FIT TO THINK: CONCEPTUAL, CRITICAL & CREATIVE THINKING

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Why This is Important

• Even in combat, how well you think is more important to how well you fight than how physically fit you are
• A wrong decision, an unasked question, a forgotten task, an incomplete analysis, or a poor synthesis can kill you
• You must exert mental sweat as well as physical sweat to be “Fit to Fight”
• Good decisions require good thinking!
To Think

- To form or **conceive** in the mind
- To meditate, ponder, **analyze** or examine
- To have in mind as a plan, intent, or purpose; **intend**
- To hold as an opinion; **believe**; suppose
- To **reflect** upon the matter in question
- To **anticipate** or expect
- To **make a mental discovery**
Idea

- any conception existing in the mind as a result of mental understanding, awareness or activity
- a thought, conception or notion
- an impression
- a plan of action; an intention
Why Do We Use A Light Bulb For An Idea?

• “Let there be light!”
• See where there was dark before
• Come to know and understand because we can see better...
• Who invented the light bulb?
  • Thomas Alva Edison in 1879
• America’s most famous inventor
• Light bulb = invention = idea
Conceptual

• Pertaining to concepts or the forming of concepts

• CONCEPT--
  a general notion or idea; conception
  an idea of something formed by **mentally combining all its characteristics or particulars**: a construct
  a directly conceived or intuited object
Why Conceptual Thinking Is Difficult

• We emphasize analysis
  – taking things apart

• Need to emphasize synthesis
  – putting things together

• Must think **both** ways

• Otherwise, we are “half wits”

• We don’t emphasize it, reinforce it, reward it, and practice it
Utility and Value

• Concepts should be broad enough to be useful
• Concepts should be specific enough to be of value
• The “Goldilocks Problem”
• Like programming
• Able to be amended and modified
• Not limited by time and place
Example

- Government is a concept
- It refers to a process, a means of decision making
- It is not bounded by time, size, place but links means and ends
- It is about both purposes and processes
- It permits comparison across cultures
- Focuses on how people make rules for living together
Example

• Air Power is a concept
• What are the attributes of air power?
• How is it defined? Measured? Assessed?
• There are different kinds of air power
  – Purpose Performance
  – Methods Munitions
  – Platforms Personnel
• Concepts can be used in myriad ways
Critical

• Inclined to find fault or judge with severity
• Occupied with or skilled in criticism
• Involving skilful judgment as to truth, merit, etc.
• Pertaining to or of the nature of crisis
• Involving grave uncertainty, risk, peril, etc.; dangerous
Critical Thinking Is . . .

• It is easy—almost natural—to criticize
• Others!
• We can all improve on someone else’s ideas, behavior, performance, etc.
• Difficult--to do well and effectively
• To find root causes of why things are sub-par
• Perfection is elusive and there is always room for improvement
The Two Cultures

• You will be irritated with how critical civilian academics are
• Academics are by nature critical—they are educated by asking hard questions
• Those in the military are trained to be team players
• It is essential to mission effectiveness
• It will be a challenge for many of you to learn how to ask tough questions of yourself and others
Critical Thinking Is . . .

• Asking Why? Why not? How?
• Testing motives, bias, incompleteness
• Deals with alternative explanations
• Formulation and testing of hypotheses
• If ... then statements, and conditions
• Looking for mismatches
• Pattern recognition
• Analysis and synthesis
Good Critical Thinking

- Requires ability to assess premises of argument
- Premises state the assumptions of logic to follow
- They are the starting point of argumentation
- If the premises are faulty, then the argument is also
- Critical thinking begins with an assessment of the premises
Kinds of Bad Premises

• Arguments are fallacious if they are based on the following:
  A. Unacceptable premises
     – Shaky, dubious, inaccurate
  B. Irrelevant premises
     – No bearing on truth or conclusion
  C. Insufficient premises
     – Do not eliminate reasonable doubt
False Dilemma

• Either science can explain how a person was cured of a fatal disease or it was a miracle.
• Science can’t explain how he was cured.
• Therefore it was a miracle.
• The two alternatives are not exhaustive
• Since there are other options, the argument is fallacious
Equivocation

• It is the duty of the press to publish news that’s in the public interest.

• There is great public interest in UFOs.

• Therefore the press fails in its duty if it does not publish news about UFOs.

• “Public interest” = public welfare

• “Public interest” = what public is interested in

• Switched meaning invalidates argument
Composition

• Subatomic particles are lifeless.
• Therefore, anything made of them is lifeless.
• Whole may be greater than the sum of its parts.
• Emergent properties (water molecule and wetness) are important
• Fallacy is assuming that what is true of parts is true of whole.
Division

• We are alive.
• We are made of sub-atomic particles.
• Sub atomic particles are alive.
• The converse of the fallacy of composition
• What is true of the whole is not necessarily true of the parts.
• Components do not equal wholes.
Appeal to the Person

• You can’t believe anything Smith says about the military.
• He’s never been in the military.
• Anything he says about it is suspect.
• An argument should stand or fall on its merits, not who proposes it.
• Crazy people can make rational statements & sane people non-sense.
• You don’t have to be a pig to be a pig farmer!
Genetic Fallacy

• The insight about how molecules arrange themselves came from a vision.
• A vision is not a scientific experiment.
• Therefore, the snake biting its tail arrangement for benzene molecules is erroneous.
• The origin of a claim is irrelevant to truth or falsity.
• Depends on evidence supporting it.
Appeal to Authority

• Linus Pauling won a Nobel Prize.
• Pauling says massive doses of vitamin C prevents colds, increases life expectancy.
• Therefore I should take lots of vitamin C.
• Appeal to celebrity or famous person is not a proof of contention or endorsement.
• May be true but the fact that he says so is irrelevant to proof.
Appeal to the Masses

• Everybody I know is taking money out of the stock market.
• Because they are doing it, I should too.
• Quantity of examples of a behavior is not necessarily proof, just popularity.
• (“100,000 lemmings can’t be wrong!"
• Popularity is not a reliable indicator of reality, truth or value.
Appeal to Tradition

• Astrology has been around for ages.
• Important people believed in its utility—(Caesar, Hitler, the Reagans)
• Therefore, there must be something to it.
• Fact that an idea has been around for a long time does not mean it is true or that it should be continued.
• Slavery was a “tradition” before outlawed.
Appeal to Ignorance

• Bigfoot must exist because nobody has been able to prove he doesn’t.

• Inability to prove one thing does not mean opposite is true—both may be wrong.

• Assumes lack of evidence for one thing is good evidence for opposite proposition.

• Lack of evidence proves nothing—necessarily.
Appeal to Fear

- If you do not convict this criminal, one of you may be the next victim.
- What defendant, even if guilty, has done in the past, is not proof of what he/she will do in future.
- What someone may do in future does not prove what they did in the past.
- Threats extort but don’t necessarily promote truth.
Hasty Generalization

- I know a professor.
- He is more than a bit weird.
- Academics are oddballs and not to be trusted.
- Can’t judge a class of people by observing only one—or many.
- Inference is legitimate only if the sample is representative of the class investigated.
- There are usually exceptions to generalizations.
Faulty Analogy

• Astronauts wear helmets and fly in spaceships.
• Figures in Mayan carvings seem to be wearing a helmet and flying in a spaceship.
• Therefore, it is a carving of an ancient astronaut.
• Carvings may bear greater resemblance to ceremonial headdress and fire.
• May make false connections in similarities/dissimilarities.
Faulty Cause

- Night follows day.
- Therefore, day causes night.
- Because two events are constantly linked does not mean that one causes the other.
- When the US relies on airpower, wars are short.
- Therefore, the use of precise airpower causes short wars.
- May be other factors involved—causal connection assumed, not proven.
Argumentation

- The process of arriving at reasons and conclusions
- Involves marshaling evidence in support of valid statements built on sound premises
- Mark Twain’s caution—the American predilection for confusing law courts and revival meetings
Objectivity

• Object (n.)—1. a material thing; 2. a purpose, end or goal
• Object (v.)—to be opposed; to feel or express disapproval
• Objective—independent of the mind; real
• Objectivity—state or quality of being objective (without bias or prejudice); objective reality
Creative

• Having the quality or power of creating
• Resulting from originality of thought, expression, etc.
• Originative, productive
• CREATE--
  to evolve from one’s own thought or imagination
  to cause to happen; bring about; arrange as by intention or design
Thoughts On Creativity

• Creativity is a lot like golf and sex . . .
  (doesn’t have to be perfect to be worthwhile)
• Creativity is rare
• Creativity is non-linear, right brain
• Creativity is difficult
• Creativity breaks boundaries
• Creativity embraces novelty
• Creativity is play and improvisation
• Creativity emphasizes alternatives
On The Need For Creative Thinking

“The most indispensable attribute of the great captain is imagination.”

General of the Army
Douglas MacArthur
Letter to Liddell Hart, 1959
Your Brain

**Left**
- one thing at a time
- linear processing
- sequential operation
- writing & symbols
- analysis
- logic & reason
- mathematical
- verbal memory

**Right**
- integrating inputs
- holistic perception
- dreams
- holistic solutions
- synthesis
- pattern recognition
- intuition, insight
- visualizing
Questions

- Questions precede answers
- Everything is an answer without a question
- Questions help discriminate among massive amounts of data
- The “need to know principle”
  - What do you need to know?
  - Why do you need to know it?
The Importance of Questions

• Comes form Latin *quaerere* (to ask, to seek)
• You are on a quest for meaning and understanding when you read
• If you don’t know where you are going, it doesn’t matter which road you take
• Know your direction if not your destination when you start your journey
Questions

• Who, What, Where, When? (Information)
• How and Why? (Analysis)
• The right questions and the right combination of questions
• The right sequence of questions
• The questions generated by your questions
• Ask “why” five times
“Only Connect”

• To bind or fasten together; join or unite; link
• To establish communication between
• To have as an associated or accompanying feature
• CONNECTION--
  association; relationship
  affiliation, alliance, combination
  junction, conjunction, union
Why Connections Are Vital

• Patterns of thought
  – deductive
  – inductive

• Extend knowledge by linkages
  – build bridges from what we do know to what we don’t know
  – “from near to far”

• Neural networks & synapses in our brain work in patterns of random connections
Your Task

• “Our challenge in this new century is a difficult one; to defend our nation against the unknown, the uncertain, the unseen and the unexpected.”

Donald Rumsfeld, Secretary of Defense
Confronting The Future

- Must become comfortable with
  - the unknown
  - the unknown unknowns
  - the unknowable
- Embrace ambiguity
- Begin by asking good questions
- Accept the tentative, hypothetical
- Relish novelty, the mismatches
- Enjoy the process
Analogies

• A partial similarity between like features of two things on which a comparison may be based

• A way of building connections and finding patterns of similarity
  – structures
  – functions

• Types of analogies: personal, direct, symbolic and fantasy
Analogies

- Personal--imagine you are a wall covering--What fears do you have? What could hurt you?
- Development of fire retardant, non-toxic items
- Direct--George de Mestral & burrs--How do they cling to clothes, dogs?
- Make a great fastener--VELCRO!
- Symbolic--Snake swallowing its tail--Friederich von Kukule & benzene molecules
- Ring structure of aromatic compounds
Analogies

• Fantasy Analogies--You become maker of your own world

• Escape hide bound notions and limitations
  – Limited only by imagination & creativity

• Example--How could navy improve security, reduce costs and minimize risk to human life at sub bases?

• Train dolphins--cheap, non-human, better sonar detection, can communicate
Forced Associations

• A way of making connections among supposedly disparate items to see what one can learn about each of them and what new combinations may emerge
• Examples--
  – Animals and weapons systems—
• AFRL does this routinely—engineer the organic and make the organic engineered
Animals & Weapon Systems

• Turtles--
  – Mobile, armored--TANKS

• Birds--
  – Flight gives height, range, responsiveness--PLANES

• Hummingbirds--
  – Can hover, move backward--HELICOPTERS

• Bats--
  – “see” by sound in darkness--SONAR
Answers

• n.—Something said or written in response to a question; the solution to a problem
• vt.—to reply to; to respond to a signal; to fulfill satisfactorily
• vi.—to reply in words or by action; to react to a stimulus; to serve the purpose, be sufficient; satisfy in detail the question asked
• There are no answers without questions—make sure you know what the question is that the answer relates to
• Miscellaneous facts are NOT answers
Thinking & Winning

• YOUR MIND IS YOUR MOST IMPORTANT WEAPON--
  – With a good one, other weapons are more useful, sometimes unnecessary
  – With a poor one, other weapons are useless to achieve victory
  – You must learn confront the unknown, the uncertain and the unknowable
  – Exercise your brain as well as your body
The Bottom Line—
Hammond’s Laws

• You are only as good as your mind--it is your best weapon for survival

• Knowledge is a force multiplier and the key to successful adaptation

• Learning how to think quickly and well is more important than learning what to think—learn how to learn for yourself
POINT TO PONDER

“When we fight the next war, I hope we do it from the neck up instead of from the neck down.”

Jimmy Doolittle
So . . .

• This is no bull—it is central to your competence, regardless of your service, career field, assignment or mission

• You must PRACTICE good thinking skills—they don’t happen by accident

• If you don’t do it, it won’t get done

• If not now, when? If not here where? If not you, who?
BOOKS ON THINKING

• Roger van Oech
  – *A Kick in the Seat of the Pants*
  – *A Whack on the Side of the Head*
• Michael Michalko, *Thinkertoys*
• Michael J. Gelb, *How to Think Like Leonardo DaVinci*
• David Hackett Fischer, *Historians’ Fallacies*