



# Promoting Critical Thinking Through Active Learning

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Research has consistently shown that active learning strategies require students to use and even develop higher-order thinking skills. Bringing active learning into the classroom can have many benefits, including the ability to help students build and reinforce critical thinking skills. Join the Macmillan Learning team and a panel of active learning experts for a conversation about using active learning strategies to help students analyze information and creatively solve problems.

# Meet the Panelists



**AJ Metz**, Associate Professor of Educational Psychology & Author, *Connections: Empowering College and Career Success*  
University of Utah



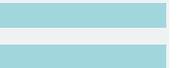
**Jamie Shushan**, Senior Student & Alumni Affairs Advisor, The Crimson Summer Academy & Author, *The Pocket Guide to College Success*  
Harvard University



**John Pollard**, Dean for Academic Affairs and Curricular Innovation & Associate Professor of Practice in the Department of Chemistry and Biochemistry  
University of Arizona



**Matt Evans**, Professor Physics and Astronomy  
University of Wisconsin-Eau Claire





# Active Learning Considerations

A.J. Metz, Ph.D.  
Department of Educational Psychology  
University of Utah

"Learning is not a spectator sport. Students do not learn much just by sitting in class listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves."

--Arthur W. Chickering and Zelda F. Gamson, "Seven Principles for Good Practice," AAHE Bulletin 39: 3-7, March 1987



# Active & Passive: We Need Both

## Active Learning (Learner-Centered)

- Students are actively or experientially involved in the learning process
- Benefits
  - Skills can be practiced and translated to real world
  - Interactive, two-way learning
  - Reinforces important material
  - Students receive more frequent and immediate feedback on their understanding
  - Multiple avenues of student learning
  - Creates sense of community, social belonging and enhances social skills

## Passive Learning (Teacher Centered)

- Students receive information from instructors and internalize it
- Benefits
  - Exposure to new material
  - Greater control over classroom
  - Ability to clarify material
  - Presentation of a large amount of material in a short time
  - Instructional materials can be prepared in advance
  - Content can be presented in an organized, structured, and meaningful way

# Considerations

## Learning outcomes

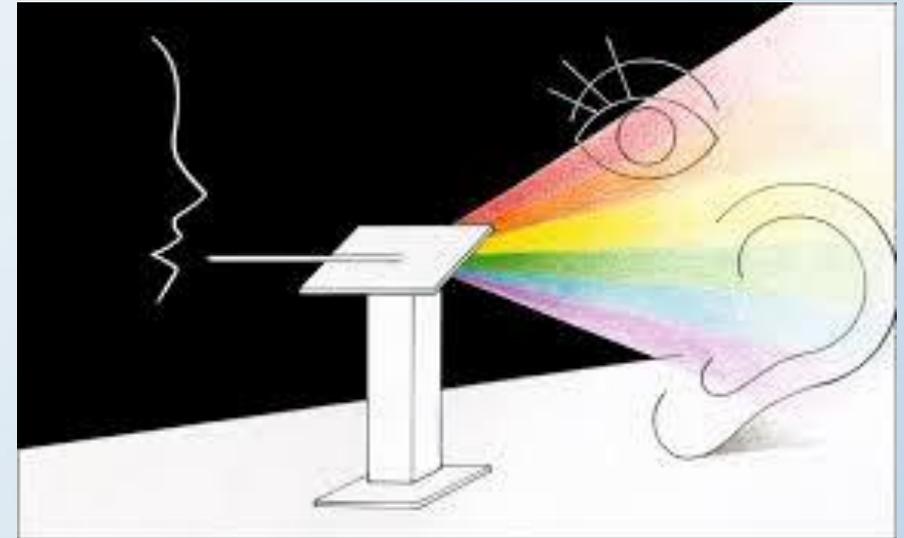
- Design activities around your learning outcomes
- Think about topics students typically find confusing
- Use problems or questions that will challenge and interest your students
- Relate the activity back to the learning outcome
  - Students don't always make that connection



# Considerations

## Lecture Material

- Cut content from your lectures to make room for discussion and activities
  - Remove least important parts
- Where does the content go?
  - Record mini-lectures, post in your online course room (CANVAS), and have students watch prior to class
  - Have students read before class and complete an online discussion board post or low-stakes online quiz so they come to class prepared to learn more advanced topics



# Considerations

## Timing

- Breaking up your lecture every 15-20 minutes will help keep students' attention and interest as they apply what they are learning
- These can be as simple as asking students to discuss their thoughts on a question with someone sitting next to them
  - Some only take 2-3 minutes



# Considerations

## Accountability

- Build in accountability for individual and group work
  - Assign participation points
  - Ask students to:
    - answer polling questions
    - Upload a photo of their worksheet
    - Turn in an index card with a response to a short writing prompt
    - Use Google docs for group notes



# Considerations

## During the Activity

- Move around the classroom to answer questions and interact with students
  - Learn more about how they are thinking
  - These interactions can inform ways to follow up after an activity with clarification or to highlight student ideas



# Considerations

## Feedback

- Offer timely feedback
- Debrief
  - Explain both correct and incorrect answers
- Take-Aways
  - Highlight interesting and unique perspectives that would be valuable to share
- Consider the value of peer feedback
  - Think-Pair-Share discussions



# Considerations

## Transparency

- Best way to ensure you and your students have a positive experience with active learning
- On the first day of class:
  - Describe course methods
  - Outline expectations
  - Explain why you are using active learning and how it will help them succeed
  - Point them to research on active learning and benefits



Setting Expectations - Making Sure They are Clear 

# Breaking the Ice

- Use icebreakers to help students become comfortable working with one another
  - 3 Minute Elevator Pitch
  - TYP activity
  - One word to describe your day
  - Get To Know You Bingo
  - “10 Things in Common” group activity
  - 3 “P’s”
    - Personal, Professional, Peculiar
  - What’s one “win” you had this week?



# Active Learning Techniques

- Think-Pair-Share
- Discussion Posts/Guides
- Case Studies
- Role-plays
- Ethical Dilemmas
- Design a presentation for a “stakeholder”
- Debate
- Peer review of writing/project
- Personal response systems/polling
- Create TikTok video clips explaining a concept or theory to the class
- Peer teaching
- Online “Scavenger Hunt” to find answers
- Game based learning (competitive exercises)
- Panel Discussions
- Problem solving using real data
- 3-D construction of brain with playdough
- Project based learned
- Movie application of in-class concepts

# Sample Discussion Guide

Instructions: As you read the chapter assigned for class this week, jot down your reactions and points you would like to make during group discussion. You do not need to use complete sentences.

- What ideas or concepts in this chapter were surprising or interesting to you?
- What ideas or concepts do you disagree with or have questions about? What are your specific questions?
- What has been your personal experience with this topic? (By personal experience, I mean either your own experience or that which you witnessed or have been privy to through your learning in other classes, reading, movie watching, through work or volunteer-related activities, or through others (e.g., friends, relatives, etc.)
- How might you use or apply this information to your work in other classes, practicum, or future work?

# Considerations Post COVID

## Mental Health Challenges

(Lee, et al., 2021)

- Increased stress and anxiety
- Difficulty concentrating
- Disrupted sleep
- Decreased social interactions

## Student Expectations?

- During COVID faculty provided greater flexibility
- Inflation of grades

## Attitudes

(Ezarik, 2021)

- 47% rate value of their education as fair or poor
- 52% said they learned less
- 58% of freshman report feeling unprepared for college
- 47% cheating is somewhat common in online courses

# Ideas for Active Learning

## **“226 Active Learning Techniques”**

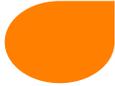
Iowa State University

Center for Excellence in Learning & Teaching

Link: <https://www.celt.iastate.edu/wp-content/uploads/2017/03/CELT226activelearningtechniques.pdf>

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# What Can Students Actively Do to Promote Their Critical Thinking?

*Critical Thinking Steps for College Reading, Note-Taking, and Studying*  
Jamie Shushan, Senior Student & Alumni Affairs Advisor, The Crimson Summer  
Academy at Harvard University

# Student Critical Thinking Challenges

- + Many students have never truly “practiced” critical thinking skills before entering college.
  - + *How can students move from memorization strategies to critical thinking strategies?*
- + Viewing “instructors” as the “absolute experts” so students passively absorb information.
  - + *How can students view class as an active conversation they are having between the instructor and other classmates (where they believe their perspectives matter)?*
- + Technology distractions that mean constant interruptions when trying to be “critical thinkers.”
  - + *How can students enjoy the benefits of technology while effectively managing devices that are constantly nudging and pinging for attention?*

# Five Steps for Critical Thinking

- + Step 1: Ask a lot of questions (and answer them).
- + Step 2: Evaluate your own reactions.
- + Step 3: Analyze the information with a “critical” lens.
- + Step 4: Make connections and keep the big picture in mind.
- + Step 5: Apply your learning to your own life experiences.

The Five Steps for Critical Thinking  
are in no particular order.



# Five Questions to Help You Build Your Critical Thinking Muscles

1. What is my immediate reaction to this?
2. What is the other side of this argument/what “other” evidence might provide a different or alternative explanation?
3. What questions do I have about this material?
4. How does this material connect to what I’ve already learned?
5. How does this relate to my life?

**REMEMBER:** *In addition to academics, you can apply your critical thinking skills to everyday college life—whenever you are solving problems or making decisions.*

# Engage With Your Readings Using Critical Thinking Notes

- + Step 1: Ask questions frequently.
- + Step 2: React as you read.
- + Step 3: Ask what's missing.
- + Step 4: Think about the big picture.
- + Step 5: Personalize the text.

Take Critical Thinking Notes in the margins of the reading or on a separate piece of paper.



"This is a 'text book', it's a bit like a website but printed on paper."

## Visual Walkthrough

### Take Critical Thinking Notes while You Read

Taking notes that push you to think critically while you read will help you better understand and retain the ideas and information in the text. Moreover, you'll be able to refer back to your reading notes when you study for tests or if you need to use the text for assignments or projects. Reading different types of textbooks will require you to use different types of strategies, too. For example, while reading a humanities textbook, you'll have to sift through a lot of text in order to identify key concepts and central ideas, while a science textbook might require you to apply concepts through exercises. In either case, you'll want to approach your textbook reading with intention. We will explore both a humanities and science textbook example in this Visual Walkthrough.

### Reading a Humanities Textbook

- 1 Underline main ideas and key concepts.
- 2 Take summarizing notes in the margins.
- 3 Circle specific examples.
- 4 Use question marks when you have a question or don't understand something in the text.
- 5 Use exclamation marks to indicate agreement.
- 6 Use a highlighter for one purpose—maybe to highlight important dates or numbers.
- 7 Personalize the text whenever you can.

### The Internationalization of the United States

Globalization was typically associated with the expansion of American enterprise and culture to other countries, yet the United States experienced the dynamic forces of globalization within its own borders. Already in the 1980s, Japanese, European, and Middle Eastern investors had purchased American stocks and bonds, real estate, and corporations such as Firestone and 20th Century Fox. Local communities welcomed foreign capital, and states competed to recruit foreign automobile plants. American non-union workers began to produce Hondas in Marysville, Ohio, and BMWs in Spartanburg, South Carolina. By 2002, the paychecks of nearly four million American workers came from foreign-owned companies. ??? But were American workers also laid off?

!!! Globalization was transforming not just the economy but American society as well, as the United States experienced a tremendous surge of immigration, part of a worldwide trend that counted some 214 million immigrants across the globe in 2010. By 2006, the United States' 35.7 million immigrants constituted 12.4 percent of the population. The 20 million who arrived between 1980 and 2005 surpassed the previous peak immigration of the first two decades of the twentieth century and exhibited a striking difference in country of origin. Eighty-five percent of the earlier immigrants had come from Europe; by the 1980s, the vast majority came from Asia and Latin America. Consequently, immigration changed the racial and ethnic composition of the nation. By 2004, Asian Americans numbered 13 million, while 41 million Latinos constituted — at 14 percent — the largest minority group in the nation. ??? But didn't this "promise" work out for most?

The promise of economic opportunity, as always, lured immigrants to America, and the Immigration and Nationality Act of 1965 enabled them to come. Although the law set an annual limit of 270,000 immigrants, it allowed close relatives of U.S. citizens to enter above the ceiling, thus creating family migration chains. In addition, the Cold War dispersal of U.S. military and other personnel around the world enabled foreigners to learn about the nation and form relationships with citizens. Moreover, during the Cold War, U.S. immigration policy was generous to refugees from Communism, welcoming more than 800,000 Cubans after Castro's revolution in 1959 and more than 600,000 Vietnamese, Laotians, and Cambodians after the Vietnam War.

Foreigner investing & purchase in the U.S.

Families from home benefited

## Visual Walkthrough, continued

### Take Critical Thinking Notes while You Read

A science textbook can look very different from your humanities textbook, but you'll find that you can use similar strategies to critically engage with the material. As you can see in this example from a chemistry textbook, which includes abbreviations, practice exercises, and formulas for calculating medicine doses, reading a science textbook will require you to pay attention to formulas and models as well as practice the concepts through problem sets and exercises in order to understand the information.

### Reading a Science Textbook

- 1 Underline main ideas and key concepts.
- 2 Circle specific examples.
- 3 Use a highlighter for one purpose—to highlight important calculations, formulas, and numbers.
- 4 Take summarizing notes in the margins that connect aspects of class to the text for better understanding.
- 5 Take time to do any practice problems while reading the text, ideally without looking at the solution first.
- 6 Use question marks when you have a question or don't understand the solution or answer to the practice problems.

#### PRACTICE EXERCISES

- 23 Using the conversions on page 12, convert the following units into calories:  
a. 5.79 kcal    b. 48.8 J
- 24 How many joules are there in 2.45 cal?
- 25 How many joules are there in 2,720 Calories, the amount of energy the average person consumes in a day?

#### Dosage Calculations

For some medicines prescribed for patients, the dosage must be adjusted according to the patient's weight. This is especially true when administering medicine to children. For example, a dosage of "8.0 mg of tetracycline per kilogram body weight daily" is a dosage based on the weight of the patient. A patient's weight is often given in pounds, yet many drug handbooks give the dosage per kilogram body weight of the patient. Therefore, to calculate the correct amount of medicine to give the patient, you must first convert the patient's weight from pounds into kilograms with an English-metric conversion, using Table 1-3.

It is important to recognize that the dosage is itself a conversion factor between the mass or volume of the medicine and the weight of the patient. Whenever you see the word *per*, it means *in every* and can be expressed as a ratio or fraction where *per* represents a division operation (divided by). For example, 60 miles per hour can be written as the ratio  $60 \text{ mi}/1 \text{ hr}$ . Similarly, a dosage of 8.0 mg per kg body weight can be expressed as the fraction  $8.0 \text{ mg}/1 \text{ kg}$ . Hence, dosage is a conversion factor.

$$\frac{8 \text{ mg}}{1 \text{ kg}} \quad \text{or} \quad \frac{1 \text{ kg}}{8 \text{ mg}}$$

Common abbreviations for medication frequency

Dimensional analysis is used to solve dosage calculations by multiplying the patient's weight by the appropriate English-metric conversion factor and then multiplying by the dosage conversion factor, as shown in the following worked exercise.

#### WORKED EXERCISE Dosage Calculations

1-19 Tetracycline elixir, an antibiotic, is ordered at a dosage of 8.0 mg per kilogram of body weight q.d. for a child weighing 52 lb. How many milligrams of tetracycline elixir should be given to this child daily?

**Solution**

**Step 1:** Identify the conversions. Since the dosage is given based on a patient's weight in kilograms, an English-to-metric conversion must be performed. From Table 1-3 this is  $1,000 \text{ kg} = 2,205 \text{ lb}$ . The dosage itself is already a conversion factor.

**Step 2:** Express each conversion as two possible conversion factors. The English-to-metric conversion factors for the patient's weight are

$$\frac{1 \text{ kg}}{2,205 \text{ lb}} \quad \text{or} \quad \frac{2,205 \text{ lb}}{1 \text{ kg}}$$

The dosage is a conversion factor between the mass of medicine in milligrams and the weight of the patient in kilograms:

$$\frac{8.0 \text{ mg}}{1 \text{ kg}} \quad \text{or} \quad \frac{1 \text{ kg}}{8.0 \text{ mg}}$$

Dosage is a conversion factor b/w volume of medo & patient weight.

Some common abbreviations indicating the frequency with which a medication should be administered include q.d. and b.i.d., derived from the Latin meaning abbreviated "daily" and "twice daily," respectively. If the medicine is prescribed for two times daily or four times daily, divide your final answer by two or four to determine how much to give the patient at each administration.

STILL UNCLEAR?  
ONSTEP 2

# Five Questions to Answer After Completing a Reading

1. What are the most important themes or concepts?
2. What examples or significant details should I remember?
3. Is the evidence presented sound? Why or why not?
4. Does the material contradict or support other readings or lectures? How?
5. Why did the instructor assign this particular reading? What's the point of the reading?

**REMEMBER:** *Engage in conversations with classmates and instructors.*

# Apply Critical Thinking to Note-taking Using the Table Format

- + The first column is for shorthand notes that highlight important points being presented.
- + The second column is for YOUR personal reaction, analysis, and opinions about class material.
- + The third column is for any questions you have during or after class.

Take Critical Thinking Notes IN YOUR OWN WORDS. Try NOT to transcribe every word!



## Visual Walkthrough

### Using the Table Format

The table format is easy to use if you are taking notes by hand or on a computer. Simply create a table with three columns: the first column for class notes, the second column for your reaction to the class material, and the third column for questions you have during class.

- 1 The first column is for notes that focus on the substance of what the instructor is saying. Use this column to write shorthand notes in your own words that highlight the important points the instructor is presenting, including concepts, theories, facts, principles, arguments and supporting evidence, examples, and anecdotes.
- 2 The second column is for your personal reaction, analysis, and opinions about the class material. This section is important because it adds a layer of critical thinking to your notes. You might want to consider such matters as, whether you agree or disagree with what's being said, whether any information appears to be missing, and how your life experiences influence and inform your response to the lecture.
- 3 The third column is for any questions you have during or after class. For example, if you don't understand a theory the instructor presents, highlight it in your notes so that you remember to discuss it with the instructor during office hours.

#### VIETNAM WAR: ON THE HOME FRONT

1 Class notes	Reaction/Analysis 2	Questions 3
<p><u>Mass movements against the war</u></p> <ul style="list-style-type: none"> <li>• Students for a Democratic Society (SDS) — Recruited 20,000 people; first major demonstration in DC; SDS chapters at more than 300 college campuses; protests against ROTC, CIA, military research projects, manufacturers of war material</li> <li>• Martin Luther King Jr. — Rebuked US government as “the greatest purveyor of violence in the world today”</li> <li>• Environmentalists — Disgusted by use of chemical weapons (e.g., Agent Orange)</li> </ul>	<p>Mass movements were necessary to get president's attention (unfortunate it had to get to this level).</p>	<p>Where did the SDS movement start, and how long did it take to spread to so many campuses?</p>
<p><u>Antiwar sentiment</u></p> <ul style="list-style-type: none"> <li>• Media questioned war — <i>New York Times</i> (1965), <i>Wall Street Journal</i> &amp; <i>Life</i> magazine (by 1968), Walter Cronkite</li> <li>• Prominent Democratic senators urged negotiation instead of force — J. William Fulbright, George McGovern, Mike Mansfield</li> <li>• Women Strike for Peace (WSP) — Founded 1961; worked for nuclear disarmament; alerted public to horror &amp; danger of the war</li> </ul>	<p>Important that media took a stand, given media influence in US — must have made a real impact — find out more.</p>	<p>Want to know more about Senate's role in de-escalation of the war — Republicans vs. Democrats?</p>

# Five Questions to Answer After Reviewing Your Notes

1. What are the key takeaways from class and why are they important?
2. Do I agree or disagree with the information presented? Why?
3. Is anything missing from the evidence, or unclear from the examples provided?
4. In what ways does the information connect to previous class discussions?
5. How does the material relate to me and my past experiences?

**REMEMBER:** *Engage in conversations with classmates and instructors.*

# Incorporate the Five Critical Thinking Steps into your Study Notes

- + Step 1: Ask a lot of questions (and answer them).
- + Step 2: Evaluate your own reactions.
- + Step 3: Analyze the information with a "critical" lens.
- + Step 4: Make connections and keep the big picture in mind.
- + Step 5: Apply your learning to your own life experiences.

Create PRACTICE TESTS whenever possible to truly test your understanding.



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# Climbing the Bloom's Taxonomy Staircase

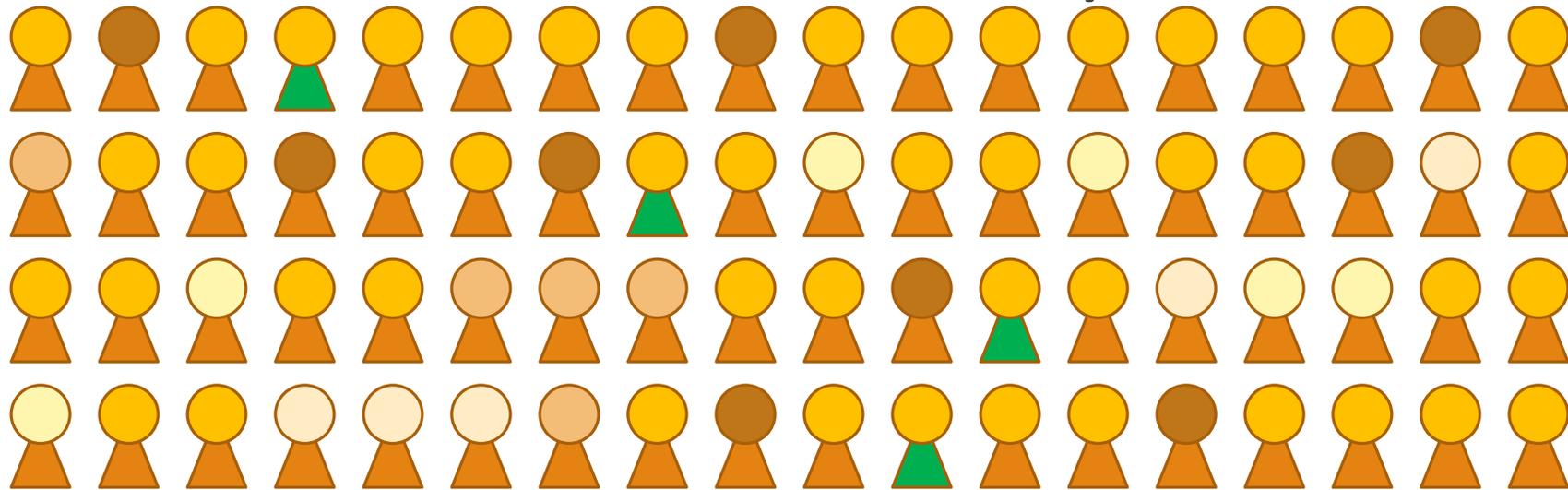
Matt Evans

Professor of Physics and Astronomy, University of Wisconsin-Eau Claire



# Why engagement of all students is necessary

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# Why engagement of all students is necessary

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# Bloom's Taxonomy & Polling Questions

