

The Oft Forgotten Component in Executive Function Training: Critical Thinking Skills

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Introduction Statements:

- Why did I choose this topic
- Relevance to adults and students - our tendency to be task focused versus thought focused
- From the mouth of babes.....

The Neurology of Critical Thinking

- The Prefrontal Cortex: Home to Critical Thinking
- The PFC gives us the potential to consider and voluntarily control our thinking, emotional responses, and behavior. It is the reflective "higher brain" compared to the reactive "lower brain". This prime real estate of the PFC comprises the highest percentage of brain volume in humans, compared to all other animals, which is roughly 20% of our brains.
- As man developed more control of his environment, the luxury of a bigger reflective brain correlated with the evolution of the PFC to its current proportions.
- The prefrontal cortex is the last part of the brain to mature, strengthening the connections in the circuits that are most used. Another aspect of neuroplasticity is the growth of stronger and increased numbers of connections among neurons. Each of the brain's over one billion neurons holds only a tiny bit of information. It is only when multiple neurons connect through their branches (axons and dendrites) that a memory is stored and retrievable.
- This prefrontal cortex maturation, the pruning and strengthening process, continues into the twenties, with the most rapid changes in the age range of 8-16. Each time a network is activated -- the information recalled for review or use -- the connections become stronger and faster.

Critical Thinking as an Executive Function: A Symbiotic Relationship

- Executive function skills do not just appear in adulthood.
- They are built over time, starting as early as the first year of life, with more complex skills building on the simpler skills that came before.
- Executive function skills are also highly interrelated. Just as an air traffic control system requires the interaction of multiple people—pilots, navigators, controllers, weather forecasters—our human executive functioning system requires that each type of skill utilize elements of the others.
- The three primary executive functions that are key to the development of critical thinking skills are **working memory, inhibitory control and cognitive flexibility**
- Whether you are working with an adult with a TBI or a child with Pre-Natal exposure, all three of these key elements will be compromised.

Strategies for Teaching or Re-teaching Critical Thinking Skills:

1. The Traditional Approach:

- Define the problem
- Generate possible solutions
- Evaluate and select the best possible solution(s)
- Implement the solution
- Evaluate the results

2. Using Bloom's Revised Taxonomy of Action Verbs to Expand Your (and Their) Horizons:

- Focus on category IV – Analyzing
- Incorporate these verbs into your therapy lexicon or translate them into more commonly recognized phrases:
 - Pro versus con
 - Compare and contrast
 - Defend your perspective
 - Argue against another's perspective
- Focus on category V – Evaluating
- Incorporate these verbs into your therapy lexicon or translate them into more commonly recognized phrases:
 - What do we have in common
 - What is different
 - State a conclusion
 - Support your position
 - Objective data versus subjective opinion

3. My Favorite – ask them WHY???

REVISED Bloom's Taxonomy Action Verbs

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	<ul style="list-style-type: none"> • Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why 	<ul style="list-style-type: none"> • Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate 	<ul style="list-style-type: none"> • Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize 	<ul style="list-style-type: none"> • Analyze • Assume • Categorize • Classify • Compare • Conclusion • Contrast • Discover • Dissect • Distinguish • Divide • Examine • Function • Inference • Inspect • List • Motive • Relationships • Simplify • Survey • Take part in • Test for • Theme 	<ul style="list-style-type: none"> • Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criteria • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Opinion • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value 	<ul style="list-style-type: none"> • Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Original • Originate • Plan • Predict • Propose • Solution • Solve • Suppose • Test • Theory

Critical Thinking – Focus on Levels 2 and 3

QUESTIONS FOR THE REVISED BLOOM’S TAXONOMY

(from Quick Flip Questions for the Revised Bloom’s Taxonomy)

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LEVEL 1 - REMEMBERING		LEVEL 2 - UNDERSTANDING		LEVEL 3 - APPLYING	
Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.		Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.		Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	
Key Words	Questions	Key Words	Questions	Key Words	Questions
choose	What is ...?	classify	How would you classify ...?	apply	How would you use ...?
define	Where is ...?	compare	How would you compare ...?	build	What examples can you find to ...?
find	How did ___ happen?	contrast	How would you contrast ...?	choose	How would you solve ___ using what you’ve learned ...?
how	Why did ...?	demonstrate	State in your own words ...?	construct	How would you organize ___ to show ...?
label	When did ...?	explain	Rephrase the meaning ...?	develop	How would you show your understanding of ...?
list	How would you show ...?	extend	What facts or ideas show ...?	experiment	What approach would you use to ...?
match	Who were the main ...?	illustrate	What is the main idea of ...?	with	How would you apply what you learned to develop ...?
name	Which one ...?	infer	Which statements support ...?	interview	What other way would you plan to ...?
omit	How is ...?	interpret	Explain what is happening ...?	make use of	What would result if ...?
recall	When did ___ happen?	outline	What is meant ...?	model	Can you make use of the facts to ...?
relate	How would you explain ...?	relate	What can you say about ...?	organize	Can you make use of the facts to ...?
select	How would you describe ..?	rephrase	Which is the best answer ...?	plan	What elements would you choose to change ...?
show	Can you recall ...?	show	How would you summarize ...?	select	What facts would you select to show ...?
spell	Can you select ...?	summarize		solve	What questions would you ask in an interview with ...?
tell	Can you list the three ...?	translate		utilize	
what	Who was ...?				
when					
where					
which					
who					
why					

Activities That Can Promote the Development of Critical Thinking Skills – In Students

1. Look at a picture containing people or action.
 - What is happening now
 - What might have happened before
 - What might happen next
2. Create a new state for the USA
 - Where is it located
 - What are some of its laws
 - Design its flag
 - What is its weather like
 - What is its main industry
3. Ask a series of “why” questions
 - Why did this happen
 - Why is it wrong
 - Why is this popular
 - Why was this invented
 - Why are books so important
4. Ask imaginative questions that have no right or wrong answer
 - If there were doors that could take us anywhere on earth – where would you go
 - How would your life change if you suddenly could become invisible
 - How would your life change if all of a sudden you could fly
 - If dogs could talk, what would you ask them
5. Create an email asking your teacher for help with an assignment or homework
6. Make a video to show a friend how to access Google classroom
7. Create a daily schedule for yourself from the moment you wake up until you go to bed
8. Create an orientation package for a new student at school

Activities That Can Promote the Development of Critical Thinking Skills – In Adults

1. You’ve just hit a million views on your You Tube video – what is it about
2. If you were to write the story of your life until now what would be its title and why
3. Research and then create a list of Gluten Free foods
4. Design your own college course – what would it entail
5. Write the first 200 words of your biography

6. What one invention would you uninvent if you could and why
7. Make an instructional video on how to play your favorite game
8. Set up a brand new email account
9. Create a website
10. Create a new country
 - Where is it located
 - What are its major laws
 - How are laws made
 - Why would people want to travel there

Critical Thinking Questions for Students:

- If you were the leader of your country, what changes would you like to make
- What is the most fundamentally urgent issue in our world and why you think so
- What single thing causes the most harm to our society and how is it avoidable
- If you were running for president what would your top three priorities be and why
- Why should students be given mental health days off from school
- What is the most beneficial approach to cleaning up our environment
- If you could choose one rule for the entire world to obey, what would it be
- What topics do you wish you could learn about at school

Critical Thinking Questions for Adults:

- What is the difference between surviving and living
- What is your definition of the word adult
- Should the work week be four days instead of five and why
- How do you think American education could be improved
- Should public transit be free
- How do you decide what news to believe
- What makes a great leader
- What have you learned about yourself during the Covid 19 pandemic

Debate Topics for Students:

- Homework should be banned
- School should be in session year round
- Homeschooling is better than traditional schooling
- Public college should be tuition free
- Teachers should be paid higher salaries
- Schools should block all social media sites on their computers
- School days should be shorter to allow for more extra-curricular activities or jobs
- Art and music are not necessary in school

Debate Topics for Adults:

- The death penalty should be abolished
- Climate change is the greatest threat facing humanity today
- Healthcare should be universal
- People should be legally required to get vaccines
- Birth control should not require a prescription
- Social media has improved human communication
- Governments should invest in alternative energy sources
- Standardized testing should be abolished

*** Have your student/patient create both a pro and con argument ***



Children must be taught HOW to think, not WHAT to think

Margaret Mead