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# Critical and Creative Thinking in the CTE Classroom

## Technical Assistance Packet

Based on Fall 2008 Workshop

*Prepared by*

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*for the*

Maine Administrators of Career and Technical Education (MACTE) and the  
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# Critical and Creative Thinking in the CTE Classroom

## Technical Assistance Packet

*Purpose of this Packet:* This technical assistance guide to critical and innovative thinking will help CTE teachers learn how to use this powerful strategy in their classrooms and labs.

*The Challenge:* Every CTE program area has core knowledge and concepts that students must learn and remember in order to understand the technical materials that they are reading in manuals or online; pass CTE certification tests (both written and performance based); and complete work summaries, logs, and descriptions of services proposed or performed. We also want our students to be able to use this powerful knowledge in new and creative ways as they prepare for the 21<sup>st</sup> century world of work.

*How to Address the Challenge:* One powerful way to develop our students' thinking beyond the literal is to develop in them, and us, an understanding of what it means to be a creative and innovative thinker and problem solver. Providing students with an understanding of what it means to be a creative and innovative thinker, experiences in thinking creatively and innovatively, and a framework for recognizing the blocks to creative and innovative thinking will give them the tools and the understandings they need to meet unforeseen challenges effectively and efficiently.

The materials in this packet were developed by PCG-CRM. Explanations and examples of all of the literacy support strategies mentioned are found in the CTE Literacy Strategies Manual at every Maine CTE center or online in the Content Literacy Guide at [http://www.ccsso.org/projects/secondary\\_school\\_redesign/Adolescent\\_Literacy\\_Toolkit/](http://www.ccsso.org/projects/secondary_school_redesign/Adolescent_Literacy_Toolkit/).

In this Technical Assistance Packet, you will find:

### Workshop Objectives

Aligning Your CTE Field to the 21<sup>st</sup> Century Learning and Innovative Skills

Aligning Your CTE Field to the Framework for 21<sup>st</sup> Century Learning and Innovation Skills

Student WIIFMs: "What's In It For Me" If I'm a Good Thinker

What Is Thinking?

What is Creative Thinking?

What is Critical Thinking?

The Need for Innovative Thinking in the Workplace

Discovery Activity: In What Ways Might This Object Be Used?

Creative Thinking Skills

Mental "Blocks" Which Limit Creative Thinking

Did "Blocks" Limit Your Creative Thinking?

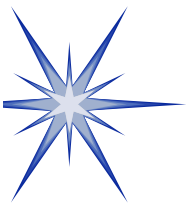
Tips for Developing Your Creativity

Aligning Cognitive Demands to Literacy Demands in CTE Program Areas

Application: How Can CTE Instructors Embed Critical and Creative Thinking in Classroom Literacy Instruction?

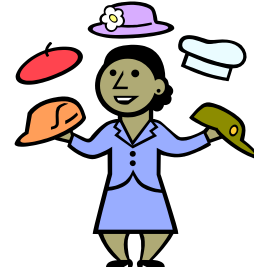
Literacy Lesson Plan to Deepen Student Critical or Innovative Thinking

Resources for Further Study

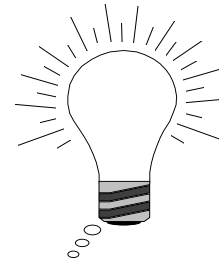


## Workshop Objectives

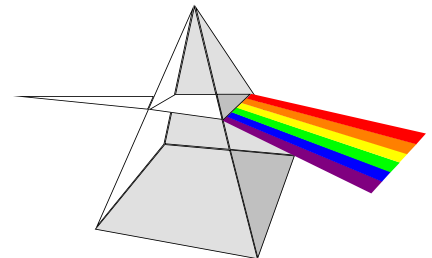
- ◆ To review and align the *Framework for 21<sup>st</sup> Century Learning* to CTE program instruction



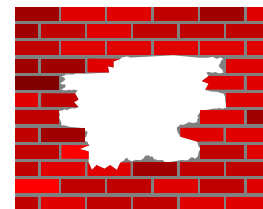
- ◆ To understand the concepts of critical and innovative thinking that CTE students need to know



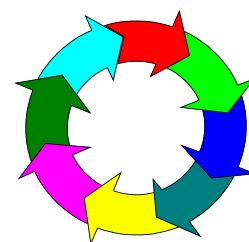
- ◆ To deepen use of literacy support strategies to advance students' critical and creative thinking



- ◆ To see how mental “blocks” hinder analysis, evaluation, and out of the box thinking



- ◆ To understand the need for critical analysis and applied creativity in 21<sup>st</sup> century workplaces





# Aligning Your CTE Field to the 21<sup>st</sup> Century Learning and Innovation Skills

**Where in your career field will students need to be able to:**

## **CREATE AND INNOVATE**

- ◆ **Demonstrate originality and inventiveness in work**

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- ◆ **Develop, implement, and communicate new ideas to others**

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- ◆ **Be open and responsive to new and diverse perspectives**

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- ◆ **Act on creative ideas to make a tangible and useful contribution to the domain in which the innovation occurs**

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## **THINK CRITICALLY AND PROBLEM SOLVE**

- ◆ **Exercise sound reasoning in understanding**

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- ◆ **Make complex choices and decisions**

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# Aligning Your CTE Field to the Framework for 21<sup>st</sup> Century Learning and Innovation Skills

- ◆ Understand the interconnections among systems

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- ◆ Identify and ask significant questions that clarify various points of view and lead to better solutions

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- ◆ Frame, analyze, and synthesize information in order to solve problems and answer questions

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## COMMUNICATE AND COLLABORATE

- ◆ Articulate thoughts and ideas clearly and effectively through speaking and writing

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- ◆ Demonstrate ability to work effectively with diverse teams

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- ◆ Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

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- ◆ Assume shared responsibility for collaborative work

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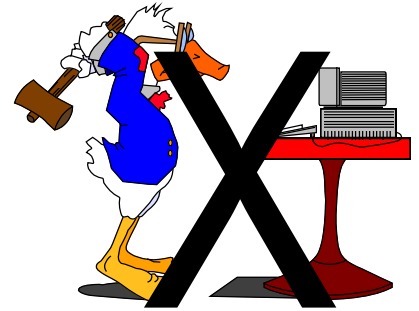
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# Student WIIFMs: “What’s In It For Me” If I’m a Good Thinker?



*More Money*



*Less Frustration*

**Better decision-making**

**Increased value to employer**

**Greater skills in problem solving**

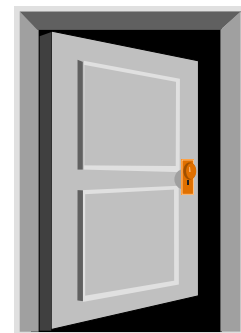
**Higher personal and workplace satisfaction**

**Portable toolbox of skills to use throughout life**

**Strong self efficacy and self esteem**



*Mastery of Challenges*



*New Opportunities*



# What Is Thinking?

*“Thinking is the overall attempt to make sense of all d\_\_\_\_\_ of our e\_\_\_\_\_ and to make intelligent choices based on that understanding.” - —Dr. John Chaffee, LaGuardia Community College*

*“Thinking is an operating skill in which \_\_\_\_\_ acts upon\_\_\_\_\_.” —Edward De Bono*

## THINKING IS A MULTI-FACETED SKILL

- ◆ Actively using one’s i\_\_\_\_\_, k\_\_\_\_\_, and s\_\_\_\_\_ to deal with ourselves, o\_\_\_\_\_ and l\_\_\_\_\_’s situations effectively, versus p\_\_\_\_\_ receiving information or merely “having thoughts.”
- ◆ Developing a q\_\_\_\_\_ and r\_\_\_\_\_ attitude which p\_\_\_\_\_ below the surface of what is simply being presented.
- ◆ C\_\_\_\_\_ and u\_\_\_\_\_ ideas which are one’s own, versus uncritically i\_\_\_\_\_ or borrowing the thoughts of others.
- ◆ Being f\_\_\_\_\_ enough to change or m\_\_\_\_\_ one’s ideas in light of new information or better i\_\_\_\_\_.
- ◆ Imagining other p\_\_\_\_\_ than are being presented.
- ◆ A\_\_\_\_\_ and e\_\_\_\_\_ complex issues and situations through critical r\_\_\_\_\_ and d\_\_\_\_\_ with others.
- ◆ T\_\_\_\_\_ critical understanding into t\_\_\_\_\_ and effective p\_\_\_\_\_ and decision-making.



# What Is Thinking?

*“Thinking is the overall attempt to make sense of all dimensions of our experience and to make intelligent choices based on that understanding.”*

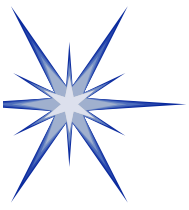
—Dr. John Chaffee, LaGuardia Community College

*“Thinking is an operating skill in which intelligence acts upon experience.”*

—Edward De Bono

## THINKING IS A MULTI-FACETED SKILL:

- ◆ Actively using one’s intelligence, knowledge, and skills to deal with ourselves, others, and life’s situations effectively, versus passively receiving information or merely “having thoughts.”
- ◆ Developing a questioning and reflective attitude which penetrates below the surface of what is simply being presented.
- ◆ Creating and using ideas which are one’s own, versus uncritically imitating or borrowing the thoughts of others.
- ◆ Being flexible enough to change or modify one’s ideas in light of new information or better insight.
- ◆ Imagining other possibilities than are being presented.
- ◆ Analyzing and evaluating complex issues and situations through critical reflection and dialogue with others.
- ◆ Translating critical understanding into thoughtful and effective planning and decision making.



# What Is Critical Thinking?

## Bloom's Taxonomy of Critical Thinking

Six levels of critical thinking were defined by Benjamin Bloom in 1956 in order of cognitive difficulty:

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

## The New Bloom for Cognitive Learning

The taxonomy was updated by Anderson and Krathwohl (2001) to emphasize learners' cognitive processes, based on contemporary research on learning and human cognition. The use of verbs helps teachers and students focus on the behavior of the learner, not the content of the material. The new terms are:

- Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create

Synthesis was changed to create as there needs to be a new creation for a synthesis to be demonstrated. Anderson and Krathwohl also switched and modified the levels of evaluation and synthesis based on many empirical studies that had been conducted on the Bloom taxonomy. This meta-analysis showed that evaluation involved inductive thinking, which is a lower-level cognitive task than the deductive thought that is required when a person creates. The New Bloom also broadened the old model to include factual, conceptual, procedural, and metacognitive processes.

Source: Cochran, D., Conklin, J. & Modin, S. A New Bloom: Transforming Learning in *Learning & Leading with Technology*. International Society for Technology in Education. February 2007.

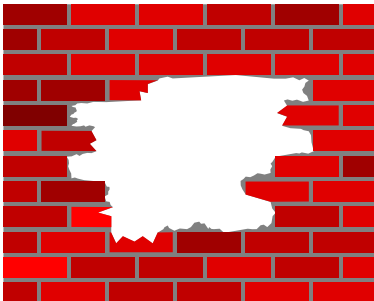
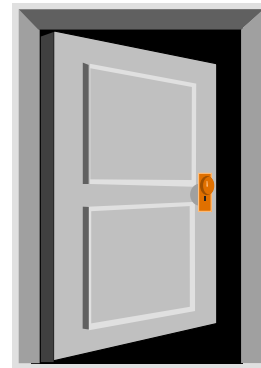


## What Is Creative Thinking?

**CREATIVE THINKING IS THE USE OF THE WHOLE BRAIN  
TO FUSE OR SYNCHRONIZE ONE'S THOUGHTS  
TO CREATE SOMETHING UNIQUE AND NEW.**

*“Simply put, creativity in organizations is a process of continually finding and solving problems and implementing solutions for the betterment of the organization and its customers.”*

—Center for Research in Applied Creativity

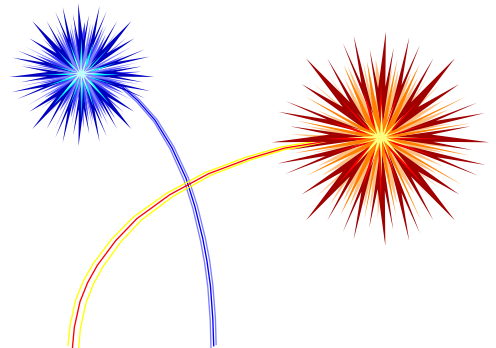


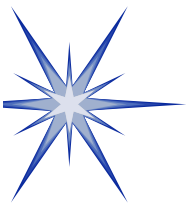
*“The fresh ideas and methods produced through creative thought and effort help organizations cope with change, develop flexibility, and grow in a world where adaptation is necessary for survival.*

—Bauer Associates

*“Creativity comes from inside out. It’s your ability to find value in systems external to yourself in order to resolve internal problems that makes you creative.... It’s your desire to find things that are better than what you have.... Creative people know there’s a solution out there. All we’ve got to do is find it.*

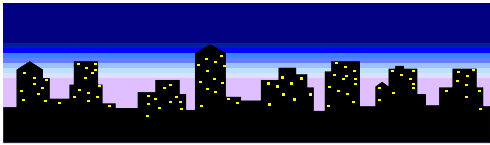
—Steve R. Grossman, co-author of Innovation Inc.





# The Need for Innovative Thinking in the Workplace

## Historical Perspective: Mass Production



Managers manage.  
Workers leave their brains  
at the door.

## Technology, Competitiveness, and the Global Economy



90% is no longer an "A."

## Human Resource Capitalism



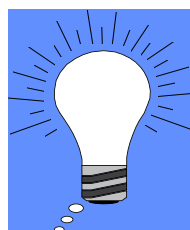
People are a company's  
strongest asset.

## Learning Organizations

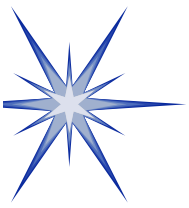


Learning is a never  
ending journey.

## Innovation



If you always do  
What you've always done  
You'll only get  
What you always got —  
Is it enough?



# Creative Thinking Skills

- ◆ **FLUENCY - thinking of many possibilities**
  - ◆ Behavior - to think of the most
  - ◆ Examples - generation of a quantity; flow of thought
  
- ◆ **ORIGINALITY - thinking of new and unusual possibilities**
  - ◆ Behavior - to think in novel or unique ways
  - ◆ Examples - unusual responses, clever ideas, not obvious
  
- ◆ **FLEXIBILITY - using different points of view**
  - ◆ Behavior - to take different approaches
  - ◆ Examples - variety of ideas, ability to shift categories, detours in direction of thought
  
- ◆ **ELABORATION - thinking of expanded possibilities**
  - ◆ Behavior - to add on to
  - ◆ Examples - embellish or embroider on an idea, stretch or expand on things or ideas
  
- ◆ **RISK-TAKING - willingness to participate in new situations**
  - ◆ Behavior - to try something different after judging the situation, benefits, and consequences
  - ◆ Examples - expose oneself to failure or criticism; take a guess; function under conditions devoid of structure
  
- ◆ **TOLERANCE OF AMBIGUITY - ability to deal with multiple solutions**
  - ◆ Behavior - to deal with uncertainty or many options
  - ◆ Examples - sees many ways to handle a situation; enjoys complex situations; thrives during change

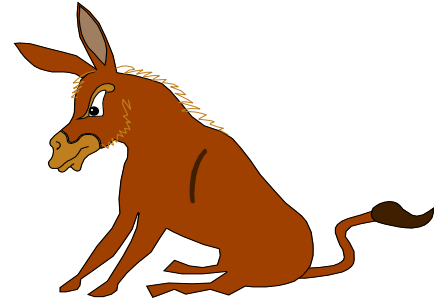


# Mental “Blocks” Which Limit Creative Thinking

## ◆ PERCEPTUAL BLOCKS

**Obstacles that prevent the problem solver from clearly perceiving either the problem or the information needed to solve the problem.**

- ◆ One right answer
- ◆ Thinking within boundaries
- ◆ It won't work here
- ◆ It can't be done
- ◆ Habit bound thinking
- ◆ Reluctance to play



## ◆ CULTURAL AND ENVIRONMENTAL BLOCKS

**Obstacles imposed by a given set of cultural patterns or by the immediate social and physical environment**

- ◆ Taboos
- ◆ Preference for serious reasoning rather than humor or intuition
- ◆ Preference for status quo over change
- ◆ Lack of support or authority
- ◆ Groupthink



## ◆ EMOTIONAL BLOCKS

**Personality traits which limit freedom of exploration.**

- ◆ Fear of failure or making mistakes
- ◆ Inability to tolerate ambiguity due to desire for order, security
- ◆ Preference for judging ideas instead of generating them
- ◆ Inability to relax, incubate and sleep on ideas
- ◆ Lack of challenge; problem fails to engage interest
- ◆ Lack of imagination

Source: Adams, J. (2001). *Conceptual Blockbusting*. Cambridge, MA: Perseus Publishing.



## Tips for Developing Your Creativity

### ◆ **RANDOMLY PICK SOMETHING AND COMPARE IT TO YOUR PROBLEM**

Open a dictionary, randomly pick a word, and compare it with your problem. Or look out a window and pick any one part of the view, like a tree or parking lot, and compare its characteristics to your problem. Forcing an analogy to something very different from your problem often results in creative solutions.

### ◆ **PLAY A DIFFERENT ROLE**

When thinking of improvements, mentally play the role of someone else and consider what he/she might do. Be creative in the role you choose: a historian, physician, quarterback, comedian, etc. Thinking from someone else's view helps you remove the perceptual blocks of your own thinking.

### ◆ **IMAGINE YOU HAVE A MAGIC WAND**

Consider what changes or actions you could create, if you put aside boundaries of what normally would be possible. Then select the specific features of this solution that appeal to you and think of some feasible actions to take.

### ◆ **THINK OUTRAGEOUSLY**

The more divergent an idea is from conventional thinking, the greater the possibility for new twists.

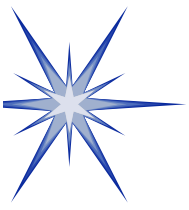
### ◆ **CHALLENGE ASSUMPTIONS**

List the assumptions and write the opposite. For example, Henry Ford challenged the practice of having workers go to where the materials were kept to build cars and created a system that brought the materials to the workers.

### ◆ **BE AN ARTIST**

Discover new ideas by drawing a picture, writing a poem, or making a model to understand the problem in a different, more imaginative way.

Adapted from M. Michalko, *Tips for Creative Thinking, Training and Development*, July 1992.



# Aligning Cognitive Demands to Literacy Demands in CTE Program Areas

## READING:

**Text:** textbooks; directions; manuals; trade journals; catalogs; codes; specifications; reference texts

**Visual aids:** graphs, diagrams, and charts; blueprints and schematics; maps; flow charts; set ups and installations

**Media:** photography; art; television; film/video; virtual conferences; audio books

**Online:** email; Internet; databases; company website

## WRITING:

**Academic:** summaries; responses to prompts; writing to synthesize and reflect

**External communication:** resumes and cover letters; requests for information; proposals for funding

**Internal operations:** work reports; logs; work summaries; sales or business plans

**Data:** charts, graphs, diagrams; specifications; labels; purchasing plans; blueprints

**Online:** blogs; wikis; digital textbooks

## VOCABULARY:

**Technical:** words you need to use when doing the work

**Conceptual:** words you need to understand to complete the work

**Academic:** words you need to know to demonstrate your understanding of the work in formal settings or during an assessment

**Lay terminology:** words you need to know to communicate with those who do not know the field

## SPEAKING AND PRESENTING

**Daily communication:** personal dialogue; work tasks; handling conflict

**Team communication:** meeting participation; mentoring; decision-making

**Management communication:** work directions; coaching; supervision

**Customer service:** sales; service; trouble-shooting

**Demonstration:** process tasks; products and services

**Speech or presentation:** meetings; conferences

**Persuasion:** rhetoric; debate; competition

## LISTENING AND VIEWING

**Customers:** sales; requests; complaints; body language and tone

**Visual observation:** gauges; process charts; output displays

## CRITICAL THINKING

**Work processes:** process flow; time management; contingency planning

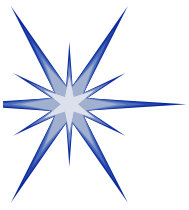
**Decision making:** work priorities; team agreements; supervision

**Problem solving:** diagnostics; trouble-shooting; process improvement; mistake proofing

## INNOVATIVE THINKING

**Synthesis:** systems thinking; continuous improvement

**Design:** product or process innovation; brainstorming; out of the box thinking



# Application: How Can CTE Instructors Embed Critical and Creative Thinking in Classroom Literacy Instruction?

## **DIRECTIONS**

Using chart paper, small groups will discuss and define ways to embed critical and creative thinking during literacy-based activities in the classroom, with an emphasis on student communication and collaboration. Each group will share its findings with the whole group.

### **A. Before-reading/learning strategies**

KWL, Knowledge rating guide, chapter preview, setting purpose, think-pair-share, give one – get one – move on, anticipation/reaction guide, problematic situation

### **B. During-reading/learning strategies**

Bloom's thinking prompts, think-pair-share, think aloud, coding/comprehension monitoring, jigsaw, proposition support outline, discussion web, sum it up

### **C. After-reading/learning strategies**

Quick writes, learning logs, group summarizing, role-audience-format-topic (RAFT)

### **D. Vocabulary development**

Word sort, triple-entry vocabulary journal, interactive word wall, concept definition map, semantic feature analysis, Frayer model

### **E. Writing to learn**

Two-column note taking (double-entry journal), graphic organizers, sum it up

### **F. Technology-based literacy**

Internet research, inquiry projects, presentation media, blogs, etc.

### **G. Visualization organizers**

Exploration of the Periodic Table of Visualization: data, information, concept, strategy, metaphor, and compound graphic organizers at [www.visual-literacy.org](http://www.visual-literacy.org)



# Literacy Lesson Plan to Deepen Student Critical or Innovative Thinking

## LITERACY STRATEGY LESSON PLAN

**Name of Strategy Used:**

**Department:**

**Grade:**

**Teacher:**

**Unit/Lesson:**

**Learning standard(s) addressed:**

**Material read in this lesson:**

**Description of instruction that preceded the use of the literacy strategy:**

**Description of the strategy purpose and classroom use:**

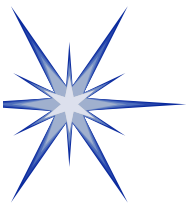
**Description of instruction that will follow use of the literacy strategy:**

**Attach samples of student work applying the strategy that illustrate high, average, and low student performance.**



## Resources for Further Study

- ◆ Adams, J. L. (1974). *Conceptual blockbusting: A guide to better ideas* (4<sup>th</sup> ed.) Cambridge, MA: Basic Books.
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## Resources for Further Study

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