



IMPLEMENTING CRITICAL THINKING

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WHAT IS CRITICAL THINKING ?

- **Critical thinking is a higher order of thinking**
 - Places emphasis on “thinking outside the box”
 - Focuses on thought or metacognition
 - Rather than **what**, critical thinking looks at **how**:
 - **Facts are proven**
 - **Arguments are formed**
 - **Conclusions are reached**
 - Involves reflecting on, questioning and testing your own thinking processes

CRITICAL THINKING VS. THINKING

Critical Thinking

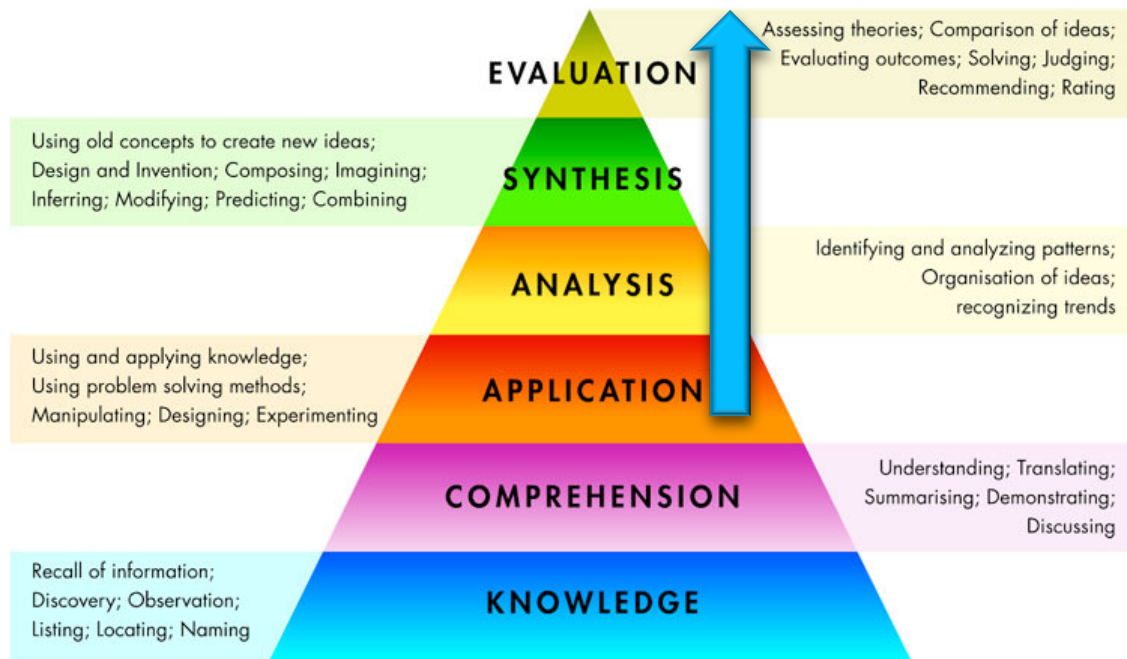
- Focus
 - On ideas: assumptions, biases, flaws in reasoning, point of view, context, implications
- Activity
 - Deeply and broadly questioning and testing the ways in which an idea is formed
- Goal
 - To apply criteria in forming a conclusion or evaluation about what you are thinking about as well as how you have been thinking about it

Thinking

- Focus
 - On information: data, facts, and examples
 - On ideas: opinions and positions
- Activity
 - Organizing and making connections between pieces of information
- Goal
 - To form an opinion about what you are thinking about

BLOOM'S TAXONOMY AND CRITICAL THINKING

BLOOMS TAXONOMY



■ Critical thinking involves:

- Application
- Analysis
- Synthesis
- Evaluation

HOW TO THINK CRITICALLY

- **Begin with the right approach**
 - Base thinking on logic rather than feelings
 - Open-mindedness while considering alternatives and other points of view
- **Look farther and deeper**
 - Making inferences about an argument's assumptions and values
- **Ask complex questions**
 - What are the strengths and weaknesses ?
 - What are the different possible solutions to the problem ?
 - Is this really relevant ?
- **Answer the complex questions using analysis, synthesis, and evaluation**
- **Reflect on how the questions are being answered**
 - Is this clear or is there still some confusion ?

INTEGRATING CRITICAL THINKING INTO YOUR COURSE

- **Problem based case studies**
 - Real-world problem with many possible solutions
 - Working with 'real-life' situations generates interest and maintains enthusiasm
 - Knowledge and understanding of subject material is reinforced
 - Group working can enhance transferable skills
- **Assignments and labs**
 - Include student reflection at the end
 - Students explain steps involved in problem solving
- **Group discussions**
 - Discussions introduce many different viewpoints to a problem
 - Use rubrics to measure creativity
- **Exams**
 - Include written response questions
 - Open-ended questions enable students to elaborate on their answers

PROBLEM BASED CASE STUDIES

National Center for Case Study Teaching in Science

- https://sciencecases.lib.buffalo.edu/collection/detail.html?case_id=683&id=683
 - Contains a searchable index of case studies by discipline
- **Example:**
 - Preparations for switching from IPv4 to IPv6 addressing at a college campus
 - Buildings and Infrastructure
 - Networking equipment
 - Software
 - Costs
 - Procedures
 - Security
 - Goal of the project
 - Students are to work together in assigned groups to provide the most efficient solution
 - There are many possible solutions to the problem

ASSIGNMENTS AND LABS

- **iLearn Assignments tool**
 - Group or individual assignments
 - Assignment submission types include file, text, on paper and observed in person
- **Assignment examples:**
 - Create a flow chart for troubleshooting a printer
 - Given a network schematic, create an IP addressing scheme to ensure that all devices can communicate
 - Enter statistics formulas in an Excel spreadsheet from scratch and use them to perform statistical tests
 - Students are to configure a wireless access point with optimal settings and explain the reasons for choosing each setting

GROUP DISCUSSIONS

- **iLearn Discussions tool settings**

- Choose group topic setting
- Use grading rubric
- Students would be required to include links to information sources in their posts
- Students must start a thread before they can read or reply to other threads
- Students must explain why they agree or disagree with another student post

- **Examples:**

- Given a scenario, students are to explain why one type of encryption would be better than another
- Students are to elaborate on the advantages and disadvantages of public cloud storage
- Given a quantitative statistics scenario and data, students are to explain why they would choose a specific test to determine significance

EXAMS

- The iLearn Quiz tool supports more than 10 types of questions
- Most question types are designed to measure knowledge and comprehension
- Written response questions can be designed to elicit application, analysis, synthesis and evaluation responses
 - Application example:
 - List the steps involved in setting group permissions on a shared folder in Windows 10
 - Analysis example:
 - Given a chart or graph, students are to interpret the meaning of the data in their own words
 - Synthesis example:
 - Students are to write a small computer program and take a screenshot of their work to upload as a file
 - Evaluation example:
 - Choose a Charles Dickens novel that you consider to be the author's best work and write a short essay explaining the rationale for your choice

CRITICAL THINKING RESOURCES

Designing Assignments for Critical Thinking

- <https://resources.depaul.edu/teaching-commons/teaching-guides/assignment-design/Pages/critical-thinking.aspx>

Tennessee Tech Resources

- Office of Creative Inquiry/QEP
 - <https://www.tntech.edu/oci-qep/index.php>
- Center for Assessment & Improvement of Learning
 - <https://www.tntech.edu/cat/about.php>

REFERENCES AND ACKNOWLEDGMENTS

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