



## Linking Classroom Assessment Techniques to the Research on How People Learn



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## Agenda

- An Overview/Introduction to Classroom Assessment Techniques (CATs)
- Placing Classroom Assessment within the Context of *How People Learn*
- Learning Principle One (Prior Knowledge) with CAT examples
- Learning Principle Two (Deep Foundational Knowledge Conceptually Based) with CAT examples
- Learning Principle Three (Metacognition) with CAT examples
- Conclusion



## Classroom Assessment Techniques (CATs)

can help teachers learn what students know or don't know or misunderstand.

- Learner-Centered
- Teacher-Directed
- Mutually Beneficial
- Formative
- Context-Specific
- Ongoing
- Rooted in Good Teaching Practice



--Angelo, T. & Cross, P. (1993) *Classroom Assessment Techniques*. 2<sup>nd</sup> Ed. San Francisco: Jossey-Bass.



## A Classroom Assessment Activity



## Matching Your Goals with Student Goals



Activity: Participants Identify Goals; Facilitator Shares Goals; and then Goal Ranking & Matching Exercise

What do you hope to get out of this session? Will it address your needs and expectations? This is a Classroom Assessment Technique (CAT) designed to help you identify your expectations and share them with the session leader--and each other. You'll also learn what the presenter's goals are for this session, and see how well those goals match yours. 1. On the lines in the left-hand column below, please list three or four goals you hope to achieve -- things you hope to learn or questions you hope to raise -- through participating in this lesson. Do they match?

Your Goals for this Session	Your Rankings	The presenter's?
_____	_____	YES NO
_____	_____	YES NO
_____	_____	YES NO
_____	_____	YES NO
_____	_____	YES NO

2. Now, using the middle column above, rank your goals in terms of their relative importance to you. Make the most important goal #1, the next most important #2, and so on.

3. As you hear the presenter's goals, circle "Yes" in the right-hand column next to each of your goals which matches one of those listed. If you end up with goals that the presenter has not mentioned, circle "No" next to them.

4. Prepare to talk about any important goals you have which are not included in the presenter's list of goals and/or to ask questions about those goals.

Reference: Angelo, T.A. & Cross, K.P. *Classroom Assessment Techniques: A Handbook for College Teachers*, 2nd edition. San Francisco: Jossey-Bass, 1993, pp. 290-294.

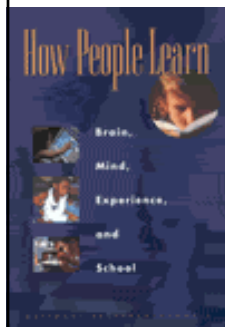


## Goals of this Presentation

Participants will:

- Experience some active learning, student-centered techniques that emphasize embedded classroom assessment feedback;
- Link classroom assessment techniques to some of the research on "How Students Learn";
- Reflect on the nature and value of classroom assessment techniques as they apply to their own courses;
- Enjoy sharing ideas with creative colleagues.





### How People Learn: Brain, Mind, Experience, and School

John D. Bransford, Ann L. Brown,  
and Rodney R. Cocking, *editors*  
Committee on Developments in the  
Science of Learning  
Commission on Behavioral and Social  
Sciences and Education  
National Research Council

NATIONAL ACADEMY PRESS  
Washington, D.C. 1999

[http://www.nap.edu/html/howpeople1/  
notice.html](http://www.nap.edu/html/howpeople1/notice.html)

**Three findings . . . have a  
solid research base to  
support them and strong  
implications for how we  
teach.**

—Bransford, Brown, & Cocking, Eds. How  
People Learn: Brain, Mind, Experience, and  
School.



### Three Key Learning Principles

- Prior Knowledge:** Students construct new knowledge based on what they already know (or don't know);
- Deep Foundational Knowledge:** Students need a deep knowledge base and conceptual frameworks;
- Metacognition:** Students must identify learning goals and monitor their progress toward them.



**Learning Principle #1**  
**The contemporary view  
of learning is that  
people construct new  
knowledge and  
understandings based  
on what they already  
know and believe.**



### Teaching/Learning Implications from Key Finding #1

It is critically important to learn where your students are and what they already know or don't know, including their misconceptions.

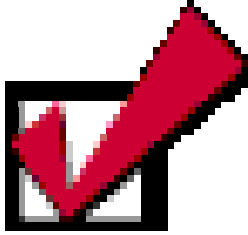


Run, Forrest, Run!



© 1994 Paramount Pictures

## Assessing Interest and Prior Knowledge



- **What do you want to learn about? What Questions do you have?**
  - Prior to new chapter, students submit questions / preconceptions about upcoming material.

Law 220 Bio Sheet  
(from Capt Ratna Contractor, US Air Force Academy)

- Name: \_\_\_\_\_
- How you would like me to address you: \_\_\_\_\_
- Hometown: \_\_\_\_\_
- Finish the following sentence: I came to this institution because \_\_\_\_\_  
\_\_\_\_\_
- Career field choice once you graduate: \_\_\_\_\_
- Extra Curricular Activities (my goal is to try and get out and watch each of my students doing "their thing"—I'm not always successful, but what are you doing that I should come to watch?): \_\_\_\_\_
- Favorite book & movie: \_\_\_\_\_
- The best teacher I've had at this institution did these three things: \_\_\_\_\_
- One thing I would like to learn about is: \_\_\_\_\_
- Have you had any first hand experience with the law? If so, and you are so inclined, please share your story: \_\_\_\_\_  
\_\_\_\_\_

## Background Knowledge Probe

(Can be as simple as a diagnostic quiz)

Purposes

- (For students) BKP's highlight key information to be studied, offering both a preview of material to come and a review of prior knowledge;
- (For teachers) BKP's help determine the best starting point and the most appropriate level for a lesson;
- (For both) BKP's can be used for pre and post-lesson feedback of learning.

(BKP) Please respond to the following questions:

- How familiar are you with Angelo and Cross's Classroom Assessment Techniques: A Handbook for College Teachers?
- How do you determine if students are learning what you think you are teaching?

## Focused Listing Metacognition

## Focused Listing

- **Purpose:** This tool helps determine what learners recall about a specific topic, including the concepts they associate with the central point. Working in pairs can help students build their knowledge base and clarify their understanding. This technique can be used before, during, or after a lesson.
- **Steps:** Ask students to write the key word at the top of a page and within a set time limit (usually 2-3 minutes) to jot down related terms important to understanding that topic.



### Assessment of Focused Listing:

Compare students' lists with a master one you have generated, looking at both the quantity and quality of their responses. Categorize responses into "related" or "unrelated" or "appropriate" or "inappropriate" stacks. Consider compiling a master list and having students then sort them by categories.



### Focused Listing Applications in Various Disciplines

Jot down relevant associations with the following:

- Antenna
- Symbolism
- Astronaut
  - Myth
- Reinforcement
- Corporation
- Random Distribution
- Electrical Circuits
  - Momentum
  - Bonding



### Other Low-Preparation CATs: Directed Paraphrasing

- Students put into their own words key concepts or parts of a lesson for a specific audience or purpose (e.g., Explain the concept of "corporation" to high school students; Explain an "irrevocable trust" to a group of retirees);
- The responses can be sorted as "confused," "minimal," "adequate," or "excellent."



### Application Cards

- Students give one or more real-world applications for an important principle, generalization, theory, or procedure.
  - Examples:
    - (Business) Stephen Covey recommends "Win-win performance agreements": give two specific applications, one related to current news and one related to your own life.
    - (Law) Give a concrete example of the concept "due process."
- The responses can be sorted as "unacceptable," "marginal," "adequate," or "excellent."



### Other Low-Preparation CATs: John Hertel's "Key Principle and Rethinking"

- Prior to a discussion, have students identify a key concept/principle in the material presented, such as a mini-case in business law or the theme of a short story;
- Conduct the discussion;
- Have students restate the key concept/principle, changing their minds or restating the original response;
- Combine and compare results with your response. Offer feedback to the class.



John Hertel's "Key Principles and Restating"

Comedy Cottage

Key point = whether the manager violated the duty loyalty and competition by opening his business in the same location

Key point = issue injunction to stop lease order to prevent him from competing in the comedy club business within a certain distance

Comedy Cottage

No idea what this case is about. Don't remember.

One principle is that of loyalty. In a corporation you are required to be loyal and not take their secrets and go create you own business (copy cat)

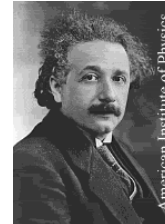


## Directed Paraphrasing Application Card “Key Principle and Re-Thinking” Applications in My Discipline:



## Knowledge Surveys

[http://www.isu.edu/ctl/facultydev/KnowS\\_files/KnowS.htm](http://www.isu.edu/ctl/facultydev/KnowS_files/KnowS.htm)



## Physics 371 Knowledge Survey: Dr. Dolores Knipp, USAFA

*Instructions: This is a knowledge survey rather than a test. Be sure to fill in your name and SSN. The purpose of this survey is to evaluate the change produced in your knowledge of astronomy and astrophysics by this course. You will answer the same questions again near the end of the course. Mark the first response if you feel confident that you can answer the question or perform the task indicated. Mark the second response to the question if you can now answer 50% of the question or you know precisely where you could get the information in 30 minutes or less. Mark the last response if you are at a loss as to how to answer the question. Do not try to actually answer the questions.*

**Briefly describe Kepler's three laws of orbital motion.**

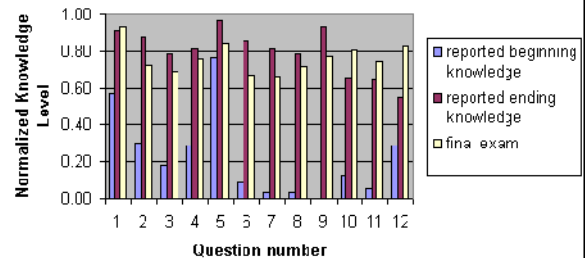
- I know this
- I know at least 50% of the answer or know exactly where to find the answer
- I don't know

**How are absorption and emission lines produced in a stellar spectrum? What information might absorption lines in the spectrum of a star reveal about a cloud of cool gas lying between the star and us?**

- I know this
- I know at least 50% of the answer or know exactly where to find the answer
- I don't know



## Comparison of Reported Knowledge With Performance on Final Exam



## Just in Time Teaching (JiTT)



<http://webphysics.iupui.edu/jitt/jitt.html>



## Learning Principle #2

To develop competence in an area of inquiry, students must:

- (a) have a deep foundation of factual knowledge;
- (b) understand facts and ideas in the context of a conceptual framework;
- (c) organize knowledge in ways that facilitate retrieval and application.

The National Teaching & Learning  
**FORUM**

Rhem, James. (1995). Deep/Surface Approaches to Learning: An Introduction. The National Teaching and Learning Forum, (5) 1, pp. 1-4.

<http://www.ntlf.com/html/pi/9512/article2.htm>

### Key Elements that Foster a Deep Approach to Learning

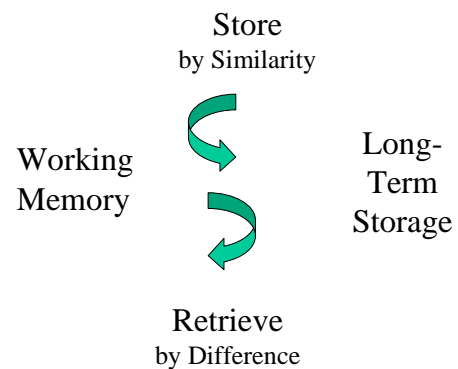
- **Motivational Context:** Students' motivation is intrinsic, and they experience a need to know something.
- **Active Learning:** Students are actively involved, rather than passive.
- **Interaction with Others:** There are opportunities for exploratory talk.
- **A Well-Structured Knowledge Base:** Content is taught in integrated wholes and related to other knowledge, rather than presented in small separate pieces.

—Oxford Center for Staff Development

### Preclass Assignments (Homework)



Use homework assignments to get students involved with the material and to foster repetition that will strengthen useful synapses.



### Graphic Organizer as CATs

A diagram to organize information in a visual format that suggests relationships.

“Helping students to organize their knowledge is as important as the knowledge itself, since knowledge organization is likely to affect students’ intellectual performance.”

—Bransford, Brown, & Cocking, Eds. How People Learn: Brain, Mind, Experience, and School.



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<http://curry.edschool.virginia.edu/go/edis771/notes/graphicorganizers/graphic/>

**ETP**  
 Educator's Teaching Program

### What are the differences between Greek Drama?

Similarities

	Tragedy	Comedy
Characters		
Endings		

**ETP**  
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### What are the differences between these two types of assessments?

Formative	Summative

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Students' understanding of and ability to use knowledge is enhanced by:

- Presenting students with explicit guidance in identifying similarities and differences;
- Asking students to independently identify similarities and differences;
- Representing similarities and differences in graphic or symbolic form.

Identification of similarities and differences—a highly robust activity—can be accomplished in many ways.

Marzano, R. J., Pickering, D. J., Pollock, J. E. (2001). *Classroom Instruction that Works*. Alexandria: ASCD, p. 62.

**ETP**  
 Educator's Teaching Program

### Applications for Comparison/Contrast in other Disciplines

- Literature: How are Antigone and Creon alike?
- History: What are the similarities between the Revolutionary War and the Civil War?
- Biology: What are the differences between mitosis and meiosis?
- Psychology: What are the differences between schizophrenia and manic-depressive?

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### Learning Principle #3

**A “metacognitive” approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.**

**ETP**  
 Educator's Teaching Program

### Teaching/Learning Implications from Key Finding #3

“The teaching of metacognitive skills [“thinking about thinking”] should be integrated into the curriculum in a variety of ways.”

—Bransford, Brown, & Cocking, Eds. *How People Learn: Brain, Mind, Experience, and School*.

**Teaching/Learning Implications**

Metacognitive approaches use strategies such as “teaching and modeling the process of generating alternative approaches, . . . evaluating their merits in helping to attain a goal, and monitoring progress toward that goal.”

--Bransford, Brown, & Cocking, Eds. [How People Learn: Brain, Mind, Experience, and School.](#)


**Chain Notes**

**Steps:** On a large envelope print a question and directions for responding. Include blank index cards. Explain the procedure to students.

**Possible Questions:** What exactly were you doing the minute or so before this reached you? What were you paying attention to?

**Punctuated Lectures**

- Listen
- Stop
- Reflect
- Write
- Give Feedback



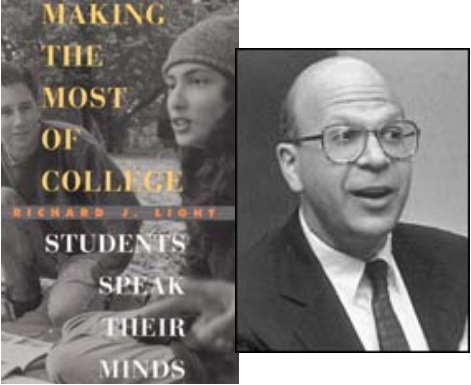
**Possible Questions**

- How fully and consistently were you concentrating on the lecture during these few minutes? Did you get distracted at any point? If so, how did you bring your attention back into focus?
- What were you doing to record the information you were receiving? How successful were you?
- What were you doing to make connections between this “new” information and what you already know?
- What did you expect to come next in the lecture and why?

**Study Time Logs**



**MAKING THE MOST OF COLLEGE**  
RICHARD J. LIGHT  
**STUDENTS SPEAK THEIR MINDS**





## Classroom Opinion Polls on Course-related Issues

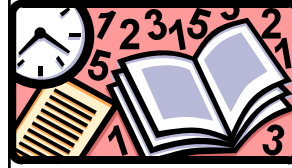
Can be posed as a Likert scale, multiple choice, short answer, etc.

Quick Poll:

- How many believe that classroom assessment techniques can improve student learning?
- How many have learned something useful during this workshop?



## Minute Paper



- What was the most important thing you learned during this session?
- What important question remains unanswered?



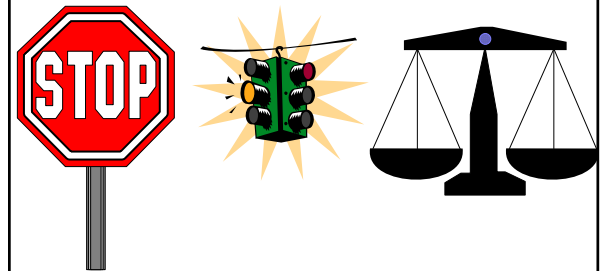
## Minute Paper for Papers

Before students hand in their papers, they answer questions or complete sentences such as the following:

- I'm most satisfied with, I'm least satisfied with ... I'm having problems with ...
- In writing this essay, what did you learn that surprised you? When editing your paper, what were you unsure about?
- What changes would you make to this assignment?
- This lesson/assignment is important to my role as an Air Force officer because...



## Stop-Start-Continue



## Some General Things to Remember about CATs:

- Don't ask if you don't want to know;
- Feedback to students is essential;
- Adapt, don't adopt;
- Use CATs creatively and responsibly to reinvigorate your teaching and your students' learning!

—Modified from Angelo and Cross



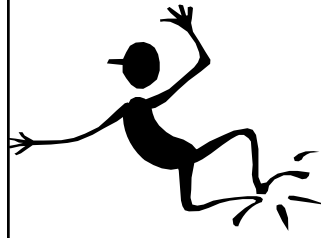
## The Good News for Teachers and Students:

“There is no universal best teaching practice. If, instead, the point of departure is a core set of learning principles, then the selection of teaching strategies . . . can be purposeful.”

—Bransford, Brown, & Cocking, Eds. [How People Learn: Brain, Mind, Experience, and School.](#)

## Three Key Learning Principles (Review: Applications)

- Prior Knowledge:** Learn what students know and don't know and discover their misconceptions;
- Deep Foundational Knowledge:** Provide the conceptual framework and organize knowledge in ways that facilitate retrieval and application;
- Metacognition** ("Thinking about Thinking"): Help students identify learning goals and monitor their progress toward them.



The  
End!

Happy Teaching!