Chapter 1: Critical Thinking: Teaching College and University Students to Think Critically and Evaluate

Here are the topics discussed in this chapter. Click on those you wish to review.

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Introduction to Thinking About Critical Thinking

College is a time for undergraduates to expand their knowledge (facts, principles, theories, concepts), to improve their basic academic success skills, to sharpen their thinking skills, to learn new thinking skills, to learn how to learn effectively, to improve their communication skills, to learn how to apply what they have learned, to develop the attitudes necessary for effective thinking, and to become self-directed learners.

Over the past twenty years critical thinking has moved from a small corner of the stage in philosophy and the social sciences to front and center. Higher education writers agree that critical thinking should be included in the undergraduate curriculum. However, there seems to be little agreement on exactly what critical thinking is. Let's think critically about what critical thinking is.

Write your definition of critical thinking here:

Why do you think these is so much confusion about defining critical thinking?

Please do not go to next page until you have filled out this page. Thank you.

The next two pages contain exercises to give you the experience of thinking critically and creatively solving problems. Be sure to write down your thoughts for each exercise.

What are the key components of critical thinking? What are the key components of creative problem solving? There are other thinking skills we teach in college and a later part of this Handbook will discuss some of the other thinking skills.

Here are some things to think about. Write your answers in the space provided.

1. What do currently enrolled students think about American History? I decided to take a random sample. I stopped by the library yesterday for a few minutes and randomly asked students what they thought. I found these results: three students wanted more homework, 10 wanted less, and eight thought the assigned amount was fine. My experiment proves that American History students want less homework and are willing to go out of their way to speak up.

   Write your thinking here:

2. Write your thinking where appropriate.
   a. In this sentence cross out the letter after the letter in the word "pardon" that is in the same position in the word as it is in the alphabet.

   b. Add just a single line to IX to make 6. Challenging.

   c. What always happens at the end of a dry spell? Come up with at least four different answers.

   d. What can you put on a table that is cut and passed but never eaten? Come up with at least two answers.

3. I own some dry cleaners and hire the manager. A few years ago I read that a number of the top U. S. companies were using handwriting experts to select managers. I called a local handwriting expert who told me that there was extensive research which proved that proper analysis of handwriting could accurately assess personality and predict job success. I was not completely convinced and asked him to analyze my handwriting. The results were very impressive. Consequently, I have used a handwriting expert the past five years. However, I recently hired a new manager even though my handwriting expert said he was too shy. I felt he would be great with people. After only six months I had to fire him. He could not keep the records straight. This latest experience has convinced me to follow exactly what my handwriting expert says.
   Write your thinking here:

4. Last summer I (Jack Jones) was hired to find the best peanut butter cookie recipe in Maryland to include in a cookbook for new cooks. First I placed a radio ad asking for anyone interested in being a peanut butter cookie taster to write to me. I then brought together 40 of the respondents to Baltimore. Each tasted the four peanut butter cookies that had been judged superior at the recent Maryland State Fair. To assure fairness, each “taste” was made with a 45 minute gap between so that taste buds would not be confused. The winner: Ruth Jones’ peanut butter cookies! She received 30% of the votes. Her closest competitor received 20%. Her peanut butter cookie recipe was included in the new cookbook as the best for new cooks to make.

   Write your thinking here:

5. Read the following paragraph to identify the citations, the research evidence, and words used incorrectly. Answer the questions listed after the paragraph.

The Bystander Effect by Ed Jones (1995). *Journal of Social Psychology, 42*(2), p. 248

(1) Will people help less often when others are present? (2) Dart (1978) in an experiment had college subjects fill out a survey in a blue room either alone or with two others. (3) Smoke was sent into the blue room. (4) 75% of the alone subjects quickly reported the smoke, while only 25% of the together subjects reported any smoke. (5) Late (1979) had subjects participate in a group discussion in which another subject appeared to have a seizure. (6) The subjects either thought they were in the discussion just with the seizure victim or thought that others were present in different rooms. (7) 85% of the alone subjects helped while only 31% helped when the subject thought that others were also listening. (8) Pill and Pill (1975) found in a clever naturalistic observation study that 95% of the time help was given to a man who fell to the floor of a subway car when a number of bystanders were present. (9) Long (1989) explained that the bystander hypothesis means that the presence of others decreases helping in a crisis. (10) Professor Al Bills says that research conclusively proves that an important difference in the studies is that in the subway study the bystanders could see that a person needed help whereas in the seizure study, the person with the seizure was in another room where he could be heard but not seen. (11) Wilder said, "More recent research has shown that some bystanders who can see the person needing help still do not help when there are bystanders present." (1995, p. 84)

a. List all of the citations. List the line, author, and date.

b. List the lines that contain psychological research evidence and include the citation.

c. List the line and any words you note that mar an objective presentation?

Answer Key for Jones (1995). (The Answer Key for use with students is usually found on a different page.)

a. List all of the citations. List the line, author, and date.
(2) Dart (1978) (5) Late (1979)
(8) Pill and Pill (1975) (9) Long (1969)
(10) Bills - not a citation (11) Wilder (1995)

b. List the lines that contain research evidence and the citation.
(2) - (4) Dart (1978)
(5) - (7) Late (1979)
(8) Pill and Pill (1975)
(9) Long (1989) - a definition (10) Bills - not research evidence since no citation is given and no research is specifically described, (11) Wilder (1995) - not clear the statement is research, a conclusion without evidence.

c. (8) - clever, (10) research conclusively proves

Write your definition of creative problem solving here:

Exercise 2 was the only example of creative problem solving. The other exercises involved critical

thinking.

Which definition best expresses your view of critical thinking?

The definitions below are quoted or slightly modified from a wide variety of sources.

1. Critical thinking is the active and systematic attempt to understand, evaluate, and find flaws in arguments.

2. Critical thinking involves deciding what to believe and how to act after a careful evaluation of the evidence and reasoning in a communication.

3. If students are to exhibit critical thinking skills, they must learn to decide when specific cognitive skills are relevant (a metacognitive skill) and then successfully apply the cognitive skills to solve problems.

4. Critical thinking is an active, purposeful, organized, cognitive process we use to carefully examine our thinking and the thinking of others, in order to clarify and improve our understanding.

5. Good thinking is what we will term critical thinking.

6. Critical thinking is an investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and can therefore be convincingly justified. In critical thinking, all assumptions are open to question, divergent views are aggressively sought, and the inquiry is not biased in favor of a particular outcome.

7. The hallmark of a critical thinker is an inquiring mind. Simply put, good thinkers are good questioners. Critical thinking is the process of raising questions.

8. Critical thinking involves the skill and propensity to engage in an activity with reflective skepticism.

9. A critical thinker is the individual who is appropriately moved by reasons.

10. Critical thinking is skillful, responsible thinking that facilitates good judgment because it (1) relies upon criteria, (2) is self-correcting, and (3) is sensitive to context.

11. Critical thinking is the process of purposeful, self-regulatory judgment. This process gives reasoned consideration to evidence, contexts, conceptualizations, methods, and criteria.

12. Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome.

Some Of The Many Ways That Critical Thinking Is Defined

Critical Thinking is:

- thinking

- clear thinking, effective thinking, good reasoning, good thinking, thinking straight, intelligent thinking, smart thinking, practical reasoning, good judgment, reflective judgment

- higher order thinking, higher cognitive skills, higher order thinking skills
- complex thinking
- Bloom's higher levels of educational objectives

- reasoning (reasoning abilities)
- problem solving (creative problem solving)
- assessing the reasons for making decisions, making informed decisions

- assessing the validity of arguments
- critical evaluation, critical analysis
- dealing with controversy
- assessing evidence
- assessing both the evidence and reasons in a communication

- raising questions, raising good questions, asking intelligent questions

- informal reasoning, informal logic

- critical reading, reading critically, reading beyond the lines

- involves only skills (abilities)
- involves skills plus dispositions (attitudes, tendencies)
- involves knowledge, skills, and dispositions

- involves the attitude of skepticism

- metacognition (metacognitive thinking - thinking about thinking)

- discovering the weaknesses in the ideas, reasoning, and evidence of others
- discovering the weaknesses in our own ideas, reasoning, and evidence; being self critical, self correcting, self assessing, self evaluating

Let's use psychology as an example to critically think about what critical thinking means in psychology. The same process can be used in other disciplines.

What do introductory psychology textbooks and books which primarily focus on critical thinking in psychology suggest critical thinking is?

There is disagreement among introductory psychology textbook authors on what critical thinking is, the component skills, and its importance. A few introductory psychology textbooks do not appear to define or discuss critical thinking or refer readers to other sources. However, most textbooks provide a definition and a brief explanation, and a few textbooks describe critical thinking as a key concept.

Although there is not a consensus on defining critical thinking, the majority of introductory psychology textbook authors and authors of the 11 books on critical thinking in psychology define critical thinking with the major emphasis on evaluation.

Critical thinking is evaluative:

Key terms: evaluate, assess, judge, critically scrutinize, accurate, consistent, flaws, evidence, evaluating alternatives, reflective skepticism, asking why.
N = 8 (Bell, 1999; Coats, Feldman, & Schwartzberg, 1994; McBurney, 1966; Mayer & Goodchild, 1994, Smith, 1995; Stanovich, 1996; Tavris, 1995; Wade & Tavris, 1993)

Critical thinking involves a variety of thinking skills:

Key terms: pattern recognition, problem solving, psychological reasoning, perspective taking, formulating inferences, calculating likelihoods, making decisions, good thinking.
N = 3 (Halonen, 1995; Halpern, 1996; Zechmeister & Johnson, 1992)

In summary, what is meant by critical thinking? Beyer (1987) made the following observation in his book *Practical Strategies for The Teaching of Thinking*.

> The term critical thinking is one of the most abused terms in our thinking vocabulary. Generally it means whatever its users stipulate it to mean. In some circles critical thinking is used to mean all thinking operations. . . . Experts in the field of critical thinking have for some years been rather specific about what they mean by the term. Critical thinking, according to them and as used here, means judging the authenticity, worth, or accuracy of something (pp. 32-33).

What conclusions can we draw about what critical thinking is?

1. A few introductory psychology textbooks equate critical thinking to thinking. Some textbooks mix together critical thinking and problem solving. Most textbooks report that critical thinking is the evaluating, judging, or assessing of information (claims, assertions, evidence) and reasoning. A few textbooks emphasize evaluating arguments while most emphasize evaluating psychological evidence and reasoning.
2. There is not total agreement among books which focus primarily on psychology and critical thinking. Eight of the eleven view critical thinking as evaluative while three view critical thinking as including other thinking skills.

A Synthesis of Critical Evaluative Questions Listed in Recent

General Psychology Textbooks

What do I know about the source of the information?
Do I understand what I have read?
Am I clear on the definition of key terms?
What assertions (arguments, claims, conclusions) is the writer making?
What evidence is given to support the assertions (arguments, claims, conclusions)?
What assumptions is the writer making?
Are there other ways of explaining the evidence?
What additional evidence might I need to obtain to decide what to believe?
What do I decide to believe?
How can I use (apply) what I have learned?

An Example: Critical Evaluative Thinking Vocabulary

critical evaluation - syn.: appraise, assess, classify, critique, evaluate, examine, gauge, grade, inspect, judge, measure, rank, weigh

Examples of jobs which require critical evaluative thinking - authorities, critics, editors, experts, inspectors, judges, jurors, lawyers, managers, and teachers.

Key Terms for Discussing Critical Evaluative Thinking

accurate
alternative explanations
argument
assertions (claims) and unsupported assertions
assumptions
bias
conclusion
construct definitions, operational definitions
contradictory
control
data
definitions of terms - vague, incorrect, misleading
evidence - scientific vs. nonscientific
expertise (authority)
fact - citation, sample, procedure, results
flaws
hypothesis
inferences
observations - objective, repeated, representative
opinion
personal experiences
population, sample, random sampling
primary sources, secondary sources
propaganda techniques - glittering generalities, name calling, bandwagons, testimonial
proves (not)
reasons
research methods - clinical observations, naturalistic observations, tests, surveys, experiments
skepticism
theories
values

Critical Evaluative Thinking builds on the chapter on research in introductory textbooks.

Assess what you believe? Critical evaluation focuses on evaluating based on criteria. Indicate by letter the following goals you believe are important for critical evaluating.

Which of the following goals do you believe beginning students should learn? B
Which of the following goals do you believe students (non majors) should learn? N
Which of the following goals do you believe majors should learn? M
Which of the following goals do you believe graduate students should learn? G

Students will be able to critically evaluate written secondary sources:
- the assigned textbook
- other textbooks
- books found in the library
- magazine and newspaper articles

Students will be able to critically evaluate written primary sources:
- books
- journals

Students will be able to critically evaluate both primary and secondary sources on topics researched in the library.

Students will be able to critically evaluate sources found on the Internet.
- Secondary sources
- Primary sources

Students will critically evaluate films, videos, and television programs.
- Students will critically evaluate how the mentally ill are portrayed in the mass media.
- Students will critically evaluate how psychology is portrayed in the mass media.

Students will be able to critically evaluate lectures.

Students will be able to critically evaluate comments from family, friends, neighbors, and employers.

Students will be able to critically evaluate their own persuasive attempts.

Students will be able to critically evaluate their time management and study skills.

Students will be able to critically evaluate their studying and taking of tests.

Students will be able to critically evaluate their own written work.

Students will be able to critically evaluate their verbal statements.

Is critical thinking the same as creative problem solving?

Some writers use "critical thinking" to refer to evaluating evidence while other writers refer to creative problem solving. A few writers use the term to mean any type of thinking. Some writers focus on asking questions while others focus on evaluating the reasoning of arguments.

How do critical thinking (evaluative) and creative problem solving relate? There is overlap in the terms. However, critical thinking focuses primarily on evaluating evidence and ideas, while creative problem solving focuses primarily on finding answers to questions (problems or challenges).

Critical thinking in the social sciences is relevant in four areas of thinking: (1) the evaluation of information and reasoning, (2) the evaluation of ideas as a part of creative problem solving, (3) the evaluation of our own observations, and (4) the evaluation of our thinking.

(1) The critical evaluation of information has as its purpose deciding what to believe. Sometimes that belief will be followed by action. Deciding what to believe when reading a secondary source involves first understanding the message. Evaluation starts with careful attention to key terms and propaganda techniques. The evidence and reasoning are identified and evaluated. Lastly, students decide what to believe. The desire to use these skills to decide what to believe based on reliable evidence and effective reasoning has been called reflective skepticism or the critical attitude. Beginning social science students can learn to evaluate secondary sources while advanced students can evaluate primary sources.

(2) Critical thinking is a part of creative problem solving. After the problem has been defined and several possible solutions have been proposed, critical thinking is used to decide which solution appears to be the best. Criteria are used to evaluate the possible solutions.

(3) Critical thinking can be used to help each of us be more careful in drawing conclusions from our own observations. Besides training our critical thinking on others, we can check our own observations and interpretations with a dose of skepticism.

(4) Critical thinking can be used to monitor our own thinking to improve our thinking. This use of critical thinking is a part of metacognitive thinking or thinking about our thinking.

How do critical thinking and creative problem solving differ?

A. What is a "problem?"
A problem exists when there is a gap between the present situation and a desired situation. "Something requiring thought and skill to arrive at a proper conclusion or decision . . . .

> syn.: issue, nut, question; rel.: enigma, mystery, puzzle, bugaboo"; (*Webster's Collegiate Thesaurus*, 1976, p. 629)

B. What is "routine problem solving?"
Routine problem solving occurs when we already have the answer to bridging the gap or the correct answer is immediately obvious.

C. What is "creativity?"
looking at one thing and seeing another
relating the apparently unrelated
ability to produce new and interesting results
ability to make new accomplishments of social worth

D. What is "creative problem solving?"
Creative problem solving is needed when there is not an obvious way to bridge the gap. The resulting solution could be seen as novel. Designing an experiment to test a new hypothesis would be an example of creative problem solving.

E. What is "critical thinking?"
Critical Thinking involves evaluating the evidence and reasoning in a communication to decide what to believe and do.

1. Evaluating secondary sources. In introductory courses students can learn to evaluate secondary sources.
2. Evaluating primary sources. In upper level courses students learn to evaluate primary sources.

F. Conclusion: There is overlap between creative problem solving and critical thinking. Both are higher order thinking skills.

1. In creative problem solving, critical thinking is needed when deciding which proposed solution is best. Criteria are used to select a solution.
2. In deciding what to do after having critically evaluated information (What does research tell me about lecture versus small group discussion?), the individual may need to do some problem solving (For example, a psychology teacher might consider: "In what ways can I produce effective group discussion?").

How do the steps in creative problem solving compare to the steps of critical thinking?

Here are two general approaches for creative problem solving and critical evaluative thinking.

Creative Problem Solving		**Critical Thinking** (with a secondary source)
STEP 1 -	Search for Challenges.	STEP 1 - Identify the Source
STEP 2 -	Express the Problem.	STEP 2 - Summarize the Message
STEP 3 -	Investigate the Problem.	STEP 3 - Analyze definitions
STEP 4 -	Produce Ideas.	STEP 4 - Identify the Evidence
STEP 5 -	Put Into Action the Best Solution	STEP 5 - Evaluate the Evidence
STEP 6 -	Evaluate the Effectiveness Of the Solution	STEP 6 - Decide What to Believe

What are some examples of changes I have made in my teaching by focusing on improving student thinking?

An Example: INCREASING STUDENT THINKING: Scanning

I. Previous Teaching

A. **GOAL:** To help students understand the big picture about the course.

B. METHOD: I lectured and told students to note the title and the authors, the major topics of the book and the major divisions of the text. I assumed that students would scan on their own and that they knew how to scan. False assumptions!

II. Current Teaching

A. **GOAL:** To get the big picture you are to scan the textbook for 20 minutes (homework) and write what you learned about your textbook. (A problem to solve - Given a limited time, what are the most important things to look for?) Only a few students ever check the indexes.

B. METHOD: I have found that students learn more if they look for themselves and they learn to be less dependent on me. "Scan for 20 minutes your textbook to see what you can learn about this textbook. Write down what you learned." In class I have groups of five share with each other what they learned and then I collect ideas from all of the groups. I also provide an Answer Key which lists the ideas from previous classes.

C. **Result:** Few students know how to scan efficiently. Since this is the first homework assignment, I now provide a feedback sheet to expand their thinking about scanning. Students get a chance to see what other students found and to share what they did. Students are getting to know classmates while learning about the textbook.

An example: INCREASING STUDENT THINKING: Defining Social Psychology

I. Previous Teaching

A. **GOAL**: To recall the definition of social psychology as stated in the textbook.

B. METHOD: Students read the first chapter in the social psychology textbook

and wrote down the definition of social psychology. They then could recall the definition of social psychology when requested.

II. Current Teaching

A. **GOAL**: To have students become aware of the various ways to define a field and to then synthesize their own definition of social psychology after studying a number of different definitions.

B. METHOD:

1. Ask students to write down their definitions of social psychology without reference to any source.
2. Ask student working alone to brainstorm where they might look to find out how to define social psychology.
3. Ask groups to brainstorm where to look.
4. Ask each student to find relevant information in their textbook.
5. Provide ten definitions from a variety of textbooks in social psychology. Ask students to compare and contrast the definitions.
6. Ask students to identify the elements of the thinking process of compare and contrast.
7. Provide a sheet which discusses how to compare and contrast.
8. Provide an example of compare and contrast using a few of the definitions.
9. Ask students to compare and contrast the definitions.
10. Ask students to write their synthesis definition of social psychology.
11. Ask students to spend an hour in the library learning about defining the field of social psychology.
12. Provide an Example Answer from previous students on what they found.

C. **Result:** Students learn to find information for themselves, to compare and contrast, to synthesize a definition, and to understand that sources differ.

An example: INCREASING STUDENT THINKING: Analyzing television

I. Previous Teaching

A. **GOAL**: Recall the facts about the effects of television after reading about TV and the effects.

B. METHOD: Students studied an article on the facts about the effects of TV.

II. Current Teaching

A. **GOAL**: To learn how psychologists think about a topic by observing, recording, and analyzing violence and prosocial behavior on three types of television programs and to write a report.

B. METHOD:

1. Students read an article on the effects of TV.
2. Students read a handout on defining aggression and prosocial behavior.
3. Students participate in a class activity on learning to use a chart to observe aggression and prosocial behavior on TV by watching and analyzing three cartoons.
4. Students observe 20 minutes of three different types of TV programs and record their observations of aggression and prosocial behavior.
5. Students write a report on what they observed and indicate what they think children would learn from the programs they watched, what they learned about television, and what they learned about doing research.

C. **Result:** Students become aware of the large amount of violence on TV which they had ignored in the past. And they get practice in observing and thinking like a psychologist.

An example: INCREASING STUDENT THINKING: Unit Reviews Every Three Weeks

I. Previous Teaching

A. **GOAL:** To have students verbally describe five concepts they learned from the unit.

B. METHOD: Students reviewed the unit, picked five concepts, restudied them, wrote three phrases on a note card for each concept, and then in class verbally explained the concepts to two other students for at least a minute - define, state the importance, and give an example. (Example - reality therapy)

II. Current Teaching

A. **GOAL**: To have students verbally describe five concepts picked out by another classmate (to show students they have learned more than they thought and to change the exercise into one involving more thought).

B. METHOD: Students do as before but once in their group of three they are to exchange note cards and then verbally describe the concepts selected by another.

C. **Result:** At first anxiety was high but after the exercise the class recommended it be tried again at the end of the next course.

How might thinking skills be taught?

Prior to making any assignments, I attempt to become clear on what thinking skills I want my students to accomplish. Sometimes I must teach pre-college skills before dealing with critical thinking. These foundation learning and thinking skills are important to all of the thinking skills I am adding to my courses: following directions, comparing and contrasting, distinguishing relevant and irrelevant material, and double-checking work.

As I add in additional thinking skills to my courses, I find that I start with Method 1 which usually does not work. Very quickly I move through Methods 2, 3, and 4. Method 5 is what I have found that I need for almost all assignments that involve new thinking skills.

Method 1 State the assignment which involves thinking skills (assign).

I make an assignment and give students no further instructions.

EXAMPLE:
"Critically evaluate this short article."

Results:

a. If students can do the assignment without further help, I do not change the assignment. This event rarely occurs.
b. If students can't do the assignment, I move to Method 2.

Method 2 Assign and provide criteria.

I add some of the criteria I will use to grade the assignment.

EXAMPLE:
"Critically evaluate this short article. I will be checking to see if you have identified the scientific evidence and the nonscientific evidence. For the scientific evidence label the three parts - citation, description of the study and the research results."

Results:

a. Students who have previously learned to critically evaluate show improvement when they know the criteria.
b. Students who have not learned to critically evaluate are unable to identify the scientific evidence and the three parts.

Method 3 Assign, provide criteria, and provide an example.

To guide student thinking and learning I provide an example of a good answer which I label "Example Answer."

EXAMPLE:
The first scientific evidence in the source I identify and the three parts are labeled.

Result:

Examples usually help but only for simple types of thinking. More complicated types with just the answer don't seem to help much. Identifying only one example of scientific evidence does not seem to help very many students.

Method 4 Assign, provide criteria, provide an example, and add in hints.

I add hints that are based on difficulties of previous students. If students forget to do an aspect of critical thinking, then the hint reminds them to do that step. Hints are written down since verbal hints are missed by too many students.

EXAMPLE:
"Previous students often overlooked the criteria of listing all the sentences that are a part of scientific evidence."

Result:

Hints provide some increased learning but are usually not very helpful until students have learned a skill and need reminding of the criteria.

Method 5 Assign, provide criteria, provide an example, add in hints, and provide practice.

I provide both practice on the whole skill (identify scientific evidence) and on parts of the skill (identify citations, research results, and the description of the study).

If the first practice is on only part of the skill, later practice will need to be on the entire skill.

EXAMPLE:
To teach students to identify scientific evidence I do the following:

Ask students to identify the three parts of scientific evidence: citation, description of the study, and the research results. This practice involves explaining to students the importance of being able to identify scientific evidence and explaining what each of the three parts involves.

Ask students to identify scientific evidence in several different sources at first in groups and then alone.

Model how to identify scientific evidence.

Provide opportunity for questions and answers.

Provide immediate feedback to students.

Build into several assignments the need to identify scientific evidence.

Result:

Most students learn to identify scientific evidence. Some pick up the skill quickly whereas others need several sessions of practice and feedback.

Method 6 **Add to method 5 mastery learning**.

If students are not successful the first time on an assignment, they are asked to redo the assignment until they can show they have learned.

EXAMPLE:
"Your answer does not show you have learned to critically evaluate. Redo the section on identifying scientific evidence. Restudy your text on identifying scientific evidence."

Result:

Almost all of my students are able to critically evaluate by the end of the course. About 5% are not successful due to their having missed several key classes and for reasons I have not yet figured out.

Method 7 **Assign without criteria, hints or examples**.

Can students identify scientific evidence without being told when asked to critically evaluate? Here I am looking for application (transfer of learning).

EXAMPLE:
"Write down your thoughts about this article." Note that I have not indicated that critical thinking is what I am looking for. Currently I do not grade on application since I think I don't effectively teach application.

Result:

Students don't apply as often as I would like. I need to give more practice in a

variety of situations.

Method 8 Observe whether students identify scientific evidence in situations outside of my classroom.

I am looking for transfer in other situations. During discussions do students cite relevant scientific evidence? Do students cite scientific evidence when writing papers where there is no explicit requirement of scientific evidence? Do students ask the instructor to provide scientific evidence to back up conclusions?

EXAMPLE:
"In Speech class I had to give a speech on the effects of TV. I was able to find scientific evidence which made my position stronger."

Result:

Transfer to other courses does occur. How often does this occur? I do not know. I do not have an unbiased method of checking. I do know that in my upper level classes that the appropriate use of scientific evidence is lower than I desire.

Does transfer take place in the everyday lives of students? Good question. Students do come and tell me about family situations where they asked for the source of the evidence and raised questions about the quality of that evidence. However, these observations are not scientific evidence!

How is critical thinking integrated into General Psychology at Howard Community College?

One of the major goals of Howard Community College's General Psychology course is to teach students how to critically think about secondary psychological sources. Critical thinking involves learning basic terms from the research chapter, developing the skill of critical evaluation, and adopting the attitude that critical evaluation of psychological information is useful. Listed below are activities designed to help students learn critically think.

1. Counting Squares.

Students are asked to count squares at the start of the course. Very few students have learned how to count squares. Counting squares involves taking a second careful look. To critically think students need to take a second careful look.

During the first class the Course Goals are handed out and students are asked to read them for the second class. During the second class I highlight critical evaluation (critical thinking) as the most important and valuable skill in the course.

Two Course Goals in General Psychology

a. When given an article on a psychological topic to read, you will be able to summarize the article by describing the central idea and key points, analyze important definitions, and identify psychological evidence.

b. You will develop the skills involved in learning how to think like a psychologist to be able to analyze and evaluate psychological evidence found in secondary sources.

2. Identifying Examples of Critical Evaluation From Everyday Life.

During the first five weeks, I comment favorably several times on the ability to think critically, ask students to evaluate informally psychological evidence, and bring to class newspaper articles on psychological topics (examples of secondary sources).

3. Experiencing the Difficulty of Careful Observations.

During the third week the film *The Eye of the Beholder* is used to dramatically point out the need and difficulty of careful observation and the need to distinguish facts from assumptions. To provide further experience on the need for careful observation my tie disappears during the film and the class is later asked to identify a tie.

4. Introducing Research Methods Terms.

During the first five weeks some of the terms related to critical thinking are introduced. To be able to critically evaluate secondary sources in psychology, students need to learn the vocabulary dealing with psychological research methods. Students are also learning to work in pairs and in small leaderless discussion groups.

5. Introducing Critical Thinking.

At the end of the sixth week students read the film guide for the film *Critical Thinking* before class, view the film in class, and then discuss the difference between primary and secondary sources and how to recognize a fact. Students are asked to count more complex squares.

6. Teaching Research Concepts.

During the seventh week a programmed booklet which I wrote entitled *Getting the Facts* is read out of class. Students study and fill out the first half of the booklet for the Tuesday class. They read about basic research methods terms, are given examples, and fill out a worksheet which is turned in at the start of class.

In class students work in pairs to think beyond the homework by filling in an activity sheet which focuses on organizing and applying the information. These sheets are then reviewed with the class and any questions are answered. The same procedure is used for a second class over the last half of the booklet. Also, students write an outline before writing their essay (see 8 below).

7. Applying Research Concepts to A Film About Research.

During the seventh week the students see the film *The Social Animal* which deals with research in social psychology. Students discuss the experiments shown in the film focusing on the research concepts. I explain briefly how experimental research concepts relate to the experiments shown in the film.

8. Demonstrating an Understanding of Psychological Research.

At the start of the eighth week students demonstrate their understanding of research methods by writing an essay as homework explaining what a psychological fact is. Students are given 12 of the key terms and then asked to write an organized essay. Writing an organized summary and showing an understanding of research terms are combined in the one assignment.

9. Using Mastery Learning.

The essay on describing psychological evidence is due on Tuesday and is graded and returned by Thursday. Students who did poorly are given suggestions for improving their answer and are asked to restudy and redo the assignment to show that they have learned. The redo assignment is a similar kind of essay but some of the terms are changed so that increased studying is necessary.

10. Identifying Psychological Facts.

During class in the eighth week students are placed into pairs to identify psychological facts from a homework reading and then given feedback.

11. Doing a Bit of Research.

During the ninth week students practice observing TV. For homework students observe three TV programs to identify the level of aggression. After making their observations, they write an informal report and draw conclusions. This project gives students experience in collecting their own psychological data.

12. Studying Critical Evaluation.

During the tenth week students study a booklet on critical thinking which is filled out at home in a similar fashion as the booklet *Getting the Facts*. The booklet describes each step in critical thinking, gives examples, gives practice problems, provides answers for self checking, and then has worksheets to be turned in to the instructor to show learning.

During class students work in pairs using activity sheets which give practice in the six steps of critical evaluation. To help students understand the term "operational definitions" one-half of the class is sent into the hall to count the number of doors on the second floor of the classroom building and one-half are sent to count the number of signs. The counters are in groups of three (their answers range from 42 to 178 for doors).

13. Demonstrating an Understanding of Critical Evaluation

During the twelfth week students work alone outside of class to critically evaluate a secondary psychological article. The evaluation is turned in on Tuesday and returned on Thursday. If a student has not learned, they are given a second chance on the assignment.

14. Applying the Skill of Critical Evaluation.

During the fourteenth week students in class with open book and open notes are tested on their skill at critically evaluating a short psychological article they have not previously seen. If students have difficulty, they are given more time to show they can critically evaluate. About 10% still have difficulties.

15. Applying Critical Evaluative Thinking.

On the final take home open book Course Review, students describe an example of where they have used their critical thinking skills. Most describe how they have used the skills to do better in other courses. Some describe events in their personal lives. Some describe how they have applied their skills to a communication in the mass media.

16. Wishing for Long Term Application.

I hope students apply their critical thinking beyond my psychology classroom. Over the years when I see former students they mention how useful critical evaluation has been. However, I have not conducted any systematic research yet.

In summary, students show me that they can critically think when they can critically evaluate

an article (a secondary source) they have not previously seen. This evaluation is based on a careful reading and thinking of the source in front of them. It does not involve any library research. I hope they can apply critical evaluation to newspaper articles, magazine articles, books and textbooks that they will be reading in the future.

Brief Comments on How I Integrate Critical Evaluation Using Additional Sources in Upper Level Psychology Courses.

In advanced psychology courses I teach a seventh step of critical evaluation which involves using both primary and secondary sources to evaluate a source or a topic.

In Advanced General Psychology students use four secondary sources on the topic of intelligence in identical twins to compare and contrast to be able to write a documented essay with conclusions.

In the same course students are taught how to evaluate a textbook section on the topic of punishment by using three other secondary sources and a primary source. Students learn the value of making charts to keep track of the information.

In Social Psychology students are given a primary research source and then asked to compare and contrast how it is reported in another primary source and several different types of secondary sources. At the end of the course some students write a documented essay after comparing and contrasting and evaluating six textbooks on Asch's research on conformity. They also read the primary source.

What are some questions to raise when critically thinking about textbooks and books in the Social and Behavioral Sciences?

Listed below are the questions that can be used to critically evaluate books and textbooks. Most of the questions can also be used with articles. Depending on your course and your goals, a few or many questions below can be taught to students.

Goal: When given a written communication (a secondary source), the student will critically evaluate the communication **without** using other sources.

Examples: newspaper articles, magazine articles, books, textbooks.

When critically evaluating a book or textbook

I. IDENTIFY THE SOURCE OF THE COMMUNICATION.
- A. What is a brief way to identify the source?
  1. Book - author, title, year published
  2. Article - author, journal name, year published
- B. What is the full bibliographic information?
  1. Book - author, year, title, place published, publisher.
  2. Article - author, year, title, journal, volume, pages.
- C. Is the author an expert (an authority) on the topic?
  How do you know? What is your evidence?
- D. Is the author trustworthy?
  How do you know? What is your evidence?
- E. Is the author describing his or her own research and/or the research of others?
- F. How recent is the source? Does it provide recent sources?

II. UNDERSTAND THE COMMUNICATION.
- A. What is the central idea?
- B. What are the central idea and key points? What is the author saying? arguing? concluding? trying to show?
- C. What assumptions does the author make?
- D. How does the author organize information?
- E. Does the author present ideas in an objective manner?
- F. Are value judgments clearly indicated?
- G. What evidence would conflict with the author's view?
- H. Is important information left out?

III. INTERPRET, ANALYZE, AND EVALUATE THE COMMUNICATION.

A. How are the key terms handled?
   1. Do key terms lack definitions?
   2. Are key terms imprecise?
   3. Are propaganda techniques used?
   4. Is emotional language or bias evident?

B. Is evidence presented?

C. What type of evidence is presented?
   1. Distinguish various types of evidence
      a. Scientific research evidence conducted by others
      b. The author cites his or her own research
      c. Expert testimony without the evidence
      d. Nonscientific evidence
         1) Personal experiences vs. inferences
         2) Self-evident truths, speculation, value judgments, opinions, common sense sayings, unsupported assertions,
   2. Distinguish hypothesis, evidence, and conclusions.
   3. Determine the reliability of the evidence
      a. How many subjects were observed?
      b. Are the subjects or data representative?
      c. Were careful controls used?
      d. Were repeated observations made?
         l) Within an individual research project?
         2) Is more than one research project reported?
         3) Is there any conflicting information? How is it handled?

D. Is sound reasoning used?
   1. Are the examples relevant?
   2. Is the evidence relevant to the key points and central idea?
   3. Does the evidence support the key points and central idea?
   4. Is there any fallacious reasoning? Is the presentation logical?
   5. Are reasonable inferences drawn from the evidence?
   6. Are statistical conclusions accurate?

IV. DECIDE WHAT TO BELIEVE BASED ON THE ABOVE

A. I accept the author's conclusions because of reliable evidence and sound reasoning.

B. I reject part of the author's conclusions for the following reasons . . .

C. I reject the author's conclusions because of unreliable evidence and unsound reasoning.

Goal: When given a communication (a secondary source), the student can critically evaluate by using additional sources.

I., II., III., and IV. from above are used plus

V. USE SEVERAL SOURCES

A. Assess a secondary source by critically evaluating how the source used the primary sources that are cited.

B. Assess a secondary source by critically evaluating other secondary sources (compare and contrast, draw conclusions).

C. Assess a secondary source by using both primary and secondary sources.

D. Comparing and contrasting the coverage of topics

l. Using chapter headings
Indicate which chapters are covered in both books and which chapters are covered in only one book

2. Using the index
Indicate which topics are most often discussed in each book by counting the page numbers for the topics most often listed, indicate topics covered in only one book

3. Using common chapters

a. Look at the topics

1) List the topics which both books discuss
2) List the topics covered by only one text
3) What percent of a chapter is devoted to each topic? (can also do by number of pages)
4) Compare the percents for common topics

b. Look at the controversies (disagreements)

l) List the controversies both books discuss
2) List the controversies covered by only one book
3) List any controversies discussed in one book but treated as noncontroversial in the other book

c. Look at key terms

l) List the key terms in each chapter and their definitions
2) Point out inconsistencies in the definitions
3) Note key terms that are not defined
4) Note terms that are imprecise
5) Point out any subjectivity in presentation

d. Look at evidence by topic or controversy

1) If there is scientific evidence, do the next step. If there is no scientific evidence, evaluate the nonscientific evidence.
2) List the scientific evidence

Provide the citation, brief description, results

3) Make critical evaluative comments about the scientific evidence.
   a) How up-to-date is the coverage in each book?
   b) How comprehensive is the coverage?
   c) What criticisms should be pointed out about the evidence? sample? procedure? results?
4) Compare and contrast the evidence for selected topics
   a) Which scientific facts are in both books?
   b) Do the books agree on what is presented? If they differ, how?
   c) Which scientific facts are in only one book?
5) Are there ethical concerns about the research?

e. Evaluate the reasoning of both sources.

f. Write evaluative and/or critical evaluative comments about a topic from each source and then both sources.
   l) Which is the more interesting to read?
   2) Which is the more credible? (better evidence)
   3) Which is the easiest to understand?
   4) Which has the most study helps for students?
   5) Which is the most up to date?
   6) Which source taught you the most?
   7) Which source would you recommend to other students?

Goal: When given a primary source, the student can critically evaluate the research. This evaluation depends on the field of study.

VI. CRITICALLY EVALUATING A PRIMARY SOURCE

A. Who wrote the article?

B. What do the abstract and summary tell you?

C. What hypothesis was tested?

D. Who are the subjects? How many are there? How were they chosen? What population do they represent? Was random sampling used to get the experimental

and control groups?

E. Briefly summarize the procedure. What questions do you have about the procedure? Were the independent and dependent variables clearly specified and measured? Were proper controls used? Was experimenter bias avoided? Are there any ethical questions which should be raised about the study?

F. What are the results? How big a difference was there?

G. What issues are discussed in the discussion section?

H. What are the limitations of the research?

I. Does this study relate to any theoretical view?

J. How does this study fit with related research?

K. What is your overall assessment of the study?

L. Can you find more recent research which critiques this study?

M. Compare and contrast other primary sources on the same topic.

Ideas for developing various kinds of thinking projects

A. Any project does not have to include all of the above ideas. Select the ones you think would be more useful for your goal. You can add your own ideas for evaluating textbooks. For example, you might go through the citations for a chapter to determine the percent of studies done before 1930, then during the 30s, 40s, 50s, 60s, 70s, 80s, and the most recent citation.

B. The critical evaluation process can be revised when dealing with sources that don't have scientific facts. Then focus on the best types of evidence presented.
   1. Distinguish primary and secondary sources
   2. Evaluate the quality of an eyewitness report
   3. Detect propaganda techniques
   4. Evaluate key definitions
   5. Evaluate the writer's reasoning
   6. Evaluate any evidence cited by the writer
   7. Determine if the writer is an expert (an authority)

C. Using primary and secondary sources.
   1. Sometimes you may wish to study a topic and are able to locate one or more primary sources. How do the secondary sources use those primary sources? For example, one student was interested in help in a crisis. She found the original *New York Times* report on the murder of Kitty Genovese (March 27, 1964) and then looked at several social psychology textbooks to see how they reported the murder from the original source.

   2. Pick a topic you are interested in. For example: From Social Psychology
      TV violence's effect on children
      cognitive dissonance and the $1 and $20 study
      effects of cooperation

   3. Critically evaluate how the secondary sources use the primary source.
      a. Are there common errors?
      b. Which source gives the most complete account?
      c. Is the primary source misused? Misinterpreted?

   4. Evaluate the primary source.
      a. What problems do you see with the primary source?
      b. What are the criticisms of the primary source in the secondary sources? Do they agree?

D. Have groups of five students design a research study to test a well-known statement such as "Too many cooks spoil the broth." After designing an experiment to test the hypothesis, ask students to identify the independent and dependent variables, controlled variables, the experimental and control groups, the population and sample, the method to determine which is the better broth. Then select one proposed study from a small group and ask the rest of the class improve it.

E. Ask students to bring to class articles which demonstrate that the article writer can critically think about research and the ideas of others.

F. Give a lecture or bring in a videotape of a presentation and ask students to evaluate the weaknesses and strength of the evidence and reasoning in the presentation.

G. Present ads to students and ask them to evaluate them, identify the motives being appealed to, and identify creative aspects of the ads.

H. Ask students to describe examples of how they have used critical thinking in other courses and/or in their everyday lives.

I. Students are asked to outline the section in their textbook on helping in a crisis. They are to cite any research and describe the results of the research. In pairs, they are assigned during the next class period to go to the library to update and expand that section from their textbook. Students write on note cards the research evidence (with citations, descriptions of the study, and the results) to hand in.

J. Students are given a primary research report, a popular summary by the researcher, and three secondary reports on the same research. Students are asked to fill out a chart on the subjects, the procedure, and the results to become aware of how primary and different types of secondary sources differ.

K. Students are given six textbook sections on the topic of Asch's conformity research on the unanimous majority. Students fill out a chart and then write an integrated documented summary.

L. After having read four case studies, articles, and chapters from abnormal psychology textbooks, students are asked to pick a topic discussed in at least three of the four case studies to write a documented paper pulling together information from course materials and library sources using correct American Psychological Association writing format.

M. Students are taught to efficiently search the library for evidence on TV aggression.

N. Students learn to take a controversial topic and write a research paper. Evidence on both sides must be fairly presented and evaluated.

Some of the issues you might want to consider when thinking about

teaching critical thinking.

Do you want to teach critical thinking?

Pros - 1. The rapid growth of information will change many of the facts I now teach.
2. Students retain skills better than facts.
3. Students need to be able to analyze, evaluate and create as well as recall what various authors have to say.
4. Teaching thinking is interesting and a challenge.
5. The goal of improved thinking is a major goal for college because of its importance beyond college.
6. Thinking skills are best taught in content courses across the entire curriculum.
7. Other pros you can think of.

Cons - 1. The rapid growth of information has produced more important information to cover in a course. If I add in thinking skills, I will cover less.
2. Students were not taught thinking skills in high school. Consequently, time will be used to teach high school thinking skills.
3. Students learn thinking skills by taking a variety of college courses.
4. I am not sure how you go about teaching thinking skills. How do you decide which ones to teach?
5. Teaching thinking skills seems to be big now. How do I know that this isn't just another educational fad?
6. Won't the teaching of thinking skills require feedback to students? I am stretched thin now.
7. Other cons you can think of.

What parts of critical thinking do you wish to teach?

A. What critical thinking skills and attitudes do I want students to leave my course with?
1. What critical thinking skills are a part of psychology that students should learn? What critical thinking skills do professionals in psychology use?
2. What critical thinking skills would be useful to students when encountering the content of psychology in everyday life?

B. What critical thinking skills do students have at the start of this course?

C. What thinking skills will I need to teach before teaching the critical thinking skills?

D. What areas of my course are students not learning as I would like? Are critical thinking skills involved?

E. Which critical thinking skills do I now test but not teach as well as I could?

F. Which critical thinking skills can I realistically handle in my present courses?

G. Which critical thinking skills do I want to enthusiastically teach?

H. What factual knowledge and concepts are needed as a foundation for the critical thinking skills I want to teach?

I. What critical thinking attitudes do I want and/or need to cultivate?

J. What should be the sequence for teaching thinking skills?
(The first thing I have to deal with is the attitude that college is to memorize answers, not look for answers or think about things. I cannot teach critical thinking assignments without first preparing a foundation.)

In what ways might you teach thinking skills?

A. Specify in the course goals the thinking skills students should be able to use.

B. Work into lectures the importance of critical thinking and examples of the usefulness of critical thinking. Encourage the dispositions associated with critical thinking.

C. Provide assignments which require thinking.

D. Provide examples of critical thinking written out.

E. Teach critical thinking explicitly. Research suggests that students don't improve their thinking skills much unless they are explicitly taught. Beyer (1987) has a set of steps to explicitly teach thinking skills which are quoted below.
Step l: Introduce the skill.
Step 2: Explain the skill.
Step 3: Demonstrate the skill.
Step 4: Review what was done.
Step 5: Apply the skill.
Step 6: Reflect on the skill. (p. 102)

F. Provide practice activities and feedback.

G. Encourage students to use critical thinking outside the classroom, when appropriate.
(I have found they start practicing on me. I encourage their evaluating the usefulness of their education by periodically getting feedback from class members and sometimes the full class.)

H. Ask broad questions in class to allow for thinking. Review Bloom's taxonomy to get in more higher level questions.

I. Ask students to state a view and present their evidence.
(Wait at least five seconds after asking a question of a student to allow them to think and respond.) Also wait five seconds after they have spoken to let the answer sink in around the class.

J. Teach students to use what they are learning in the classroom to situations beyond the classroom (application, transfer).
1. Provide examples of how to apply critical thinking outside of the classroom.
2. Ask students several times during the course to apply what they have been

learning about thinking.

K. Ask broad questions in class to allow for more thinking. Review Bloom's taxonomy as explained in Sanders (1966) to ask more higher level questions.

L. Increase the amount of time students actively think about what they are learning. Short written assignments, giving time for students to individually think about a question or problem, and using small groups (pairs learning together, groups of three, four, or five students). One way communication in the classroom will need to be decreased.

M. Use graphic organizers when possible. Pictures, figures, and diagrams can help clarify what is being learned. Organizers can be helpful to students who learn well from visuals.

How can you tell when your students have learned?

A. Develop your own assignments and tests.
(Asking students to critically evaluate something that has already been evaluated is testing memory, not critical thinking.)
B. Borrow ideas from other teachers.
C. Use standardized tests. (I have not yet found a test on critical thinking just for psychology.)
D. Have students report examples of how they are using critical thinking.
E. Encourage students to develop assignments which use critical thinking skills.

If I were talking to a faculty friend who wanted to start including critical thinking in her courses, I would say. . .

A. Jump right in. Few of us were explicitly taught thinking skills. Consequently, we have few models to follow.
B. Start small. Try a new assignment with a few students.
C. Be persistent. Success is usually not instant. You may need to change student attitudes and/or start at a more basic level. You may need to sharpen some reading, writing, and/or study skills first.
D. Build on the work and ideas of others.
E. Watch for examples from everyday life and the mass media. They pop up all of the time.
F. Critical thinking assignments can be used with textbooks.
    1. What is the most important topic in this book? How did you decide?
    2. What is the author arguing? What is his evidence?
    3. What could the author have done to make this book easier to study from?
G. Build in a process for getting feedback from students on the teaching of critical thinking. Keep notes on their ideas to include more thinking in your homework and class activities.
H. Develop a network with others teaching critical thinking to share experiences and ideas.

What are some visuals to use when teaching critical thinking?

Critical Thinking. (1971). 11 minutes, color, film. Coronet Instructional Films. 65 E. South Water Street, Chicago, IL 60601

Eye of the Beholder. (1953). black and white, film. Stuart Reynolds Productions.

Think Twice: The Persuasion Game. (1978). 19 minutes, color. film. Churchill Films. 662 North Robertson Blvd., Los Angeles, CA 90069.

Think Twice: They're Confusing You. (1978). 19 minutes, color, film. Churchill Films. 662 North Robertson Blvd., Los Angeles, CA 90069

Twelve Angry Men. (1952). This feature film about a jury is now available on videotape.
Secrets of the Psychics. This video deals with The Amazing Randi analyzing the secrets of psychics.

Is it important to teach our students to think better?

"Teachers want their students to be able to think. We identify 'teaching students to think' as one of the most important goals of our teaching, but we often lament that we don't have enough time or enough background to do a better job of it. . . . One of the most consistent recommendations coming from reports calling for educational reform is for the enhancement of students' thinking skills. . . .

"Why are thinking skills so important and why is there so much concern today about the way they are being taught? The classic argument for teaching people to think is that clear thinking is necessary for effective citizenship in a democracy. Thinking has also been seen as a liberating force, freeing the individual from the ignorance that characterizes chauvinism and ethnocentrism, from narrow self-interest and 'small-mindedness.'. . . It has also been argued that good thinkers are often better adjusted and happier individuals, who find life more interesting and rewarding. .. . Perhaps the best, most down-to-earth argument is that people must be able to think if they are going to function. . . . To function in any society, one must learn to think; in the information age, thinking may be the key survival skill."

Thinking varies across disciplines, but two important types of thinking for college teachers are critical thinking and creative thinking. Critical thinking involves judging, assessing, or evaluating the value of information in terms of evidence and reasoning using specified criteria. Creative thinking involves producing new and different products and ideas as well as solving problems not previously encountered (James Davis, 1993, *Better teaching, more learning: Strategies for success in postsecondary settings*. Phoenix, AZ: American Council on Education and Oryx Press, pp. 173-178).

"What kinds of classroom settings work best for the teaching of thinking?....It has been suggested that the shifting of educational priorities to emphasize thinking 'requires a redefinition of the function of the classroom,' a transforming of the setting for teaching into an 'association of thinking' or a 'community of inquiry.'. . . . For thinking to take place, students need to get engaged in it, and that often requires some new roles for them and their teachers....

"What takes place in classrooms when teachers use inquiry strategies is often quite different from what goes on in 'conventional classrooms.' Barry Beyer sums it up well: 'The most supportive environment for the teaching and learning of thinking exists where student and teacher thinking can occur continuously, where learning activities regularly require thinking, and where students and teachers frequently reflect on and discuss their thinking. In such classrooms the active search for knowledge constitutes the focus of learning.'" (Davis, 1993, pp. 183-187).

The Importance of Critical Thinking During College

The Goal of a College Education - Learning to Learn

The fundamental goal of college is to help students learn how to learn. Too much information has been produced in psychology to expect students to even cover the various topics of interest to psychologists. In *Teaching Introductory Psychology* (1997) which is edited by Sternberg and written by ten introductory psychology textbook authors, several authors specifically mention that recall of isolated definitions and facts will be quickly forgotten and that emphasis in General Psychology should be on ideas, issues, applications, and critical thinking skills.

Computers, technology, and the Internet are increasingly putting information at our fingertips. Finding, understanding, and applying what is learned is becoming more important. Learning for many adults has become a life long challenge. "It is strange that we expect students to learn yet seldom teach them about learning. We expect students to solve problems yet seldom teach them about problem solving. And, similarly, we sometimes require students to remember a considerable body of material yet seldom teach them the art of memory." (Norman, D., 1980, *Teaching Learning Strategies,* San Diego, CA: University of California.)

One Major Goal of a College Education - Critical Thinking

Critical thinking is an important component of learning to learn and a major goal of a college education. "A college catalog that failed to praise critical thinking or to pledge that graduates will think more critically when they leave than when they arrive would be an anomaly." (Brown, M. 1986, Preconditions for encouraging critical thinking on the campus. *International Journal of Social Education*, *3*, 18-27.)

There is considerable evidence and discussion on the necessity to develop critical thinking in our college students. "We insist that the most essential goal of the undergraduate experience is to help all students think critically and become proficient in the written and the spoken word." (Boyer, E. 1989, Keynote address delivered at the 2nd National Conference on the Training and Employment of Teaching Assistants entitled *Preparing the Professoriate of Tomorrow for Teaching: Enhancing the TA Experience*. University of Washington, Seattle, November 16, 1989)

"A major objective of social studies education is the development of critical thinking. Critical thinking is essential in refining and interpreting the vast scope of the social studies content base." (Firth, G., 1983, May. A major objective of social studies. *The Clearing House*, 408-410)

"Almost all college and university teachers advocate critical thinking as a

fundamental goal of education . . . However, evidence is sparse that many teachers are successfully implementing critical thinking in their classrooms or that large numbers of students are developing critical thinking skills. In fact, the literature suggests that most classrooms are greatly lacking in critical thinking activity (Ellner and Barnes, 1983, Perkins, 1985)."

"While America's colleges and universities have as a primary part of their mission the transmission of subject matter knowledge in a variety of areas and the development of certain academic skills (typically verbal and quantitative), there appears to be widespread agreement that students' critical thinking ability is among the most important cognitive skills for college students to develop. Nowhere are the centrality and importance of developing students' critical thinking skills more apparent than in Goal 5.5 of the National Education Goals, agreed to in 1989 by President George Bush and the nation's governors at the Charlottesville, VA Education Summit. Those goals have since been made a matter of statuary law by the Clinton administration in the form of 'Goals 2000: The Educate America Act.' Specifically, Goal 5.5 states that 'The proportion of college graduates who demonstrate an advanced ability to think critically, communicate effectively, and solve problems will increase substantially' *(National Education Goals Panel*, 1991, p. 5). (Keeley, S., Shemberg, K., Cowell, B., & Zinnbauer, 1995, Fall???)

"Critical thinking has been defined and measured in a variety of ways, but Pascarella and Terenzini (1991) have noted that it 'typically involves the individual's ability to do some or all of the following: identify central issues, make correct inferences from data, deduce conclusions from the information or data provided, interpret whether conclusions are warranted on the basis of the data given, and evaluate evidence or authority' (p. 118).

"However defined, critical thinking ability is probably also the most extensively studied of the higher-order thinking abilities." (Terenzini, T., Springer, L., Pascarella, E., & Nora, A. 1994. *The Multiple Influences of College on Students' Critical Thinking Skills*. Paper presented at the meeting of the Association for the Study of Higher Education, Tucson, AZ, November 1994)

"Goals, stated on the opening pages of a community college catalog, vary little from one community college to the next . . . Goals of the community college are to assist the student in

- Becoming a contributing member of society,
- Developing a sense of self-worth
- Developing critical thinking skills,
- Developing values consistent with those of our democratic society." (Kellough, R., 1990, *A Resource Guide for Effective Teaching in Postsecondary Education,* NY: University Press of America)

"A major paradigm shift has occurred in higher education around the country. Over the last several decades the focus of education has changed from curriculum content to curricular outcomes, with a major emphasis on helping students learn to think critically." (Rane-Szostak, D., and Robertson, J. 1996, Jan. Issues in measuring critical thinking. *Journal of Nursing Education, 35*(1), 5).

"Literature within our disciplines and in education in general continues to admonish us to teach our students how to think. As worthy a goal and strongly endorsed as critical thinking is, many of us struggle at the level of implementation--How?" (Teach your students to think. 1991, February. *The Teaching Professor*, *5*, 1).

"In talking to teachers about thinking, we have found that one truism seems always to hold, no matter who the audience is, where it is addressed, or when the address is presented: Virtually all teachers believe that they teach for thinking. When we have asked them whether they believe that their students are learning to think, however, most of them shrug their shoulders or otherwise convey an indefinite response." (Sternberg, R., and Martin, M. 1988, Summer. When teaching thinking does not work, what goes wrong? *Teachers College Record, 89*(4), 557)

"It is imperative that citizens of the 20th and 21st centuries think critically, yet recent tests have shown that only 25% of first-year college students have the skills needed for logical thought. The need for critical thinking skills has been identified as a national and international priority." (Halpern, D. 1996, *Thought and Knowledge*. Mahway, NJ: Lawrence Erlbaum, p. 32)

Focusing on Thinking Dispositions (Attitudes) (not just Critical Thinking Dispositions)

The topic of dispositions has not been discussed as much as thinking skills. Listed below are several lists I have found useful.

A. Expert Consensus on Critical Thinking Dispositions
Facione, Peter. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction (executive summary)*. In *The Delphi Report*, Millbrae, CA: California Academic Press. Quoted.

Approaches to life and living in general:

inquisitiveness with regard to a wide range of issues,
concern to become and remain generally well-informed,
alertness to opportunities to use critical thinking,
trust in the processes of reasoned inquiry,
self-confidence in one';s own ability to reason,
open-mindedness regarding divergent world views,
flexibility in considering alternatives and opinions,
understanding of the opinions of other people,
fair-mindedness in appraising reasoning,
honesty in facing one' s own biases, prejudices, stereotypes, egocentric or sociocentric tendencies
prudence in suspending, making or altering judgments,
Willingness to reconsider and revise views where honest reflection suggests that change is warranted.

Approaches to specific issues, questions or problems:

clarify in stating the question or concern,
orderliness in working with complexity,
diligence in seeking relevant information,
reasonableness in selecting and applying criteria,
care in focusing attention on the concern at hand,
persistence though difficulties are encountered,
precision to the degree permitted by subject and circumstances. (p. 25)

B. **Dispositions Inventory**. Facione, P., & Facione, N. (1992). *Test Manual: The California critical thinking dispositions inventory.* Millbrae, CA: The California Academic Press. Quoted.

1. Truth-seeking
2. Open-mindedness
3. Analyticity
4. Systematicity

5. Self-confidence
6. Inquisitiveness (pp. 3-4)

.

C. Developing or Reinforcing the Attitudes Associated With Effective Thinking. (Ruggiero, 1988, *Teaching thinking across the curriculum*, pp. 68-76, quoted) Note: These attitudes deal with more than critical thinking.

1. Interest in the sources of their attitudes, beliefs, and values
2. Curiosity about their mental processes and eagerness to develop them further
3. Confidence in their abilities and a healthy attitude about failure.
4. Willingness to make mistakes
5. Sensitivity to problems and issues
6. A positive attitude toward novelty
7. Interest in widening their experience
8. Respect for and willingness to use intuition when appropriate
9. The desire to reason well and to base judgments on evidence
10. Willingness to subject their ideas to scrutiny
11. Willingness to entertain opposing views without reacting defensively
12. Curiosity about the relationships among ideas
13. A passion for truth
14. A healthy attitude toward argumentation.

D. Attitudes Essential For "Good Thinking" Burton et al, 1960, *Education for effective thinking*. NY: Appleton-Century-Crofts. Quoted. There is a newer edition of this book.

1. Intellectual curiosity...
2. Intellectual honesty, acceptance of responsibility for process and result...
3. Objectivity...
4. Intelligent skepticism or suspension of judgment; criticalness...
5. Open-mindedness...
6. Conviction of universal cause-and-effect relationships...
7. Disposition to be systematic...
8. Flexibility...
9. Persistence.
10. Decisiveness...
11. Respect for another's view...
12. Candor and expectancy of candor...
13. Careful listening. (pp. 38-39).

E. Attitudes of a Critical Thinker. Robert Ennis wrote about critical thinking dispositions and abilities in an article found in *Teaching Thinking Skills* (edited by Baron & Sternberg, 1987). Here quoted are his dispositions.)

l. Seek a clear statement of the thesis or question.
2. Seek reasons.
3. Try to be well informed.
4. Use and mention credible sources.

5. Take into account the total situation.
6. Try to remain relevant to the main point.
7. Keep in mind the original and/or basic concern.
8. Look for alternatives.
9. Be open-minded.
    a. Consider seriously other points of view than one's own (dialogical thinking)
    b. Reason from premises with which one disagrees--without letting the disagreement interfere with one's reasoning (suppositional thinking)
    c. Withhold judgment when the evidence and reasons are insufficient
10. Take a position (and change a position) when the evidence and reasons are sufficient to do so
11. Seek as much precision as the subject permits
12. Deal in an orderly manner with the parts of a complex whole.
13. Use one's critical thinking abilities
14. Be sensitive to the feelings, level of knowledge, and degree of sophistication of others.

F. Attitudes of Effective Thinkers (Costa and Lowery, 1989, *Techniques for teaching thinking*). quoted from Chapter 7

1. Persistence: persevering when the solution to a problem is not immediately apparent
2. Decreasing impulsivity
3. Listening to others -- with understanding and empathy
4. Flexibility in thinking
5. Metacognition. Awareness of own thinking.
6. Checking for accuracy and precision.
7. Questioning and problem posing
8. Drawing on past experiences and knowledge
9. Transference beyond the learning situation
10. Precision of language and thought
11. Wonderment, inquisitiveness, curiosity, and the enjoyment of problem solving
12. Cooperative thinking.

G. The End Product of Education is the Inquiring Mind. (Paul, 1986, quoted in *Dimensions of thinking,* 1988, by Marzano et al.)

1. A passionate drive for clarity, accuracy, and fair-mindedness
2. A fervor for getting to the bottom of things
3. Listening sympathetically to opposite points of view
4. A compelling drive to seek out evidence
5. An intense aversion to contradiction, sloppy thinking, and inconsistent application of standards
6. A devotion to truth as against self-interest. (p. 2)

H. Attitudes from *Opening The American Mind* by Barell (Ed.), 1988

1. Belief in the power of thinking
2. Openness to inquiry
3. Tolerance for ambiguity
4. Willingness to risk
5. Persistence in problem solving
6. Willingness to consider alternative points of view
7. Active listening
8. Empathy
9. Cooperation (quoted)

I. Selected Thinking Dispositions from Barry Beyer's *Practical Strategies for the Teaching of Thinking* (1987), Boston: Allyn and Bacon. quoted from p. 212.

1. Select a clear statement of a problem, a thesis, a question.
2. Deliberately examine a variety of viewpoints.
3. Seek to be well informed.
4. Use credible sources.
5. Seek a number of alternatives.
6. Seek/give reasons.
7. Seek/provide evidence.
8. Be open-minded.
9. Be willing to change a position/judgment when evidence and reasoning are sufficient to do so.
10. Judge in terms of situations, issues, purposes, and consequences (not in terms of fixed, dogmatic precepts or emotional, wishful thinking).
11. Persist in carrying out a thinking task.
12. Be slow to believe--be skeptical.
13. Be objective.
14. Suspend judgment when appropriate/sufficient evidence and reasoning are lacking.

J. Paul, R. W. (1992). *Critical thinking: What every person needs to survive in a rapidly changing world.* Rohnert Park, CA: The Center for Critical Thinking and Moral Critique. Paul has a very broad definition of critical thinking.

Affective Strategies

S-1 thinking independently
S-2 developing insight into egocentricity or sociocentricity
S-3 exercising fair mindedness
S-4 exploring thoughts underlying feelings and feelings underlying thoughts

S-5 developing intellectual humility and suspending judgment
S-6 developing intellectual courage
S-7 developing intellectual good faith or integrity
S-8 developing intellectual perseverance
S-9 developing confidence in reason

K. Angelo, T., & Cross, K. 1993, *Classroom assessment techniques*. San Francisco, CA: Jossey-Bass. LB2822.75.A54. Teaching goals inventory in community colleges, pp. 399-402, quoted)

Liberal Arts and Academic Values

26. Develop an appreciation of the liberal arts and sciences
27. Develop an openness to new ideas
28. Develop an informed concern about contemporary social issues
29. Develop a commitment to exercise the rights and responsibilities of citizenship
30. Develop a lifelong love of learning
31. Develop aesthetic appreciations
32. Develop an informed historical perspective
33. Develop an informed understanding of the role of science and technology
34. Develop an informed appreciation of other cultures
35. Develop capacity to make informed ethical choices

Work and Career Preparation

36. Develop ability to work productively with others
37. Develop management skills
38. Develop leadership skills
39. Develop a commitment to accurate work
40. Improve ability to follow directions, instructions, and plans
41. Improve ability to organize and use time effectively
42. Develop a commitment to personal achievement
43. Develop ability to perform skillfully

Personal Development

44. Cultivate a sense of responsibility for one's own behavior
45. Improve self-esteem/self-confidence
46. Develop a commitment to one's own values
47. Develop respect for others
48. Cultivate emotional health and well-being
49. Cultivate physical health and well-being
50. Cultivate an active commitment to honesty
51. Develop capacity to think for oneself
52. Develop capacity to make wise decisions

L. **Core dispositional components of critical thinking.**
Lendman, Christy. (1995). *Core components of curricula which promote critical thinking in postsecondary education: Summary of results*. Handout from the author. quoted.
Dispositions
- Inquisitiveness
- Trusts in reason
- Independent of mind
  - open mindedness
  - fair mindedness
  - flexibility
  - willing to reconsider
- Persistence/Perseverance
- Precision
- Honesty

M. **Robert Marzano's** *A different kind of classroom: Teaching with dimensions of learning* (1992), Alexandria, VA: Association for Supervision and Curriculum Development.

Dimension 5: Productive habits of mind (p. 14)
- 5 habits of mind (quoted)
  - being sensitive to feedback
  - seeking accuracy and precision
  - persisting even when answers and solutions are not apparent
  - viewing situations in unconventional ways
  - avoiding impulsivity

N. Attitudes Necessary for Critical Thinking by **D'Angelo** (1971) , *The Teaching of Critical Thinking*. Amsterdam: B. R. Gruner N. V. Quoted.
(1) Intellectual curiosity
(2) Objectivity
(3) Open-mindedness
(4) Flexibility
(5) Intellectual skepticism
(6) Intellectual honesty
(7) Being systematic
(8) Persistence
(9) Decisiveness
(10) Respect for other viewpoints. (pp. 7-8)

Selected Articles on Teaching and Assessing Critical Thinking

(An annotated list.)

Browne, M. Neil. (1986). Preconditions for encouraging critical thinking on the campus.

International Journal of Social Education, *3l*, 18-27.

"A college catalog that failed to praise critical thinking or to pledge that graduates will think more critically when they leave than when they entered would be an anomaly." (p. 18)

Ask question often.

Ask higher level questions.

Teach students a variety of ways of looking at things.

Learning goes beyond college.

Fewer errors in the future can be due to more errors now if we learn from them.

There is little evidence that teachers try to teach critical thinking.

Use essay format for testing.

Browne, M., Haas, P., & Keeley, S. (1978, January). Measuring critical thinking skills in college. *The Educational Forum*, 43, 219-226.

Critical thinking skills:

1. "Identifying a controversy and conclusions,
2. Identifying major arguments pertaining to the controversy,
3. Identifying and analyzing implicit premises according to their level of abstraction,
4. Recognizing language difficulties (e.g., ambiguity, vagueness),
5. Evaluating the validity of individual arguments and truth of individual premises,
6. Formulating a conclusion from premises based on number 5,
7. Recognizing alternative inferences that could be drawn from premises supporting the conclusion, and
8. Suggesting a rudimentary technique for verifying these alternative inferences."

Used Watson-Glaser Test at first, but did not correlate with student performance in the courses. In the test students are to recognize something rather than apply something. Students are given 10 pages of information on a topic that includes both pro and con information. Students are given two days to think about the material. Students then have up to four hours to write their exam using their critical thinking. Two people read each essay. 90% of scores were within one grade level of each other. Tests are scored using an explicit scoring rubic.

Brown, M., & Keeley, S. (1988, Spring). Do college students know how to think critically when they graduate? *Research Serving Teaching, 1*(9), Center for Teaching and Learning of Southeast Missouri State University.

"While the study indicated that most students are able to identify some flaws in statistical reasoning, they generally failed to recognize ambiguities, questionable assumptions, and value preferences, important components of critical evaluation." (p. 1)

Ennis, R. (1993, Summer). Critical thinking assessment. *Theory Into Practice, 32(*3), 179-186.

"Although critical thinking has often been urged as a goal of education throughout most of this century. . . , not a great deal has been done about it. Since the early 1980s, however, attention to critical thinking instruction has increased significantly--with some

spillover to critical thinking assessment, an area that has been neglected even more than critical thinking instruction." p. 179

An Annotated List of Critical Thinking Tests - p. 183

"Regrettably, I can find no subject-specific critical thinking tests (that is, critical thinking tests whose primary purpose is to assess critical thinking in a subject matter area. . ." p. 182

"In making your own test, it is probably better that it be at least somewhat open ended anyway, since making good multiple-choice tests is difficult and time consuming, and requires a series of revisions, tryouts, and more revisions." p. 184

Keeley, S., & Browne, M. (1986). How college seniors operationalize critical thinking behavior. *College Student Journal*, *20,* 389-395.

"We believe that a multiple choice test is not a valid indicator of a person's capacity to actively critically evaluate." (p. 389) Students were given a 500 word essay and asked to critically evaluate it in two hours. Looks like they were paid per valid point made.

Keeley, S., Browne, M., & Kreutzner, J. (1982). A comparison of freshmen and seniors on general and specific essay tests of critical thinking. *Research in Higher Education*, *17*, 139-154.

Kiah, C. (1993, Nov.). *A model for assessing critical thinking skills*. Paper presented at the Annual Student Assessment Conference of the Virginia Assessment Group and the State Council of Higher Education for Virginia. (ERIC Document Reproduction Service No. ED 367 400).

Decided to measure critical thinking by focusing on problem solving. Community college graduates were verbally interviewed. Report is very short with no specifics. No references listed.

Kuhn, L. (1988, Spring). What reasoning skills are important in graduate school? Research Serving Teaching, 1(10), 1-2. Center for Teaching and Learning of Southeast Missouri State University.

"Browne and Keeley (1986) provide evidence that critical thinking skills must be explicitly taught, further, they report that many graduating seniors lack important critical reasoning skills. Given the pattern of significant interdisciplinary differences in faculty perceptions reported by Powers and Enright (1987), it would seem especially important that individual faculty members incorporate into their classes those critical thinking activities most central in their discipline." (p. 2)

Lehman, D., Lempert, R., & Nisbett, R. (1988, June). The effects of graduate training on reasoning: Formal discipline and thinking about everyday-life events. *American Psychologist*, 43(6), 431-442.

"Both psychology and medical training produced large effects on statistical and methodological reasoning, and psychology, medical, and law training produced effects on ability to reason about problems in the logic of the conditional. Chemistry training had no effect on any type of reasoning studied." (p. 431) "The results are thus quite consistent

with the view that reasoning can be taught and that different graduate disciplines teach different kinds of reasoning to different degrees." (p. 438) "The truth is that we know very little about reasoning and how to teach it." (p. 441)

Lehman, D., & Nisbett, R. (1990). A longitudinal study of the effects of undergraduate training on reasoning. *Developmental Psychology, 26*(6), 952-960.

"Social science training produced large effects on statistical and methodological reasoning" but little effect on conditional logic. (p. 952)

Matulich, L. (April, 1993). *Critical thinking or cony cozenage*. (Paper presented at a Symposium of the American Society for Engineering Education, Klamath Falls, OR, April 29, 1993). (ERIC Document Reproduction Service No. ED 373 824)

FIPSE Grant allowed faculty across four disciplines to share ideas on teaching critical thinking. Faculty shared course goals, course content, and ideas on teaching critical thinking. They also compiled resources and research on critical thinking. They focused on the problems of defining terms (Older children are bigger than younger children.), the problems of identifying the writer's purpose, and the problems of unstated assumptions. No references listed.

Powers, D., & Enright, M. (1987). Analytical reasoning skills in graduate study. *Journal of Higher Education, 58*(6), 658-682.

Faculty in six different graduate programs listed and then rated the specific thinking skills of most importance. There were differences among the programs.

Presseisen , B. (1986). *Critical thinking and thinking skills: State of the art definitions and practice in public schools*. Paper presented as the annual meeting of the American Educational Research Association, San Francisco, CA on April 20, 1986.

She reviews the history of critical thinking: l938 to 1960, 1961 to 1980, and current interests. She reviews the ideas of Glaser, Paul, and Ennis.

Wright, B. 1991, September). Discipline-based assessment: The case of sociology. *AAHE Bulletin,* 14-16.

"Mostly, when we talk about assessment, we mean assessment of the major; so far, we've done almost no assessment of the sociology or social-science component in general education." p. 16

Sources Useful to Teachers Teaching Critical Thinking

Ability-based learning program: The psychology major. (1995). Milwaukee, WI: Alverno College.

Anisfeld, M. (1987). A course to develop competence in critical reading of empirical research in psychology. *Teaching of Psychology, 14*, 224-227.

Barnes, C. (Ed.). (1992). *Critical thinking: Educational imperative*. San Francisco: Jossey-Bass.

Bell, J. (1988). *A guide to critical thinking for Maryland social scientists*. Columbia, MD: Howard

Community College. (ED 296 770) Contains several bibliographies.

Bell, J. (1999). *Evaluating psychological information: A guide to critical thinking in psychology* (3rd ed.). Boston: Allyn and Bacon.

Beyer, B. (1987). *Practical strategies for the teaching of thinking*. Boston: Allyn and Bacon.

Beyer, B. (1997). *Improving student thinking: A comprehensive approach*. Boston: Allyn and Bacon.

Brookfield, S. (1987). *Developing critical thinkers*. San Francisco: Jossey-Bass.

Browne, M., & Keeley, S. (2001). *Asking the right questions: A guide to critical thinking* (6th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Carroll, D. (2001). Using ignorance questions to promote thinking skills. *Teaching of Psychology, 28*(2), 98-100.

Chaffee, J. (1994). *Thinking critically*. Boston: Houghton Mifflin. B105.T54C42

Chamberlain, K., & Burrough, S. (1985). Techniques for teaching critical reading. *Teaching of Psychology, 12*, 213-215.

Clark, J., & Biddle, A. (1993). *Teaching critical thinking: Reports from across the curriculum*. Englewood Cliffs, NJ: Prentice-Hall.

Coats, E., Feldman, R., & Schwartzberg, S. (1994). *Critical thinking: General principles and case studies*. NY: McGraw-Hill.

Connor-Greene, P. (1993). From the laboratory to the headlines: Teaching critical evaluation of press reports of research. *Teaching of Psychology*, 20(3), 167-169.

Costa, A., Miller, I., & Quinby, N. (1985). An incomplete bibliography. In A. Costa (Ed.). *Developing minds* (pp. 295-302). Alexandria, VA: Association for Supervision and Curriculum Development.

Costin, F. (1985). Courage in the classroom. *Teaching of Psychology, 12*, 125-128.

Critical Thinking. (1985, Winter). National Forum: *The Phi Kappa Phi Journal, 65*, 1. Full issue.

Crossen, C. (1994). *Tainted truth: The manipulation of fact in America*. NY: Simon and Schuster.

Diestler, S. (1998). *Becoming a critical thinker* (2nd ed.). Upper Saddle River, NJ: Prentice-Hall. See chapters 4, 5, and 8.

Eggen, P., & Kauchak, D. (1996). *Strategies for teachers: Teaching content and thinking skills* (3rd edition*)*. Boston: Allyn and Bacon.

Ennis, R. (1962). A concept of critical thinking. *Harvard Educational Review 32*, 81-111.

Ennis, R. (1987). A taxonomy of critical thinking dispositions and abilities. In J. Baron & R. Sternberg (Eds.). *Teaching thinking skills: Theory and practice* (pp. 9-26). NY: W. H. Freeman.

Ennis, R. (1996). *Critical thinking*. Upper Saddle River, NJ: Prentice-Hall. See chapters 3,4, and 10.

Ferguson, N. (1986). Encouraging responsibility, active participation, and critical thinking in General Psychology students. *Teaching of Psychology, 13*, 217-218.

Fisher, A., & Scriven, M. (1997). *Critical thinking: Its definition and assessment*. CA: Edgepress.

Furedy, J., & Furedy, C. (1979). Course design for critical thinking. *Improving College and University Teaching, 27*(3), 99-101.

Gilovich, T. (1991). *How we know what isn't so: The fallibility of human reason in everyday life.* NY: Free Press.

Glaser, E. (1941). *An experiment in the development of critical thinking*. NY: Bureau of Publications, Teachers College, Columbia University.

Gray, P. (1993, April). Engaging students' intellects: The immersion approach to critical thinking in psychology instruction. *Teaching of Psychology, 20*, 68-74.

Griggs, R., Jackson, S., Marek, P., & Christopher, A. (1998). Critical thinking in introductory psychology texts and supplements. *Teaching of Psychology, 25*(4), 254-266.

Halonen, J. (Ed.). (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.

Halonen, J., & Gray, C. (1995). *The critical thinking companion for introductory psychology* (2nd ed.). NY: Worth.

Halpern, D. (1996). *Thought and knowledge: An introduction to critical thinking*. Hillsdale, NJ: Lawrence Erlbaum. Contains several bibliographies

Howard, G., & Englehardt, J. (1984). Teaching rival hypotheses in experimental psychology. *Teaching of Psychology, 11*, 59-62.

Johnson, R., & Blair, J. (1994). *Logical self-defense*. NY: McGraw-Hill. See chapters 10 and 11.

Kahane, H., & Cavender, N. (1998). *Logic and contemporary rhetoric: The uses of reason in everyday life* (8th ed.). Belmont, CA: Wadsworth. See chapters 6, 10-12.

Keeley, S., Ali, R., & Gebing, T. (1998). Beyond the sponge model: Encouraging students' questioning skills in abnormal psychology. *Teaching of Psychology, 25*(4), 270-274).

Knight, C. (Ed.). (1991). *Teaching critical thinking in the social sciences*. VA: Virginia Community College System and Tidewater Community College. Contains several bibliographies

Kurfiss, J. (1988). *Critical thinking: Theory, research, practice, and possibilities*. ASHE-ERIC Higher Education Report no. 2. Washington, DC: Association for the Study of Higher Education.

Lawson, T. (1999). Assessing psychological critical thinking as a learning outcome for psychology majors. *Teaching of Psychology, 26*(3), 196-198.

Leff, H., Nevin, A., Meeker, D., Cogan, J., & Isenberg, G. (1993). Turning psychology inside out. In J. Clarke and A. Biddle (Eds.), *Teaching critical thinking: Reports from across the curriculum* (pp. 193-202). Englewood Cliffs, NJ: Prentice-Hall.

Leamnson, D. (1999). *Thinking about teaching and learning: Developing habits of learning with first year college and university students*. Sterling, VA: Stylus.

Lyle, E. (1958). An exploration in the teaching of critical thinking in general psychology. *Journal of Educational Research, 52*, 129-133.

McBurney, D. (1996). *How to think like a psychologist: Critical thinking in psychology*. Upper Saddle River, NJ: Prentice-Hall.

McPeck, J. (1990). *Teaching critical thinking: Dialogue and dialectic*. NY: Routledge.

Marek, P., Jackson, S., Griggs, R., & Christopher, A. (1998). Supplementary books on critical thinking. *Teaching of Psychology, 25*(4), 266-269.

Mayer, R., & Goodchild, F. (1990). *The critical thinker: Thinking and learning strategies for psychology students*. Dubuque. IA: W. C. Browne.

Messer, W., & Griggs, R. (1989). Student belief and introductory psychology. *Teaching of Psychology, 16*, 187-191.

Meltzoff, J. (1998). *Critical thinking about research: Psychology and related fields*. Washington, DC: American Psychological Association.

Moeller, T. (1985). Using classroom debates in teaching developmental psychology. *Teaching of Psychology, 12*, 207-209.

Meyers, C. (1986). *Teaching students to think critically*. San Francisco: Jossey-Bass.

Nosich, G. (2001). *Learning to think things through: A guide to critical thinking in the curriculum*. Upper Saddle River, NJ: Prentice-Hall.

Norris, S., & Ennis, R. (1989). *Evaluating critical thinking*. Pacific Grove, CA: Midwest Publications.

Paul, R. (1993). *Critical thinking: What every person needs to survive in a rapidly changing world*. Rohnert Park, CA: Center for Critical Thinking and Moral Critique at Sonoma State University.

Piattelli-Palmarini, M. (1994). *Inevitable illusions: How mistakes of reason rule our minds.* NY: Wiley.

Rubinstein, J., & Slife, B. (Eds.). (1993). *Taking sides: Clashing views on controversial psychological issues*. Guilford, CT: Dushkin Publishing Group.

Ruggiero, V. (1989). *Critical thinking*. Rapid City, SD: College Survival, Inc.

Sabini, J., & Silver, M. (1985). Critical thinking and obedience to authority. *The Phi Kappa Phi Journal, 65*, 13-17.

Sagan, C. (1996). *The demon-haunted world: Science as a candle in the dark.* NY: Random House.

Schick, T., & Vaughn, L. (2002). *How to think about weird things: Critical thinking for a new age* (3rd edition*)*. Mountain View, CA: Mayfield.

Shemer, M. (1997). *Why people believe weird things: Pseudo science, superstition, and other confusions of our time*. NY: Freeman. BF773.S56

Smith, D. G. (1977). College classroom interactions and critical thinking. *Journal of Educational Psychology, 69*(2), 180-190.

Smith, R. (2002). *Challenging your preconceptions: Thinking critically about psychology* (2nd ed.) Belmont, CA: Wadsworth/Thomson.

Smith, R., & Palladino, S. (1997). *Psychologist as detective*. Upper Saddle River, NJ: Prentice-Hall. BF76.5.S54

Stanovich, K. (1998). *How to think straight about psychology*. Glenview, IL: Scott, Foresman and Company.

Sternberg, R. (Ed.). (1997). *Teaching introductory psychology*. Washington, DC: American Psychological Association.

Sternberg, R. (1999). Teaching psychology students to be savvy consumers and producers of research questions. *Teaching of Psychology, 26*(3), 211-213.

Stice, J. (Ed.). (1987). *Developing critical thinking and problem solving abilities*. San Francisco: Jossey-Bass.

Tavris, C. (1995). *Psychobabble and biobunk: Using psychology to think critically about issues in the news*. NY: HarperCollins.

Tishman, S., Perkins, D., & Jay, E. (1995). *The thinking classroom: Learning and teaching in a culture of thinking*. Boston: Allyn and Bacon.

Wade, C., & Tavris, C. (1993). *Critical & creative thinking: The case of love and war*. NY: HarperCollins.

Wade, C., & Tavris, C. (1996). *Learning to think critically: The case of close relationships*. NY: Harper and Row.

Wesp, R., & Montgomery, K. (1998). Developing critical thinking through the study of paranormal phenomena. *Teaching of Psychology, 25*(4), 275-278.

Willis, A. (1992, August). *Integrating levels of critical thinking into writing assignments for introductory psychology students*. Paper presented at the meeting of the American Psychological Association, Washington, DC.

Zechmeister, E., & Johnson, J. (1992). *Critical thinking: A functional approach*. Pacific Grove, CA: Brooks/Cole.

See the February 1995 special issue on Critical Thinking and #4 for 1998 of *Teaching of Psychology*.