Metacognition:
A Key to Cultivating Critical Thinking

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Learning Objectives

During this workshop, participants will:

- ❑ Define metacognition skills
- ❑ Discuss strategies that foster metacognition and critical thinking skills
- ❑ Model metacognitive strategies they can apply in the classroom

Critical Thinking Definition

Broward College defines critical thinking as a process of **evaluating** information by **questioning** and **testing** assumptions, **accepting** and **rejecting** arguments and/or perspectives, and **applying reasoning** to make **informed decisions**.

Critical Thinking Goal & Outcomes

Goal: To enhance students' critical thinking skills

Students will be able to:

1. **Explain** questions, problems, and/or issues
2. **Analyze** and **interpret** relevant information
3. **Evaluate** information to determine potential conclusions
4. **Generate** a well-reasoned conclusion

Think-Pair-Share

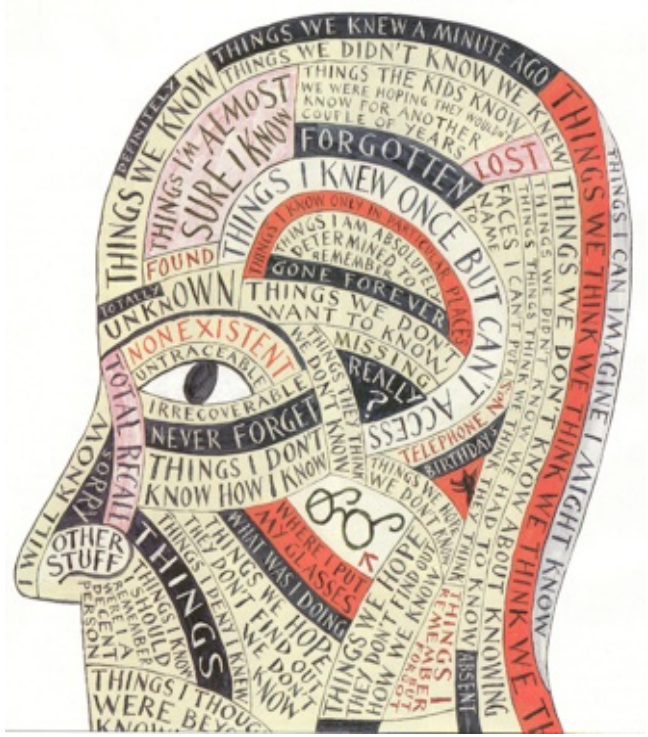
What is the main problem evident in this clip?

How does this clip relate to a similar problem we see in many of our own students?

The “Think-Pair-Share” activity is based on this American Idol clip:
https://www.youtube.com/watch?v=ztTCcTBXGJI

http://chronicle.com/article/MetacognitionStudent/130327/

Metacognition: Thinking about Thinking



Understanding how we think is the foundation of critical thinking

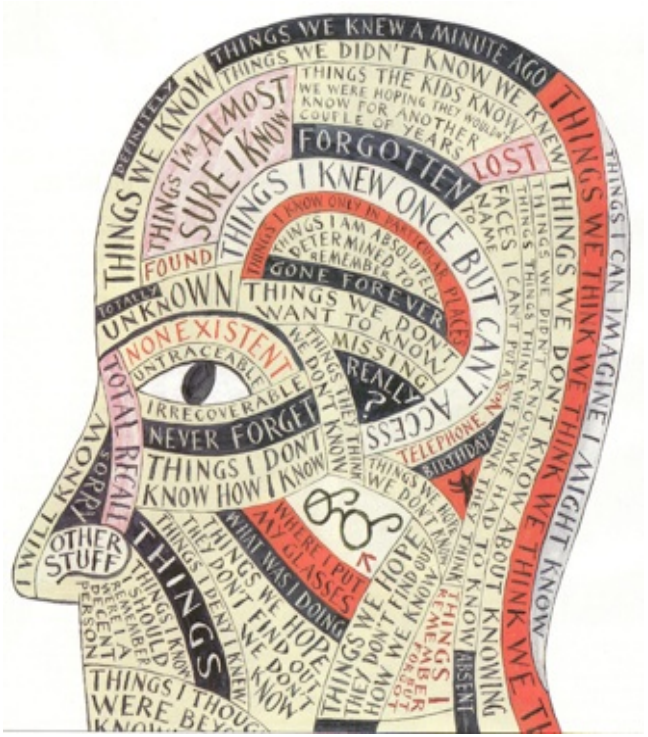
"Interrelated set of competencies for learning and thinking"

Dawson, T. (2008) Metacognition and Learning in Adulthood

"Process of reflecting and directing one's own thinking"

National Research Council (2001)

Metacognition: Thinking about Thinking



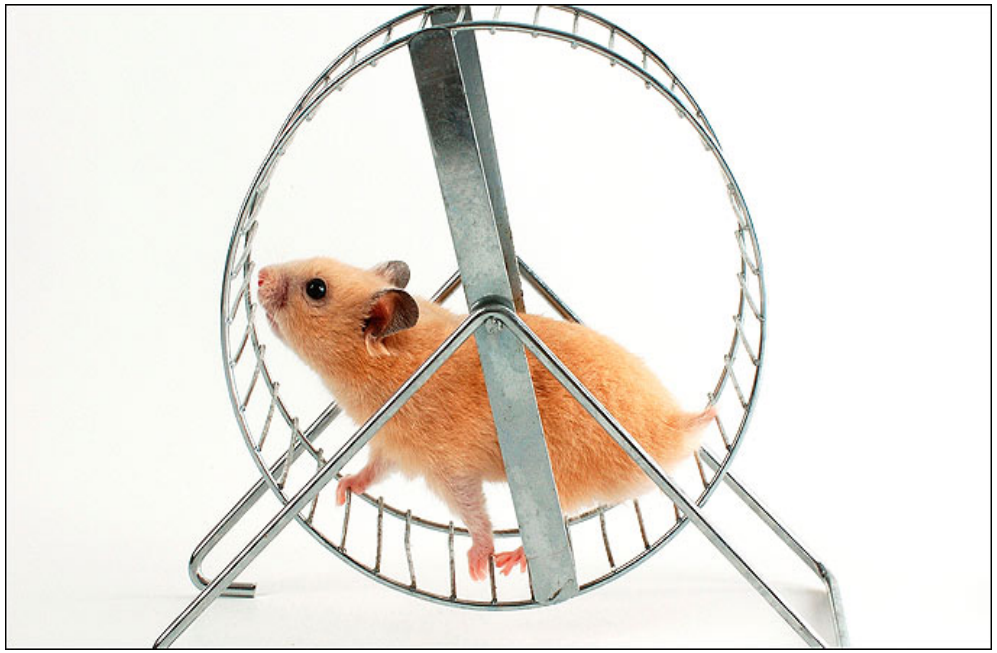
- Being consciously aware of yourself as a problem solver
- Planning, monitoring, and controlling your mental processing
- Accurately assessing your level of learning

What is going on in these stories?

handout provided

THE “A” STUDENT: MELANIE

THE HAMSTER WHEEL: JOHN



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What is going on in these stories?

Break into Pairs
A or B

- Person A Reads the "A" Student
- Person B reads The "Hamster Wheel" Student

INDIVIDUALLY AND IN WRITING…

IDENTIFY AREAS UPON WHICH THE STUDENT CAN IMPROVE

(broken link redacted)

Identifying Areas For Improvement

- All As gather on one side of the room

- All Bs on the other side of the room

Spend several minutes discussing:

1) areas upon which the student can improve
2) improvements you think are related to metacognition

Identifying Areas For Improvement

- Please return to your original pairs.

Take turns telling one another about your specific scenario and the areas of improvement that may be related to metacognition.

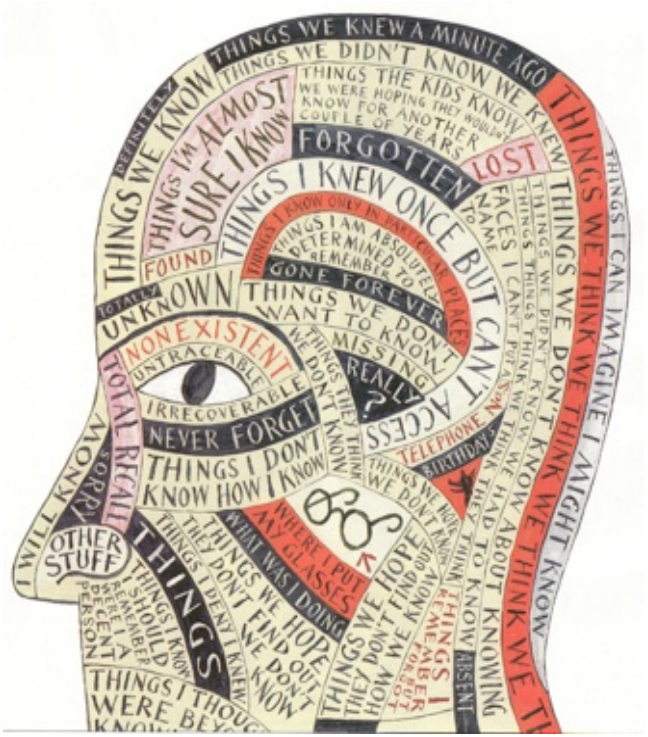
Use your notes and your collaboration.

Cycle of Metacognitive Process

Metacognition is about planning, monitoring, and evaluating one's own thinking and learning.

Ambrose, S. A. (2010). *How learning works: Seven research-based principles for smart teaching*. San Francisco, CA: Jossey-Bass.

Metacognition: Thinking about Thinking



- ❑ Active learning
- ❑ Critical thinking
- ❑ Reflective judgment
- ❑ Problem Solving
- ❑ Decision Making
- ❑ Motivation for Learning

Dawson, T. (2008) Metacognition and Learning in Adulthood

Direct Paraphrasing

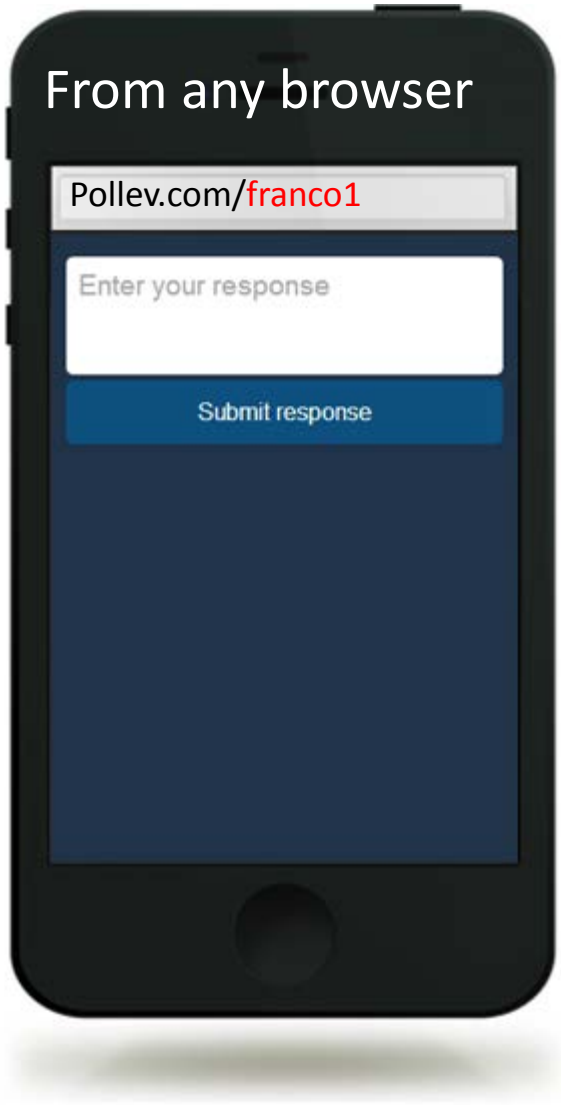
- Turn to your left: Explain the concept of metacognition to a 6 year old
- Turn to your right: Explain the concept of metacognition to your associate dean

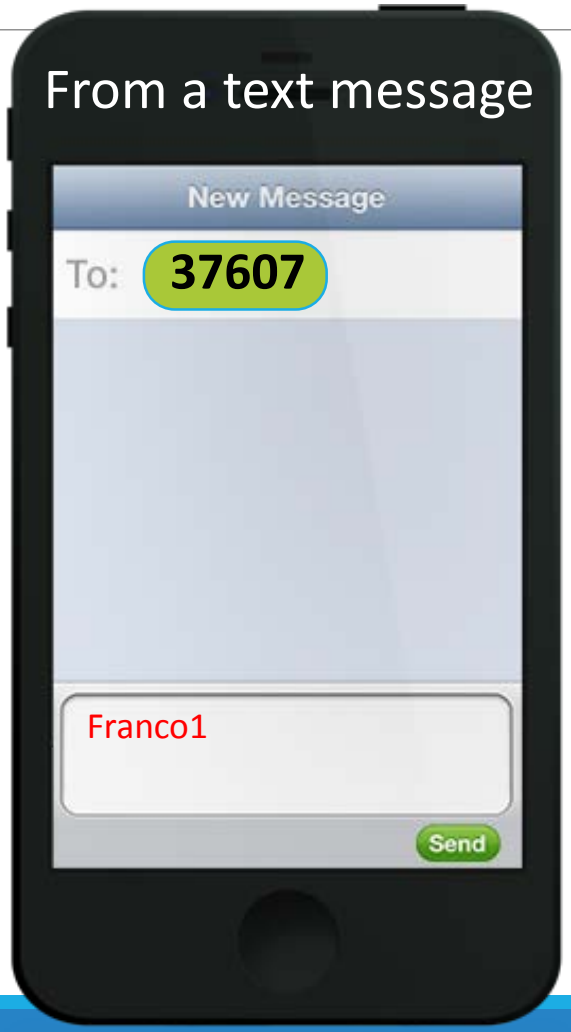
What did you notice about your own metacognition?

http://www.lcc.edu/cte/resources/teachingtips/tip22.aspx

Participating with Poll Everywhere

How to join via the web or text messaging





Your poll will show here

1

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Make sure you are in Slide Show mode

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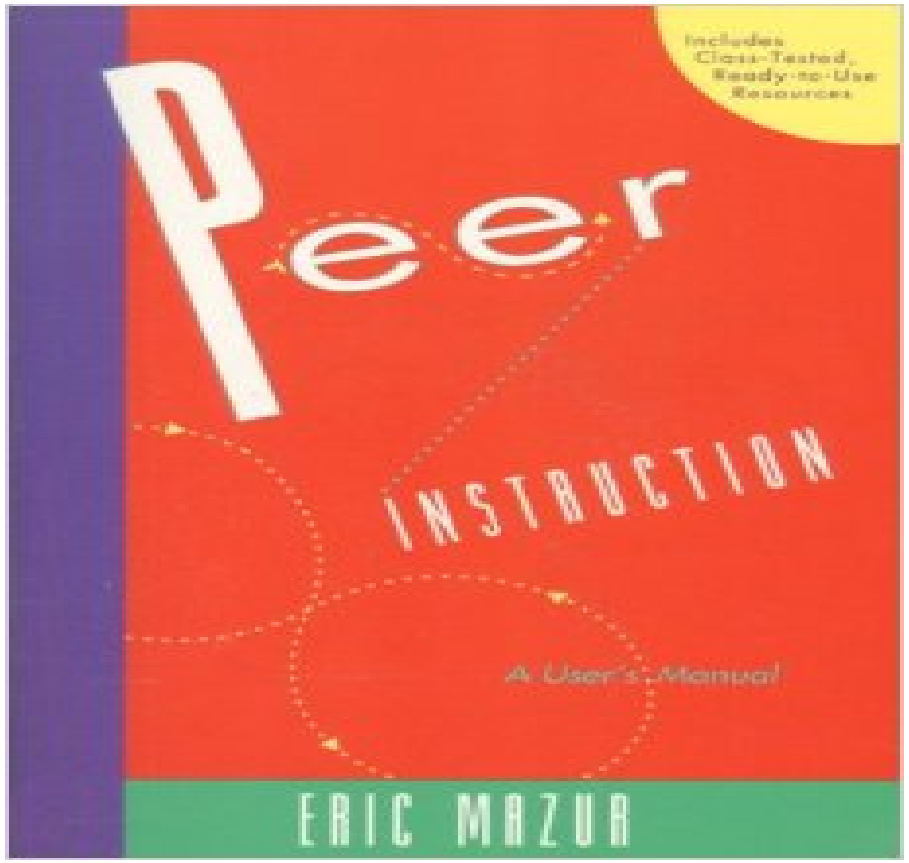
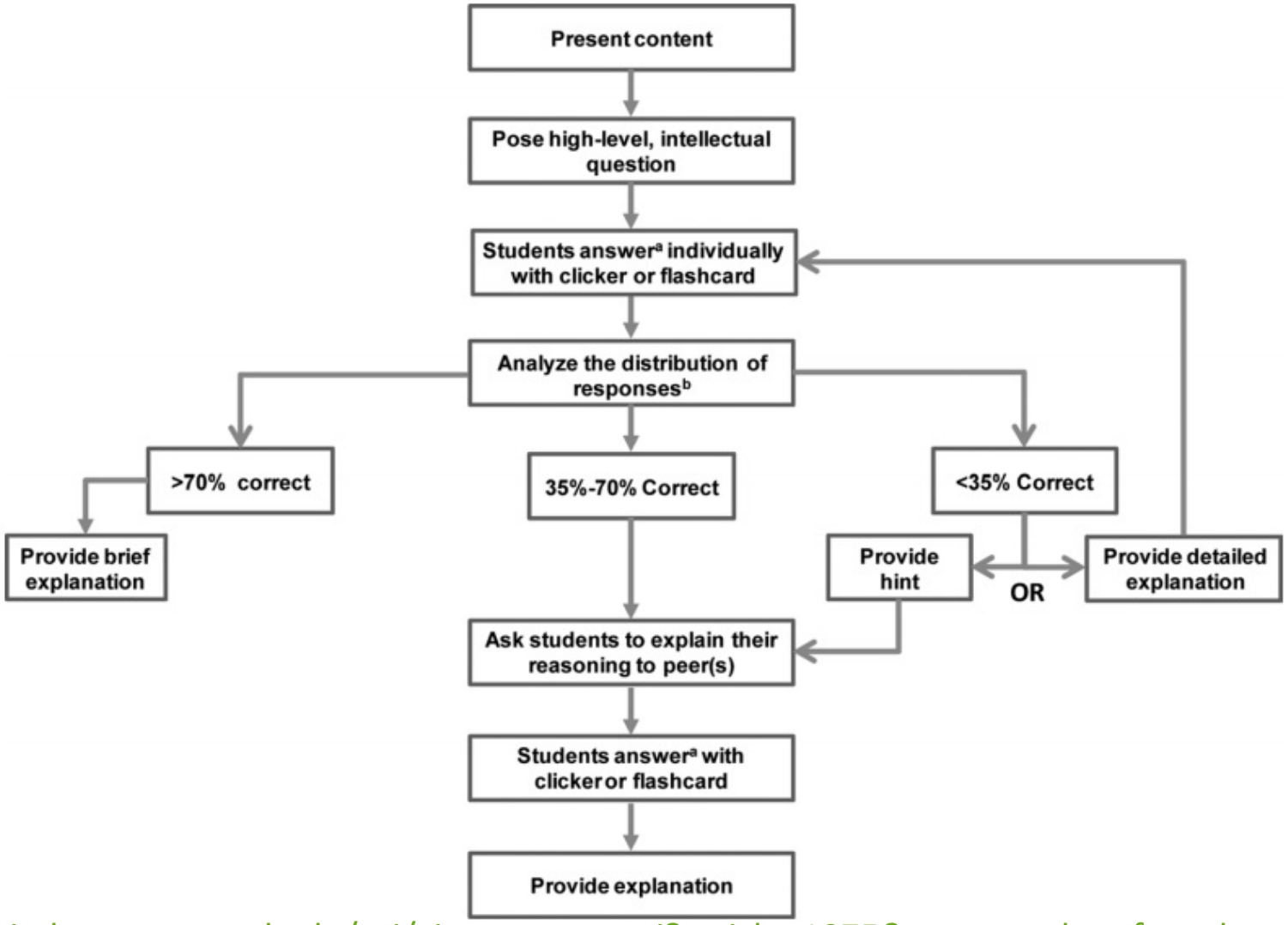
Putting Metacognition Into Practice…



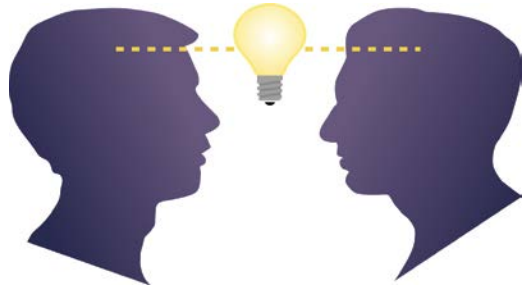
Peer Instruction Steps



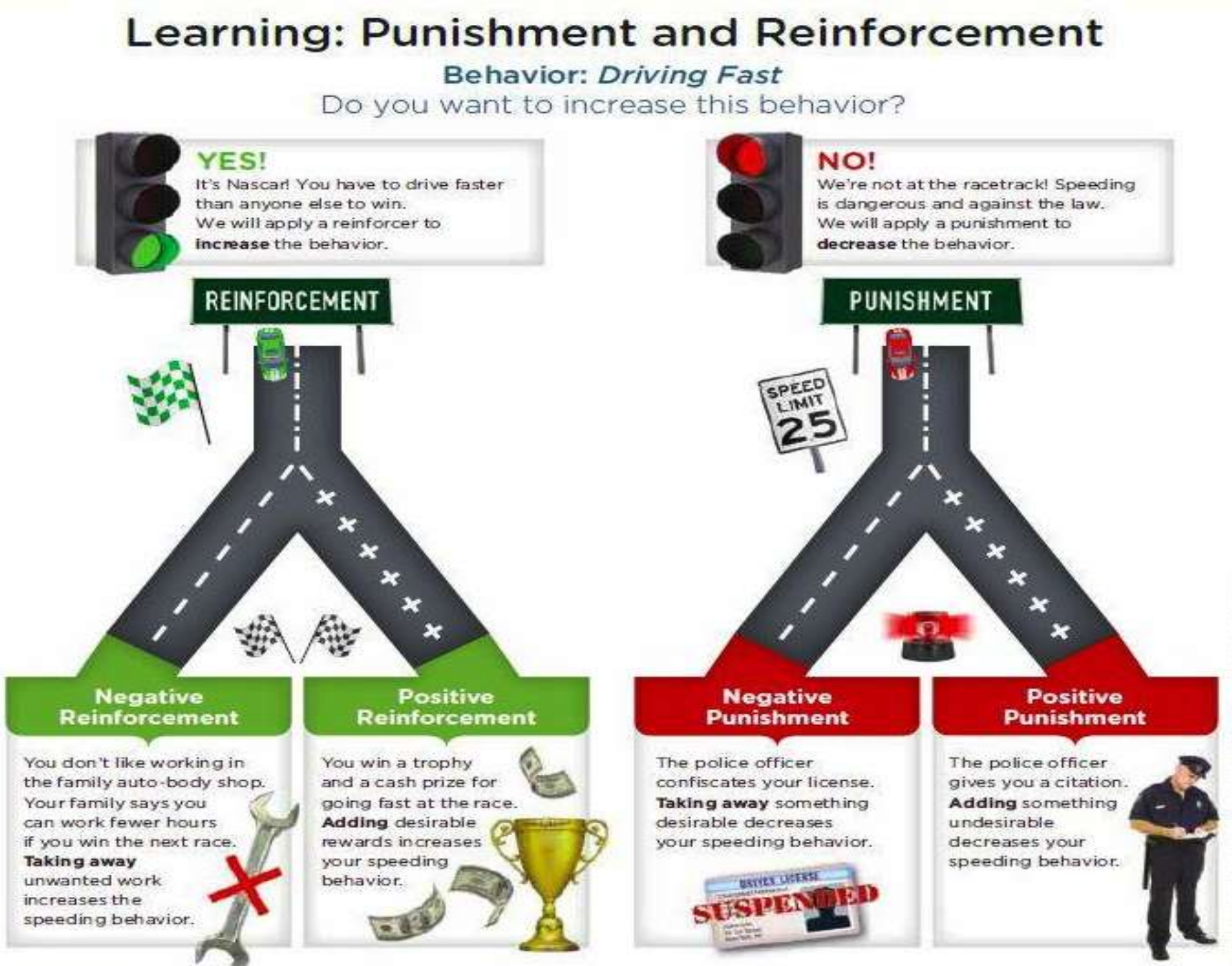
http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1075&context=chemfacpub

Why Peer Instruction?

This video explains why students should find value in the peer instruction process. Click on link: https://www.youtube.com/watch?v=G52407TB8B0



Present Content



Step 1

Pose High Level Question

1 min

Step 2

Give Students Time to Think

1 min

Step 3

Student Record Individual Answers (Vote)

Your poll will show here

1

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or

Open poll in your web browser

Step 4

Peer Discussion: Convince Your Neighbor and explain your reasoning

(1-2 mins)

- ❑ Share how you thought about what the question was asking.
- ❑ Share the process you used to arrive at an answer you wanted to choose.
- ❑ What was your main reason for choosing your answer, and what were the main reasons you did not choose each of the other answers?
- ❑ How do your ideas compare with your neighbor's ideas?
- ❑ What was most confusing to you about this question?
- ❑ How confident are you in your answer? Why? What else would you need to know to increase your confidence?

Step 5

Student Record Revised Answers (Vote again)

Step 6

Show student responses

Step 7

Provide explanation

1 Min

Your poll will show here

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Peer Instruction Best Practices

DON'TS	WHY?
Don't ask easy recall questions	Students show greater gains with difficult questions
Don't skip the individual vote	Forces students to think and increases engagement during discussion.
Don't show the first vote bar graph if you plan to have the students vote twice	Students more confident, even if answer was incorrect
Don't leave out the peer discussion	Students with correct initial vote improved their reasoning after discussion
Don't omit the teacher explanation	Higher performance on final exam

http://www.colorado.edu/sei/documents/CourseTransformationGuide_CWSEI_CU-SEI.pdf

Vickrey, T., Rosploch, K., Rahmanian, R., Pilarz, M., & Stains, M. (2015). Research-Based Implementation of Peer Instruction: A Literature Review. *CBE Life Sciences Education*, *14*(1).

Peer Instruction Evidence

1. Impact on learning in variety of disciplines (physics, geosciences, computer science, calculus, algebra, physiology)
2. Peer Instruction improves ability to apply material to novel problems (problem solving)
3. Lower attrition rates
4. Provide immediate feedback
5. Higher self-confidence

Reflection

Metacognitive Questions for Students

- What did you learn about this topic? (monitoring)
- With what did I have difficulty? (monitoring)
- What types of strategies can I use to deal with this difficulty? (problem solving-planning)
- What specific actions am I going to take this week to solve any difficulties? (planning)

http://www.slu.edu/blogs/cttl/2013/05/30/teaching-metacognition-through-critical-reflection-strategies-and-tools/

“Wrapper”

- An opportunity to reflect on your performance and how it could be improved.
- Tools developed at Carnegie Mellon to assist students with developing their metacognitive skills.
- Secondary task or requirement that accompanies an assignment or exam and asks students to reflect on their learning processes.

Bowen, J. (2013). Cognitive wrappers: Using metacognition and reflection to improve learning. Retrieved from http://josebowen.com/cognitive-wrappers-using-metacognition-and-reflection-to-improve-learning/

Exam Wrappers

TYPES OF QUESTIONS

- What did you do to prepare for the exam?
- Where did you make errors?
- What can you do differently to prepare for the next exam?

BENEFITS

- Easy to complete
- Are repeatable and flexible
- Can be used to help faculty adjust their teaching strategies and assist students in achieving learning outcomes
- Help students develop metacognitive skills:
  - Analyze own strengths and weaknesses
  - Identify study strategies that work
  - Adjust learning strategies

(Broken link redacted)

Sample Exam Wrapper

(Course Name) Self-Assessment & Reflection **Student Name:**

1. Approximately how much time did you spend preparing for this exam? _____
    a. What percentage of your preparation for Exam 1 was spent studying alone or with others?
        i. % alone: _____
        ii. % with others _____
2. What percentage of your test preparation time was spent in each of these activities?
    a. Discussing content with classmates/students in other sections _____
    b. Skimming the textbook _____
    c. Reviewing your notes _____
    d. Reading the textbook and other assigned readings _____
    e. Reviewing homework questions _____
    f. Reviewing graded quizzes _____
3. As you look over your exam, think about how and where you lost points. Estimate the percentage of points you lost due to the following:
    a. % Not understanding a concept or term _____
    b. % Not knowing how to begin the problem _____
    c. % Not knowing how to apply the right formula _____
    d. % Careless mistakes _____
    e. Other reason (Please Specify):
4. Based on your responses to the questions, list three things you might do differently. For instance, will you spend more time studying or try to sharpen a particular skill. (Please be specific.)
    a.
    b.
    c.
5. What can we do to help support your learning and prepare for the next exam?

Cycle of Metacognitive Process

Reflect-Pair-Share

Which of the steps in the cycle of metacognition are addressed by:

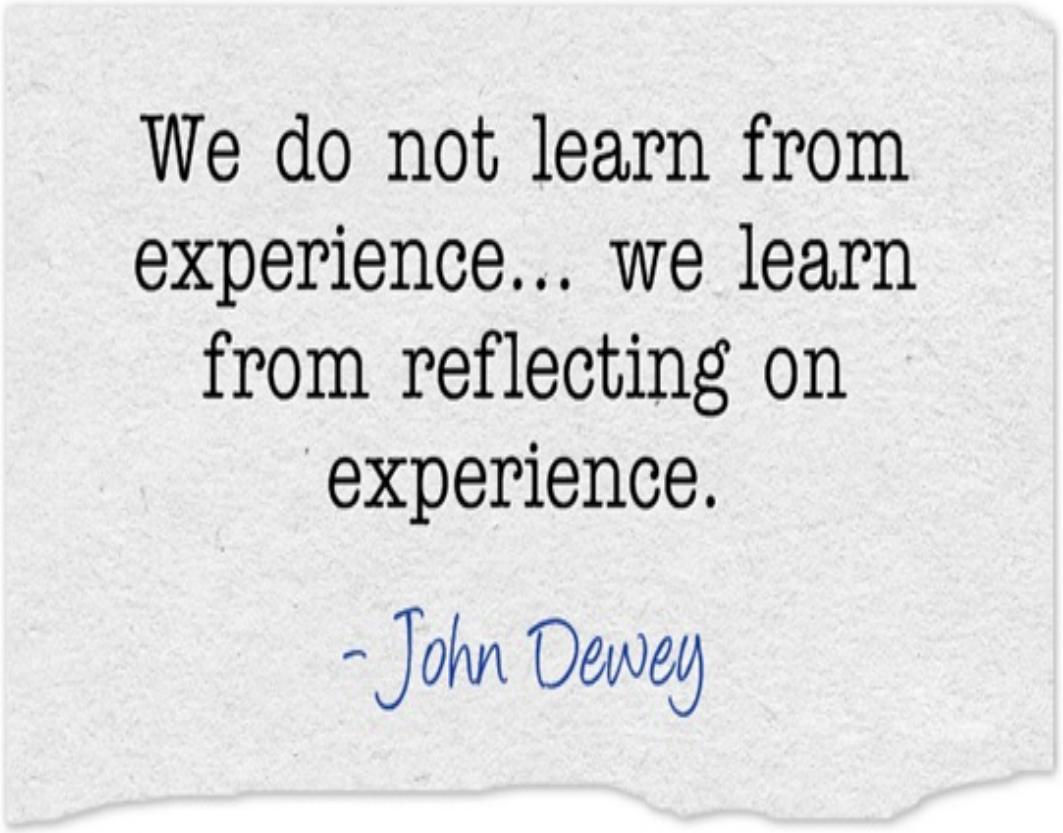
1) Peer Instruction Technique
2) Wrappers

Ambrose, S. A. (2010). *How learning works: Seven research-based principles for smart teaching*. San Francisco, CA: Jossey-Bass.

Reflect on what you learned today by completing the following statements:

The most important idea (concept) I learned in today's workshop was …

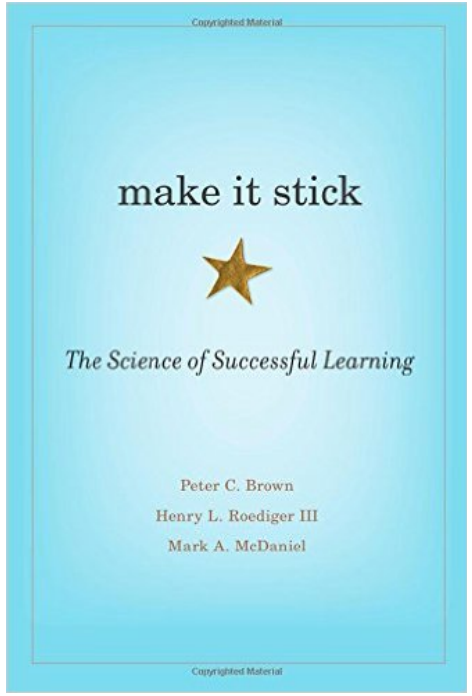
One way in which I can incorporate metacognition into my interaction with students is …

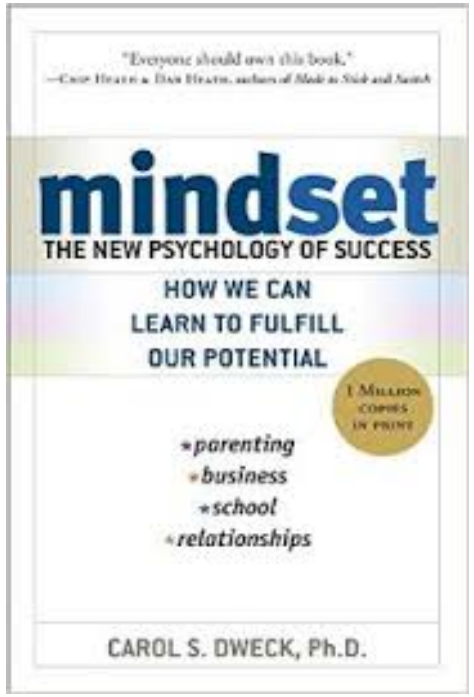


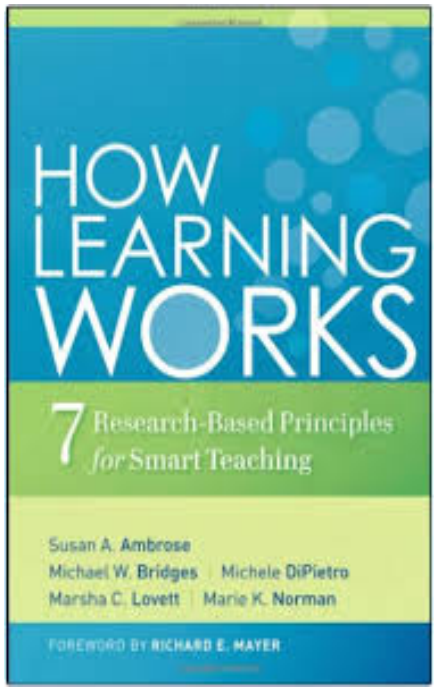
QUESTION EVERY POSSIBILITY

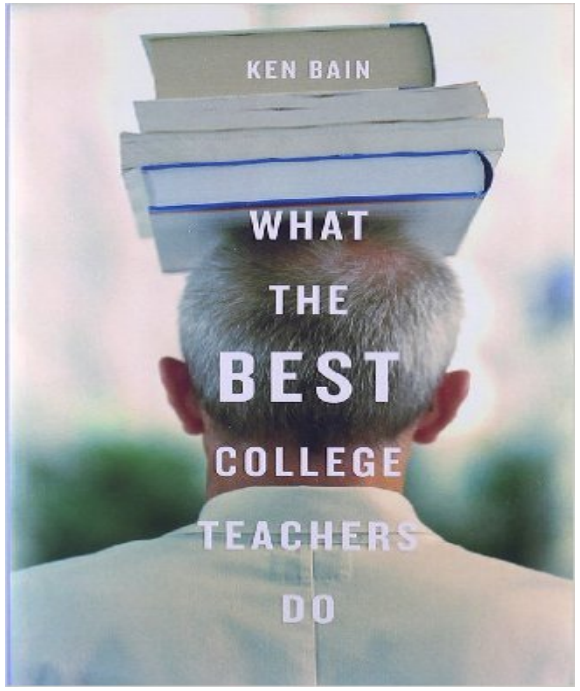
Think Critically

Book Resources









Video Resources

https://www.youtube.com/watch?v=dUqRTWCdXt4 (TED Talk on Metacognition)

(Broken Link Redacted) (APA Meta-studying: Teaching Metacognitive Strategies to Enhance Student Success)

Videos for students

http://www.samford.edu/departments/academic-success-center/how-to-study/ (short clips to teach students about effective study techniques)

(Broken Link Redacted) (Teacher study Guide to go with Videos for Students)

Resources

http://www.facultyfocus.com/articles/teaching-professor-blog/teaching-metacognition-to-improve-student-learning/

http://www.lifescied.org/content/11/2/113.full.pdf

http://www.improvewithmetacognition.com/

http://www.facultyfocus.com/articles/learning-styles/assessing-and-developing-metacognitive-skills/

https://matrix.scranton.edu/academics/ctle/

More resources

http://chronicle.com/article/MetacognitionStudent/130327/

http://www.facultyfocus.com/articles/effective-teaching-strategies/three-ways-to-help-students-become-more-metacognitively-aware/

http://www.slu.edu/blogs/cttl/2013/05/30/teaching-metacognition-through-critical-reflection-strategies-and-tools/

National Research Council (2001). Knowing what students know: The science and design of educational assessment . Washington, DC : National Academy Press.

Vickrey, T., Rosploch, K., Rahmanian, R., Pilarz, M., & Stains, M. (2015). Research-Based Implementation of Peer Instruction: A Literature Review. *CBE Life Sciences Education*, *14*(1).