustain itself and will eventually disintegrate and be faced with the degraded state of its environment. In order to avoid this, it is necessary to focus on maintaining standards that ensure that we conform our beliefs and conceptual system to the logic within our broader environment. In so doing we show respect for something greater than ourselves and we also sustain that environment; making possible long-term cumulative development.
Standards

Subjective thinking leads the individual to conclusions that are in some way desireable to that subject. The world though, does not always turn out to be how people would like it to be, in fact, it has no regard whatsoever for how people would like it to be and thus often turns out to be something different. To believe something that is an undesirable logic requires discipline and living by the standards of reasoning.

All thinking is by its nature subjective but by adhering to standards we try to achieve greater objectivity in our thinking. Our minds will tend to take a path of least resistance unless we make a specific high-energy effort to step out of these processes and think in a more clear and logical manner. Cognitive biases of subjective thinking lead us into invalid or fallacious thinking rather than into formal logical ways of thinking. These biases are numerous, pervasive, and can have a very powerful influence on how we think and it requires exerting a concerted effort to overcome them in the form of applying cognitive standards to our thinking.

If one wants to be the best high jumper one has to be disciplined in the usage and training of one's body in order to again a certain high achievement. The higher one wants to jump the more disciplined one will have to be in the training of the body. The same is true for thinking, there is the same standard, but this time it is not about jumping higher it is about being able to use higher levels of abstraction effectively. One can only do this by structuring the more basic elementary concepts, once one has these basic building block it is then possible to move up to building more complex and abstract patterns out of them. However, one can not move on to higher level reasoning until the basic concepts have been formed, if one tries to do this the reasoning will be floored. Just like building a house out of weak building blocks that will fall apart if we build too high.

In order to make the basic building blocks solid one has to have discipline in their construction so that they are well structured and balanced. What this means in more practical terms is that one has to define things properly. Until a concept has been properly defined it is not possible to use it properly in the building of higher level more abstract structures. Thus we need to employ discipline in our reasoning in order to define things properly.

The better we can define things the more solid our reasoning will be and we will be able to build larger, more abstract conceptual systems which in turn means that we can reason effectively about more complex systems. When we properly define things we try to get at their most elementary features that define them as distinct from other entities. Every word is distinct in some way or else it would not exist, it may be very similar to others but never exactly the same in all contexts. If one does not use objective standards in reasoning and define things properly then it will not be possible to see what is the same and what is different and thus we will form false categories - that will not correspond to those within the environment, creating tension and conflict.
Standards of Thinking

For every human being thinking comes naturally, but we typically do not think systematically and effectively, much of our thinking left to itself, has many limitations and failings. Our thinking is often biased, unfocused, distorted, partial, uninformed and largely unconscious. People often have no conception of what standards they use for validation. Most of what we know is derived from what our peers have said, what we have been socialized into with only limited standards of validation placed upon it. The effective use of reasoning has to be systematically learned, cultivated and practiced; this is done through the application of stands to our thinking.

It is the nature of the mind to create thoughts, though the quality of that creation varies enormously from person to person. Achievement of quality requires standards of quality. We are thinking systematically or critically when we rely on reason rather than emotion; require evidence; ignore no known evidence; follow evidence wherever it leads; are concerned more with finding the best explanation than being right; analyze apparent contradictions in our reasoning; ask questions and seek knowledge that is valid within all frames of reference, not just one. Systematic thinking involves doing the work necessary to research and understand things for oneself, instead of giving the responsibility to another.

Standards

Universal intellectual standards are standards which must be applied to thinking whenever one is interested in checking the quality of reasoning about a problem, issue, or situation.[note]http://goo.gl/B1FUfZ[/note] To think critically entails having command of these standards. While there are many standards, The Critical Thinking Institute defines a list of the central elements of effective reasoning including:

Clarity: is the quality of being clear, coherent and intelligible. Clarity is a universal standard for reasoning, if a proposition is unclear, we cannot determine whether it is accurate or relevant. In fact, we cannot tell anything about it because we do not yet know what it is saying. Thinking and statements have to be refined in order to simplify and clarify them.

Accuracy: is the degree to which the result of a statement or piece of information conforms to the correct state. Is the statement accurate enough to deal with the topic at hand? Can we check that it is accurate? And how accurate is it, can we measure its degree of accuracy?

Precision: it is possible to make many statements that are clear and accurate but not precise and thus have little value. For example, saying there are many galaxies in the universe does not really inform us of anything at all as it is too imprecise.

Relevance: is what is being said relevant to the topic? or is the thinking relevant to the problem at hand? Lack of relevance in thought or speak will achieve little and is one way of avoiding the issue. Effective reasoning should be adapted specifically to the task at hand and not dealing with some other issue.
Depth: Does one's thinking have sufficient depth to deal with the complexities at hand? Simple questions require only simple answers, complex issues require a depth of insight and thinking. One should be able to think deeply about an issue if needed, superficial thinking is typically of little value when dealing with a topic of any complexity.

Breadth: have we made a full inquiry, gathering data from a wide and diverse set of sources? Is there a sufficient number of perspectives included in the analysis to achieve an inclusive conclusion? It is possible to go deeply into some specific issue without going horizontally to achieve sufficient breadth of vision and a holistic perspective on the issue.

Logic: Is our reasoning logically consistent? Parts of it may be logically consistent but, does it all fit together without inconsistencies? When the aggregate thoughts are mutually supporting and make sense in combination, then one is thinking in a logical fashion. When the combination in some way is contradictory it is not logical. Our reasoning has to make sense as a whole.

Fairness: are we conducting an open minded unbiased inquiry into the situation? Have we determined our desired conclusion before starting the process of reasoning? If so, then it is not truly a fair process. There are many ways that our own prejudices and self-interests can enter in to manipulate our conclusions toward certain ends, have we given full thought to how that may be present in our reasoning?
Motivated Reasoning

Motivated reasoning is reasoning based upon subjective motives that condition the cognitive processes of the individual towards generating conclusions that endorse the maintenance or attainment of the subjective motives of the individual. As such motivated reasoning is characterized by rationalization, a phenomenon where the outcome to the process of reasoning is predetermined and reasoning is used as a means to give conceptual validation to the predetermined outcome. Neuroscience research concludes that motivated reasoning is qualitatively distinct from objective reasoning (instances where there is no strong emotional stake in the outcomes).[note]http://goo.gl/7U4vNz[/note] Motivated reasoning is closely associated with emotional reasoning, which is a cognitive process by which a person concludes that their emotional reaction proves something valid, regardless of the observed evidence or other people’s reasoning.[note]https://goo.gl/DYyI6V[/note]

Processes of motivated reasoning are a type of inferred justification strategy which is typically used to mitigate cognitive dissonance. When people form and cling to false beliefs despite overwhelming evidence, the phenomenon is labeled "motivated reasoning". In other words, "rather than search rationally for information that either confirms or disconfirms a particular belief, people actually seek out information that confirms what they already believe." This is a form of implicit emotion regulation in which the brain moves quickly to converge on judgments that minimize cognitive dissonance.[note]http://goo.gl/gsXq2a[/note]

The outcomes of motivated reasoning derive from "a biased set of cognitive processes — that is, strategies for accessing, constructing, and evaluating beliefs. The motivation to be accurate enhances use of those beliefs and strategies that are considered most appropriate, whereas the motivation to arrive at particular conclusions enhances use of those that are considered most likely to yield the desired conclusion."[note]http://goo.gl/3nY8xx[/note]

An example of motivated reasoning may be seen in the psychological mechanisms people commonly use to preserve a favorable identity. In order to maintain positive self-regard, people unconsciously discount unflattering information that contradicts their self-image or is otherwise troubling. The same can be seen in whole populations of people where a nation may selectively construct its history omitting unfavorable elements that are otherwise widely considered historical facts.[note]https://goo.gl/RiUAx3[/note]

Preconceptions

The common feature of all motivated reasoning is that the outcome is predetermined and thus the process of reasoning is essentially just a process of searching for evidence and reasons to support that predetermined outcome, what is called rationalization. This can be seen as an inversion of the normal conception of objective reasoning, where all relevant evidence is gathered, synthesized and thought through to create a conclusion. With
motivated reasoning however, the outcome is predetermined and the process simply used to present a rational argument to others and oneself. Social science research suggests that reasoning away contradictions is psychologically easier than revising feelings. In this sense, emotions are shown to color how “facts” are perceived. Feelings come first to define preconceptions, and evidence is used mostly in service of those preconceptions. Evidence that supports what is already believed is accepted, that which contradicts it is excluded in various ways.[note]http://goo.gl/Ci4Mz3[/note]

Cognitive Bias
Motivated reasoning defines a situation where the individual can not accept the outcomes to a process conducted through the use of objective reasoning and may develop elaborate rationalizations to justify holding beliefs that logic and evidence have shown to be wrong.[note]http://goo.gl/z13bC0[/note] Motivated reasoning involves building models based upon subjective motives and trying to make any form of objective reality then fit into the model. Evidence disproving the preconception is systematically denigrated through a number of psychological mechanisms such as biased information searching, biased information assimilation or disconfirmation bias. Biased information searching is a phenomenon where the individual actively searches for evidence that supports the preferred belief or discredits any information not consistent with the desired outcome. Biased information assimilation is exposing oneself to sources that will systematically support one’s preconceptions e.g. a person reading a certain politically or ideologically motivated news source which supports their preconceptions. Disconfirmation bias refers to the tendency for people to extend critical scrutiny to information which contradicts their prior beliefs and accept uncritically information that is congruent with their desired beliefs.[note]http://goo.gl/xQyatb[/note] Similarly, another form of cognitive bias used in motivated reasoning may be motivated skepticism, which is the practice of an individual applying more skepticism to claims that contradict their preconception, than to claims that support them.

Cognitive Dissonances
The view of motivation as a means to reducing cognitive dissonance within the individual has long been held by social scientist.[note]http://goo.gl/lv49AY[/note] Cognitive dissonance is a theory of human motivation that asserts that it is psychologically undesirable for individuals to hold manifestly contradictory beliefs, ideas or opinions. The theory holds that this dissonance causes stress that is unpleasant to the individual, which then motivates a person to change their cognition, attitude, or behavior so that they conform to each other and thus reduce the dissonance.
The theory was first explored in detail by social psychologist Leon Festinger. Festinger's theory of cognitive dissonance focuses on how humans strive for internal consistency. An individual who experiences inconsistency (dissonance) tends to become psychologically uncomfortable and is motivated to try to reduce this dissonance—as well as actively avoid situations and information likely to increase it.[note]https://goo.gl/Y15yDL[/note]
Two opinions, or beliefs, or items of knowledge are dissonant with each other if they do not fit together—that is, if they are inconsistent, or if one does not follow from the other. For example, a cigarette smoker who believes that smoking is bad for her health has an opinion that is dissonant with the knowledge that she is continuing to smoke.[note]https://goo.gl/ibFyv0[/note]
In this situation the person is both addicted to the substance and does not want to give it up; likewise they do not want to experience the dissonance between the evidence about smoke related health issues and their actions, the outcome to this is that the person may use various cognitive bias (outlined above) to avoid the evidence or at least downplay it. In such a circumstance the person is using motivated reasoning to reduce cognitive dissonance and continue to experience the desirable psychological state (smoking) and avoid the undesirable psychological state of having to quit smoking. Likewise, in such a case the individual's reasoning process may become subordinate to the desired conclusion designed to avoid the psychological or physical stress of change.

Neuroscience
A 2004 article in the Journal of Cognitive Neuroscience entitled "Neural Bases of Motivated Reasoning" highlighted some of the underlying neurological workings to motivated reasoning summarizing their results as such: The study pressed finding from functional neuroimaging of the neural responses of 30 committed partisans during the U.S. Presidential election of 2004. The researchers presented subjects with reasoning tasks involving judgments about information threatening to their own candidate, the opposing candidate, or neutral control targets. Motivated reasoning was associated with activations of the ventromedial prefrontal cortex, anterior cingulate cortex, posterior cingulate cortex, insular cortex, and lateral orbital cortex. As predicted the study found, motivated reasoning was not associated with neural activity in regions previously linked to cold reasoning tasks and conscious (explicit) emotion regulation. The findings provided the first neuroimaging evidence for phenomena variously described as motivated reasoning, implicit emotion regulation, and psychological defense. The researchers suggested that motivated reasoning is qualitatively distinct from reasoning when people do not have a strong emotional stake in the conclusions reached.
Reasoning Elements

The Elements of Reasoning are a list of factors that are designed to make people aware of the different elements involved in the process of reasoning. The Elements of Reasoning framework is developed by the Foundation for Critical Thinking.[note]https://goo.gl/sZPD[/note] Within this framework reasoning is understood as a process where people use data, information and assumptions to infer conclusions from a perspective, in attempting to answer a question or solve a problem, with consequences then resulting from the conclusions drawn. From this definition can be drawn a number of elements to the reasoning process, including; purpose, problem, assumptions, information, concepts, point of view, inference and consequences.

Purpose

Reasoning is purposeful in nature. A central part of reasoning is a deliberate effort to construct inferences so as to reach justifiable conclusions.[note]http://goo.gl/ZiKWCs[/note] This differs from other cognitive activities such as daydreaming in which the mind operates without focus on achieving some result. Reasoning is a concerted activity that requires a degree of effort. Because it is goal-oriented it is something that can be done with varying degrees of success. One may or may not succeed in the given purpose of solving a problem, understanding something, forming a plan, proving one's case etc. In this respect also it differs from daydreaming, where the concepts of success and failure do not really apply. Thinking is a skill. It is a skill that everyone has to some degree, but it is also a skill that everyone can improve.[note]https://goo.gl/59L5e7[/note] In this respect effective reasoning involves; choosing significant and realistic purposes; taking time to state one's purpose clearly; distinguishing the given purpose from related purposes; checking periodically to be sure one's activities are still aligned with the overall purpose of the reasoning process.[note]https://goo.gl/WJT6xn[/note]

Solving Problems

Everyone thinks, almost all of the time. However reasoning is a particular kind of mental activity that is focused in some way on solving a problem; planning an action, studying for an exam, defending a position on a controversial issue etc. To reason means to figure out with standards. All reasoning is an attempt to figure something out or to resolve a question. This involves a number of factors; taking time to clearly and precisely state the question at issue; possibly breaking the question into subquestions; expressing the question in several ways to clarify its meaning and scope; Identifying if the question has one right answer, is a matter of opinion, or requires reasoning from more than one point of view.[note]https://goo.gl/WJT6xn[/note]

Assumptions

Not everything can be questioned all of the time, all reasoning is based on some assumptions. People who think critically seek a clear understanding of the assumptions they are making and the assumptions that underlie the reasoning of others. They are able to
distinguish between assumptions that are justifiable in the context and those that are not. It is necessary to note that assumptions generally function at the unconscious or subconscious level of thinking and thus typically have not been critically examined by the thinker. Assumptions are often the grounds for prejudices, stereotypes, biases, distortions and other errors in one's reasoning that one would not like to be aware of. Effective reasoning means assessing these assumptions, as well as those of others, to determine whether those assumptions are based on sound reasoning and evidence and if not attempting to reconstruct them so.

People must want to seek out, in their thinking, unjustifiable assumptions generated and maintained through naive egocentric or sociocentric tendencies. To achieve high standards in thinking one must try to clearly identify one's assumptions and determine whether they are justifiable. In doing this it is necessary to exercise balanced judgment in considering how assumptions are shaping one's point of view.

Point of View

All reasoning is done from some point of view. The world is complex and any given phenomena may be understood from many different dimensions. If we take just a single individual person and try to give definition to them, one will note the many ways in which we could do this, social, psychological, economic, biological etc. all of which would lead to different processes of reasoning and different conclusions.

One's reasoning will only ever be a partial account of the world and it is important to identify what is the main point of view that we are using and make this explicit. In identifying points of view, one can seek other perspectives and identify their strengths as well as weaknesses. In presenting one's point of view and assessing the perspectives of others, inclusiveness, open-mindedness, empathy and balance of judgment are required.

In contrast with preference, which is only ever a partial subjective interpretation, in seeking objective reasons one is looking for a balanced assessment or judgment of different subjective accounts while maintaining an awareness to one's own perspective in reconstructing and judging them.

Information

All reasoning is based on data or information of some kind. A reason is fundamentally based on evidence given and that evidence is ultimately information of some kind. Whenever we construct a case, whether we are a researcher, a manager, a lawyer, or just a child wishing to obtain more pocket money from their parents, if this is done through reasoning then it will be based on information of some kind. An argument is only ever as good as the premise and the information contained in those premises. Claims should be restricted to those supported by the information provided. Information comes in varying degrees of quality, thus it is necessary to always ask where the information is coming from and make some assessment to its potential validity and accuracy. Search for information that opposes one's position as well as information that supports it. Make sure that all information used is clear, accurate, and relevant to the question at issue. Make sure sufficient information has been gathered to present a balanced case.[note]https://goo.gl/WJT6xn[/note]
Concepts

All reasoning is ultimately created by concepts and ideas. Being able to identify and express clearly the abstract ideas used within the process of reasoning is of fundamental value. Conceptual frameworks are what give structure to reasoning, by defining well the concepts, categories and the interrelationships being used we can create sound, clear and coherent reasons that can be easily communicated. Concepts are the building blocks of reasoning and they need to be well built, i.e. well defined. It is important to identify the concepts being used and the definitions of those concepts; concepts should be used with care and precision. Likewise to avoid confusion and miscommunication concepts need to be used in keeping with established usage. Different concepts mean and do different things, it is important to understand the precise meaning of concepts and how they will shape the case being formulated. Effective reasoning involves the use of abstraction in order to define different levels to a conceptual framework, with higher more abstract concepts used to structure lower more concrete ideas. Understanding the use of abstraction enables the appropriate structuring and categorization of an argument and thus the capacity to present complex issues in an accessible, intelligible and coherent form.

Inference

All reasoning contains inference through which we draw conclusions. The inference is the logical set of connections that take us from one place (the premise) to another (the conclusion), without inference there is no reasoning. The statement "I like butter cookies because I like them" involves no reasoning and is not a rational argument because the premise and the conclusion are essentially the same; there is no logical inference between them. Reasoning contains inferences by which we draw conclusions and give meaning to data.[note]https://goo.gl/YIXLVE[/note] Effective reasoning involves the process of thinking about something in a logical way in order to infer a conclusion or judgment based upon information.[note]http://goo.gl/rRIYwR[/note] Thus it is important to not only identify the information and concepts being used but also the logical connections that are being drawn between them. It is the way that we interrelate the information that gives new meaning to the conclusion that may make the argument of value. The processes of inference are studies within logic, they may be deductive formal processes that involve certainty, where the conclusion follows for certain from the premises, or they may involve varying degrees of uncertainty as studied within informal logic. Either way, it is important to be aware as to how the case is constructed through understanding its logical inference.

Implications

Reasoning leads somewhere and has implications and consequences. Thinking that leads nowhere has no value. Reasoning starts somewhere and takes up somewhere else; to a new conclusion on an issue and these conclusions have implications. For human beings, our thinking governs what we say and do which in turn have implications; when we reach new
conclusions these will have new implications. If someone constructs an argument that there are for sure aliens on a planet nearby and convinces others, then the implication of this is that people will invest their time and energy in search for them. If we construct an argument for history as a linear process leading to ever greater progress then we will expect the future to be such and act accordingly; thinking has implications.

We often construct arguments and theories that are designed specifically to achieve certain outcomes that we desire without considering what other implications are entailed within that reasoning, or what would happen if it was generalized to all. Being responsible for our thinking and actions means tracing out the implications and consequences that follow from one's reasoning, taking things to their natural conclusions and asking would that lead to a rational outcome for all. For example, jumping in one's car all the time to go places may seem rational for the individual but it often leads to irrational outcomes when generalized, i.e. traffic jams, air pollution, excess greenhouse gasses.

In tracing out the implications of our reasoning it is important to actively search for negative as well as positive implications in the consideration of all possible consequences.
Arguments

An argument is an exchange of ideas or opinions between individuals[note]http://goo.gl/Um3VUg[/note] in which the individuals express different opinions about some topic.[note]http://goo.gl/uwYkkP[/note]
A defining feature to arguments is excludability, i.e. both members are engaged in some mutually dependent situation that excludes the possibility of each holding their beliefs or following their independently desired actions. Due to this excludability, the members engaged in an argument must go through a process in order to generate a combined outcome. In so doing one person’s argument will prevail over others or they will synthesize their different opinions or ideas. The process of argumentation is studied in a number of different contexts from philosophy, mathematics, and science, to law, politics, and psychology.

Arguments may be rational or nonrational, a rational argument is one that is based on objective reasoning, where the most cogent argument prevails. A non-rational argument is one based upon the subjectively motivated reasoning of the individuals, where the exchange is affective in nature; as opposed to logical.[note]http://goo.gl/nilali[/note]
Likewise, arguments may be categorized as being formal or informal. Informal arguments, as studied in informal logic, are presented in natural language and are intended for everyday discourse. Inversely, formal arguments are studied in formal logic and are expressed in a formal language. [note]https://goo.gl/YYOomC[/note]

Rationality

A primary distinction can be made between arguments depending on whether they are rational or non-rational, where rational means conducted or in accordance with objective reason.[note]http://goo.gl/IC2rUd[/note] Rational and non-rational arguments have very different structure and dynamics that define their overall workings and how the conclusion is reached. A rational argument is one where the members hold objective reasons to support their case and are prepared to alter their conclusions according to that derived from the most sound reasoning; thus a resolution can be reached based upon objective reasoning. A non-rational argument is one based upon the subjective reasoning of the individuals, their beliefs or opinions are not affected by objective reason and thus a conclusion can not be reached based upon objective reasoning.

Non-Rational Arguments

Rational means applicable through reason, non-rational means not able to be explained by reason, non-rational arguments are obtained through intuition rather than from reasoning or observation.[note]http://goo.gl/ohF6hl[/note] Intuition is the ability to understand something immediately, without the need for conscious reasoning.[note]http://goo.gl/LsMbqm[/note]
Thus arguments that are based on intuition are firstly derived from emotional instinct and then the holder may construct conscious reasons to support them, but the conclusion does not follow from the conceptual construction. The conceptual reasoning is just used to defend the argument - what is called rationalizing - thus changing the reasons for the argument will not change the conclusion for the holder of a subjective idea or opinion, because it was not created originally through objective reasoning.

Non-rational arguments are based upon the subjective emotions of the individual and are driven by motivated reasoning, where members hold conclusions that are not explicable by reason and can not be altered by reason alone. For example, the individual may hold subjective beliefs or opinions that are non-generalizable - such as a belief in the superiority of their culture or society - and thus can not be supported by objective reasoning that is applicable to all. The arguments and opinions offered by the members are subjective in nature; the opinions offered by the members have no objective grounding i.e. one believes X because one's parents believed X, one believes X because it makes one feel good etc.

Affective

Instead of an exchange of ideas, non-rational arguments are more often affective in nature, where affective means relating to, or arising from influencing feelings or emotions.[note]http://goo.gl/YxzYBW[/note] Without the resort to objective reasoning non-rational argumentation is primarily driven by the capacity to affect emotional states within the other members involved.

This may take many forms, the most readily identifiable being the use of forceful coercion in order to induce fear and control over other members in the argument. However, force is most often the last resort in the interaction between people, typically a product of all other strategies failing.

More often individuals will use positive associations to enable an affective influence that persuades, or motivates a particular audience in a specific situation; the classical example being advertising. Advertising can be seen as a form of argumentation, different members are interacting to achieve some combined outcome - typically the purchase of a product. The advertiser has a subjective argument - to buy their product - and are likewise driven by motivated reasoning to conclusions that make their product appear favorable. Advertisers typically do not use objective reasoning to persuade consumers but more often engage with them on an affective level in order to appeal to their emotional desires and fears. They do this by associating a product with some positive emotional desire of the individual - most evidently the sexual desires of male consumers - and trying to convince them that if they purchase the product they will achieve the desired state or inversely the relief of some undesirable state.

Likewise the same can be seen in political debates, where candidates will practice limited use of objective reasoning but instead engage in the use of affective terminology and associations to persuade the audience towards certain conclusions based on emotional sentiments.
Non-rational argumentation can be seen as an extension of motivated reasoning where there is a preconceived conclusion on the behalf of the individuals and the aim is to simply defend that irrespective of the evidence and case that others may make against it.[note]https://goo.gl/DYylsV[/note] The agency of the members in the argument is often emotionally manipulated in order to achieve the desired conclusion.

Rational Arguments

Rational arguments involve the exchange between members who believe that they have some grounds for their argument based on objective reason. To engage in rational argument members have to be prepared to alter their opinions, beliefs or actions based upon the soundest reasoning given by any member.

Rational arguments involve a reason or set of reasons given in support of an idea, action or theory. A person gives the reasons supporting their claim in order to influence others to adhere to their claim and thus reach a conclusion to the argument. Rational arguments are guided by the process of objective reasoning, whereby different claims are made by the different parties involved, individuals present evidence to support their claims and use logical inference to draw conclusions hoping to influence others to adopt their case while remaining open to being influenced by the cases presented by others in an attempt to find a conclusion that is justified by the soundest evidence and logic.

There are a number of preconditions to a rational argument. Firstly, those engaged in a rational argument seek the free consent of others involved in the argument, thus unlike non-rational argumentation where people simply use whatever means to get the other person to agree with them without respect for their individual agency, rational arguments require that the members involved respect the free will and agency of the other members, they are not simply trying to get them to adopt their belief, they wish for the other person to come to that conclusion themselves. Thus in a rational argument one simply presents one's evidence and the process of inference used to draw the conclusion and then lets others use that evidence and inference process to derive the conclusion for themselves. This is similar to the scientific method in the natural science where when a research discovers something new before anyone will believe them they have to present the data used and process of arriving at that result, other researchers will then perform a similar experience, if they come to the same conclusion then they too will typically adopt the ideas of the first research, in such way a consensus is reached, by everyone having reached that conclusion themselves without anyone being coerced and everyone's agency is respected.

Secondly, although arguments may connote conflict this form of rational argumentation is largely cooperative. The members have to agree on some things in order to even initiate the argument. Members must not only share a common language but typically share some common context within which they are arguing. For example, many arguments within the scientific community will be based upon agreement on the vast majority of ideas and lexicon within their domain, while disagreeing about some particular area of interest. Likewise, many scientists will not even engage in an argument with those who do not accept basic scientific theories, such as evolution, as they are seen as too irrational.
Third, argumentation occurs only under conditions of uncertainty, about matters that could be otherwise. If the facts surrounding an argument are evident then an argument typically will not take place, it is difficult to argue whether it is raining or not as one has to just put out one’s hand and feel that it is either raining or not, the degree of uncertainty is so small that it is difficult to argue about it. People engage in arguments about things that are uncertain and thus controversial, uncertainty implies that things could be otherwise; the outcome is not known for sure and it may not be possible to know conclusively. For example, one may have an argument about why the Roman Empire fell because there are many factors involved and some degree of uncertainty. Typically people will not engage in an argument if they believe they have certainty on the question under consideration. If it is pouring rain and you are soaking wet when someone comes up and tells you it is not raining you will just laugh, you are so certain of the facts that you will unlikely engage in the argument.

Fourth, because things are uncertain argumentation requires that members give justification for the ideas and beliefs they support. Members offer a rationale for accepting an uncertain claim, informal arguments do not offer certainty, they simply present a case that is more or less justified depending on the strength of the evidence and the logical conclusions drawn, others engage in the argument then either accept those claims and inference or offer their own.

Finally, members entering into rational argument give over their beliefs to the combined process of reasoning they are engaged in with their interlocutors, in so doing they run the risk of having to alter their beliefs or opinions. They run the risk of being shown to be wrong. Thus the decision to engage in argumentation suggests a willingness to run the risk of having to change one’s currently held ideas.

Formal & Informal

Informal arguments, as studied in informal logic, are presented in natural language and are intended for everyday discourse. Conversely, formal arguments are studied in formal logic and are expressed in a formal language. Informal logic may be said to emphasize the study of argumentation, whereas formal logic emphasizes implication and inference. Informal arguments are sometimes implicit. That is, the rational structure – the relationship of claims, premises, warrants, relations of implication, and conclusion – is not always spelled out and immediately visible and must sometimes be made explicit by analysis.¹

¹[Note]

Formal arguments are deductive in nature meaning that conclusion follows necessarily from the premises. With deductive reasoning the conclusion contains no information not already present - at least implicitly - in the premises. Thus deductive reasoning does not add to our store of knowledge; it merely rearranges it. The central aim of this type of reasoning is to generate proofs, i.e. rigorously analyzes the structure of a statement with formal methods to
prove if it is a sound argument. Deductive reasoning is analytic; it requires no reference to
the external world, and it may be counterfactual.[note]https://goo.gl/RIFGuS[/note]

Although augmentation has been studied for millennia, for much of the 20th century, the
systematic study of argumentation was associated with formal logic, which achieves
deductive certainty at the price of limited relevance to everyday affairs. However, during the
past few decades, there has been renewed interest in the study of informal reasoning, which
depends on probabilities. Informal reasoning is inherently uncertain, but it characterizes
reasoning in most areas of human activity. Very seldom does one actually reason in
syllogistic form, most real world arguments cannot be separated from their content in the
way required to apply formal methods. Most argumentation is not represented by a form in
which the conclusion contains no new information.[note]https://goo.gl/RIFGuS[/note]

Informal logical - which is non-deductive logic - is reasoning using arguments in which the
premises support the conclusion but do not entail it, i.e. the argument is not a closed system.
Induction is an example of informal argumentation, a form of reasoning that makes
generalizations based on individual instances. An inductive argument is said to be cogent if
and only if the truth of the argument's premises would render the truth of the conclusion
probable (i.e., the argument is strong), and the argument's premises are, in fact, true.
[note]https://goo.gl/ZE4IdY[/note]
Subjective & Objective Claims

Objective means independent from the particularities of a specific instance or individual, subjective means conditional on the particularities of the individual - the subject. An objective claim is a statement about a factual matter, i.e. one that can be proved true or false. For these factual matters there exist recognized criteria and methods to determine whether a claim is true or false. A subjective claim, on the other hand, is not a factual matter; it is an expression of opinion, belief, or personal preference. A subjective claim cannot be proved right or wrong by any generally accepted criteria while an objective claim can.[note]https://goo.gl/eWPNKz[/note] The distinction between subjective and objective claims is a subtle one and one should be careful not to simplify it into assertions about truth values, to end up in a position of relativism or objectivism.[note]http://goo.gl/cEW[/note]

Claims can be said to exist on a spectrum from being objective to being subjective depending on the degree to which they are contingent on a particular context or subject i.e. individual perspective.
At the objective end of the spectrum are what are call facts.[note]http://goo.gl/VOaX5g[/note] In that, they are deemed to exist as being true or false independent of the individuals making the claim. At the other subjective end of the spectrum are what we call opinions. In that the claim is only held to be relevant in relation to the subject making the claim, thus only the subject can truly validate the claim, e.g. "I like sports cars" is a subjective claim, the validity of this statement is fully dependent on the subject making the statement. Most claims lie somewhere in between pure objective fact and purely subjective opinion.

To determine whether a claim is objective or subjective one can ask if it meets a number of criteria required to be considered objective. To be deemed objective claims must meet the following criteria, firstly objective claims have a truth value, they can be proven to be true or false. Secondly, objective claims have an agreed upon method for determining whether they are true or false. Thirdly, in the event of disagreement about whether the claim is true or false at least one person will be correct.[note]https://goo.gl/g5VOCe[/note]

Thus a question of fact has a correct or incorrect answer, while a question of preference has as many answers as there are people to have opinions. While in between the two are questions of reason that have better or worse answers. These different types of claims then create different dynamics to arguments. When it is a question of fact it is not up to anyone to decide the conclusion, it is up to all to verify the fact, to check if it is true or false. When it is a question of reason it is up to the person with the best reason to say. When it is a question of taste it is up to everyone to say.
Truth Value

Claims have a truth value when they can be proven to be either true or false. Objective claims are what is called falsifiable. Falsifiability or refutability of a statement, hypothesis, or theory is the inherent possibility that it can be proved false. A statement is called falsifiable if it is possible to conceive of an observation or an argument which negates the statement in question.[note]https://goo.gl/8ctJ2V[/note] Karl Popper propounded the idea of falsification as a criterion for demarcating what can be deemed scientific from unscientific, such that what is unfalsifiable is classified as unscientific. The practice of declaring an unfalsifiable theory to be scientifically true is deemed pseudoscience.[note]http://goo.gl/ZN7JM[/note]

For example, Karl Marx claimed his writings to be a scientific account of the economic and social dynamics of capitalism. Under this guise of objectivity, he predicted that the proletariat would eventually revolt and overthrow the bourgeoisie ruling class. However, this did not happen as predicted, when it failed to occur Marxists created new reasons to defend why it had not happened without allowing this fact to falsify the claim. In such a case there is no way to falsify the claim and thus it is not objective. Likewise, claims about supernatural forces that can not be disproven can not be deemed as objective claims due to their lack of truth value. This does not mean that they are true or false it simply means that they are not objective clames, as some might like them to be.

Method

For a statement to be objective it must be derived from some method that can determine whether it is true or false. For example, with a claim that relates to an empirical fact such as a statement that today is hotter than yesterday, we can gather the empirical data about the two days in question and compare them to derive a truth value to the statement; this is a method of validation.

With a subjective claim, there is no known objective method to prove whether it is true or false. For example, with statements about the existence of a God or multiple Gods, there is no known way of proving these statements.

Conclusion

With a disagreement over an objective claim, there will be one party that is correct while others will be incorrect or only partially correct. When two people disagree about an objective claim one of them has to be incorrect. With a subjective claim, both parties' claims may be true or false. One person may say that vanilla is the best tasting ice cream and another say that chocolate tastes better, these are subjective opinions on behalf of the individuals and there is no way of resolving this dispute through reason. With subjective claims truth in the objective sense does not exist, both people can disagree without anyone being incorrect.[note]https://goo.gl/g5VOCe[/note]
Agreement

Agreement between members does not make subjective claims objective. One might live in a society where all like vanilla ice cream and dislike chocolate ice cream, but this does not make the claim that vanilla ice cream is better than chocolate ice cream any more of an objective claim, there is not objective truth for this statement. Subjective claims are of pure preference or taste, it does not matter how many people agree with the claim it does not make it any more valid. Agreement in this circumstance simply means that people happen to have similar preferences. [note]https://goo.gl/g5VOCe[/note]

For example, taking a pole as to what kind of ice cream people like would not derive an objective reason, all this would define is how many people agree with the statement, without finding out if it is true. We would find how many people like the chocolate flavor but we would not find out if the chocolate ice cream is truly objectively better than the vanilla flavor because no such thing exists. Different people may like different types of ice cream without anyone being correct or incorrect, it is simply their preference.

Reasoning

Arguments based on purely subjective claims or purely objective facts involve limited use of reasoning. Facts can often be checked to be decisively correct or incorrect, while with questions of subjective opinion there are no objective reasons for the claims and thus objective reasoning is of little us.

Rational arguments happen at an in between ground, where there are both objective facts and subjective opinions involved, both certainty and uncertainty, to make for a more complex dynamic. In such a case reasoning can to be used to derive a solution, with arguments taking place where different parties construct cases for their claims based upon reasons.

For example, what food one likes is a subjective test, but which diets are healthier is a more objective fact. There is little room to argue with people about what they like, as the Roman saying goes "Concerning matters of taste there can be no intelligent discussion." Everyone knows what food they prefer and no one knows that better than them, it is pointless to argue about it. Likewise, when it comes to the question of a healthy diet this is largely an objective fact and we would turn to nutritionists to answer this for us.

However, if we all had to combine our taxes to pay for the healthcare of each other, we may decide that we do not want to pay for people who eat a poor diet and we may have to define collective standards for what food to tax. People would then have different arguments and try to support them with reasons.
Rational Arguments

A rational argument is the exchange of evidence-based reasons that are designed to influence an audience. Rational argumentation is the capacity to give reasons; to connect the claims that one makes to the justification for making them. The reasons offered within an argument are called “premises”, and the proposition that the premises are offered for is called the “conclusion”.[note]http://goo.gl/nxqqy[/note] Within arguments, people construct statements that can be used to support a conclusion or position on a matter this is uncertain or yet to be decided, hoping to influence others to adhere to their position. When people speak to each other or to a crowd they make certain claims, they make statements and construct a case that they believe in and that they would like for others to believe also.[note]https://goo.gl/RIFGuS[/note]

A rational argument is a combination of logic, dialectic, and rhetoric. Arguments involve elements of logic in that they require the use of logic in the connection of evidence to the claims being made through inference; thus arguments have a structure which is studied within logic. Rational arguments are a dialectic exchange in that arguments are conducted between people with different opinions who exchange ideas in a process of discovering and testing knowledge through questions and answers. Arguments contain elements of rhetoric, in the classical sense, where it means the study of how messages influence people, as it focuses on the development and communication of knowledge between speakers and listeners.[note]https://goo.gl/RIFGuS[/note]

Grounds for Arguments

Rational arguments can be seen as a subset of all types of arguments, in which case they can be contrasted with non-rational arguments which are not based upon objective reasons given, but instead upon the subjective motives and instincts of the individuals involved.

Non-rational arguments may be seen as the product of motivated reasoning on the behalf of one or more of the individuals engage in the argument. Motivated reasoning is reasoning based upon subjective motives that condition the cognitive processes of the individual towards generating conclusions that endorse the maintenance or attainment of the subjective motives of the individual. In such a case the individual's argument is not constructed on objective reasoning and can to be influenced to change solely through cognitive reasoning, thus the conclusion to the argument will not be a product of reason and thus not a rational argument. Motivated arguments are particularly common in situations we there are deep vested cultural, social or economic interests held by individuals, such as in matters of religion, sport or politics.[note]http://goo.gl/gsXq2a[/note]

Insofar as the believer refuses or is unable to review or change their opinion in the light of new relevant information or more coherent logic the argument is dogmatic and can not be
resolved through reasoned argument; thus non-rational. In such a case, the argument may resort to various forms of affective exchange, or a resolution may well be unattainable.

Thus Rational arguments require a set of preconditions before the process can be engaged in. The cases presented by the individuals have to be derived from their objective reasons given, instead of being rationalizations for their instinctive beliefs. In a rational argument, members have to be willing to change their argument when new information or a better argument is presented.

Reasoned argument can not be conducted in the face of dogma - where dogma is a belief or set of beliefs that is accepted by a member or group without being open to question or doubted through reason - as a precondition to rational argument is that questions are open to and decided by reason alone. Members engaged in a rational argument hold defeasible cases, where defeasible means they are open in principle to revision.[note]http://goo.gl/Fr624D[/note] Reasoned argument provides an objective process for resolving disputes without resort to force or manipulation in that it simply defines a set of standards that all members must follow in order to try and derive a combined outcome.

Dialectic

Dialectic, in the general sense, refers to the development of knowledge through questions and answers.[note]https://goo.gl/RIFGuS[/note] The classical example of this would be the Dialogues of Plato where Socrates encounters an interlocutor and the person states a view, Socrates then asks a series of questions and through the exchange of questions and answers the individual's view is tested, elaborated or clarified. Another good example of a dialectic process would be a law court where cross-examination is conducted with a series of questions asked and answers given to try and figure out what is true of the case.

A rational argument is a form of dialectic process in that the participants in an argument hold mutually exclusive view; they believe that the claims they make can not both be true in some way and they seek to find a combined resolution through a collective process of reasoning; which is the argument.

Members are not prepared to simply remain with the differences in their perspectives but wish to resolve the issue at hand; they want to come to a common understanding of some kind. In this process, members give their own reasons but are also, importantly, open to being influenced by others in trying to reach some consensus.

Cooperation

A dialectic, although an argument in this case, is essentially a cooperative endeavor in that members are actively committed to seeking the most reasonable outcome. The purpose of an argument for a critical thinker is not to win, although that is often the default mode of how we behave.

In a rational argument, members do not try to influence other people against their will. In the argument they seek their free assent to the case given, on the grounds that they have come
to this based primarily upon the logical connections made in the argument and not through other means of persuasion or manipulation.[note]https://goo.gl/RIFGuS[/note]

We can not avoid trying to influence other people but there are many ways to do this. Rational argumentation respects the audience's individual capacity to draw their own conclusion, and thus respects their freedom, by seeking their free assent, not demanding it. If they do not want to give it once the case is presented then there is nothing one can do. Rational argumentation respects the listener and that they may have different ways of thinking. The aim then is not simply, in all events to imbue them with the opinion of the individual making the case, as this would violate their capacity to draw their own conclusions and thus violate their agency.

In reasoned argument a precondition is that the members respect the opposition's opinion; the audience has to come to their own conclusion, one can not alter that. With reasoned argument, there is only opportunity to change the other person's opinion through the presentation of alternative evidence or logic.

Process

In its most cooperative form, a rational argument is a process to find which argument is most sound, best supported by logic, and relevant evidence. Thus it is not just a way of defending one's beliefs but also a way of improving them, in this sense a rational argument may be seen as a constructive endeavor in contrast to non-rational arguments which are often counter productive in nature.

Arguments derived from reason are defeasible; the holder is prepared to change their conclusion in light of new evidence supporting a counter argument.[note]https://goo.gl/RIFGuS[/note] Arguments that are rational in nature are only supported by evidence and logic, thus if the logic or evidence changes then the conclusion must change in some way. The point of this type of argument is to derive a conclusion that is defeasible irrespective of whoever may present it.

Rational arguments should be focused on the process, not any particular outcome, so that when new inputs are received it is possible for the members to incorporate those into the argument; though this is often not what happens. When we receive new information that contradicts one of our assumptions or beliefs our tendency is to rationalize that away. This is why conducting a truly rational argument requires intellectual standards on the behalf of the participants that is typically not achieved in most common arguments. As long as the process is valid it is ok to change the conclusion when new inputs become available, in fact, this is the essence of good science, that it is a process without a fixed conclusion. We do not take scientific theories as dogma, but they are always open to revision and possible improvement. Due to this the members partaking in the argument take the risk of being wrong, of having to change their conceptual system; the members assume the risk of their beliefs being proven wrong and having to ratify them.[note]https://goo.gl/RIFGuS[/note]
Argument Structure

The degree of effectiveness to an argument is often a function of the degree of understanding to the principles and structure that underlie the process. A rational argument is a set of statements to support a conclusion, it starts with a set of premises and then derives a set of conclusion based upon those. As such arguments have a basic structure to them, in that they consist of evidence given, a process of inference used to reach a claim that seeks the adherence of an ordinance.

Reasons are the justifications that we give for our claims, our justifications are not absolute proofs because all of the matters that are being debated are in some way uncertain; things may depend on some value judgment or they may relate to the unknown future. Thus we try to justify our claims by giving reasons for them. In an argument we are making a leap from the known to the unknown and the audience is being asked to accept the justification for this, i.e. the reasons given.[note]https://goo.gl/RIFGuS[/note] We have to reach some conclusion and the audience will give their adherences to whoever has the best case to make. A claim is justified if it would be accepted by a critical listener. For example, the process of generating new scientific knowledge often operates in this way, where someone comes up with a hypothesis and the other scientists try to disprove it. Scientist in the lab work as critical questioners of the ideas presented by the theoretical scientist. Scientists remained skeptical about Einstein's special theory of relativity until experiments had been conducted to verify that light did, in fact, bend around a large body of matter.

If the premise of an argument or the logic used to draw the inference are inaccurate then the conclusion will be incorrect. Arguments are only as good as the premise that they are founded on and the logic used to draw the conclusion. Often confusion lies in the fact that people are not clear about the premises or logical process in the argument. A hidden premise is a fact, or assumption that supports the argument that is not manifest to us. In everyday life, the arguments we normally encounter are often arguments where important assumptions are not made explicit. Identifying hidden assumptions is an important part of critical thinking.[note]http://goo.gl/mQQw5[/note] Likewise, some premises are assumptions - i.e. not known to be an established fact - and it is important to make explicit when that is the case.

The conclusion of an argument can be true or false, meaning it is in some way in line with objective reality. Arguments are not true or false, they are simply valid or invalid depending on the logic used. The term sound refers to the entire argument, an argument it sound when all of the premises are true and its logic is valid.

Rhetoric

Arguments are expressed to an ordinance and when all is said and done the success of an argument depends on the assent of the audience. Assent means adhering to a claim based upon the reasons given for it.[note]https://goo.gl/RIFGuS[/note] This means the audience
excepts the grounds that are given, the justification that is presented and the connection that is made between these justifications and the claim. Argumentation is then one of the ways that we seek to persuade others and reach common consensus without resorting to force, emotional manipulation or other means.

A focus on this aspect to arguments is called rhetoric. The classical understanding of rhetoric is as the study of how messages influence people; it focuses on the development and communication of knowledge between speakers and listeners.[note]https://goo.gl/RIFGyS[/note] Rhetoric in its basic form is about the effective presentation of an argument to a particular audience where one holds in mind the audience and crafts one's words and message to make them most relevant to that particular audience. In its highest form rhetoric is about the art or skill of speaking or writing formally and effectively, especially as a way to persuade or influence people.[note]http://goo.gl/997Zg[/note] Today the term rhetoric has been significantly denigrated in status - in no small part due to media politics and mass marketing - coming to mean more like, "language that is intended to influence people and that may not be honest or reasonable.[note]http://goo.gl/997Zg[/note] However a focus on audience and presentation is always a consideration within any argument and should not be inherently given negative connotations.