

Classroom Assessment Techniques (CATs)

Descriptions and Samples

The Minute Paper

The **Minute Paper** is the single most commonly used classroom assessment technique. It really does take about a minute and, while usually used at the end of class, it can be used at the end of any topic. Its major advantage is that it provides rapid feedback on whether the *instructor's* main idea, and what the *students* perceived as the main idea, are the same. Additionally, by asking students to add a question, this assessment becomes an integrative task. Students must first organize their thinking to rank the major points and then decide upon a significant question. As we quickly realize, really good questions are hard to formulate.

Students need not necessarily be asked to list the most important or main point of a session. Sometimes an instructor may wish to probe for the most disturbing or most surprising item. The Minute Paper is creatively variable to match the teaching/learning environment.

The Minute Paper assists students to organize a "chunk" of information and reduces the threshold for expressing ignorance by making it easier (and more private) to ask a question. Minute Papers generally provide positive reinforcement for the instructor and have the added surprise that students DON'T all have the same questions. Instructors can read about four Minute Papers per minute.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p.148-53.

Sample: The Minute Paper #1

In concise, well-planned sentences, please answer the two questions below:

1. What are the two [three, four, five] most significant [central, useful, meaningful, surprising, disturbing] things you have learned during this session?
2. What question(s) remain uppermost in your mind?

Sample: The Minute Paper #2

What was the most useful or meaningful thing you learned from this assignment?

(Explain in no more than 100 words)

Sample: The Minute Paper #3

In your own words, explain the major point in this assignment.

Write the question related to this assignment that you would like to have answered in class.

Sample: The Minute Paper #4

What was the most interesting idea for you in the assignment?

In your opinion, what aspect of the assignment is most important for me to clarify in class?

Chain Notes

- Compose a question which will help you and your students capture a moment in their mental activity.
 - Make sure the question can be answered quickly by all students.
 - On a large envelope, print the question, directions, and enough index cards or slips of paper for each student.
 - At the beginning of class, announce what you are doing and why -- emphasize the importance of waiting until the envelope arrives and of writing quick honest anonymous responses. (For instance: just before this arrived, what were you paying attention to?)
 - Start the envelope.
 - Summarize the results and discuss them.
-

Memory matrix

- Draw a simple matrix with row and column headings or distribute in a handout.
- Fill in yourself using course information.

- Make a handout with rows and columns filled in; copy on the board or overhead.
- Tell students to fill in. Give them a minimum number per cell (three is better than one, which might stymie them as they search for the one right answer).
- Collect and assess.

Adaptations:

Categorizing Grid

Provide the row and column labels and answers in a scrambled format and have students place them in the right cells.

Pro and Con Grid

Focus on a decision or judgment dilemma. Prompt students to take a certain perspective and tell them how many responses you want.

Directed Paraphrasing

The **Directed Paraphrase** asks the student to summarize in well-chosen words a key idea that has been presented during the current class period or the one just past. The *paraphrase* part requires the student to generate a new way to express the concept. The *directed* part specifies the [virtual] audience to whom the paraphrase is directed, thus revealing whether the student understands the concept within the specified framework. A nursing student might be directed to paraphrase the concept of drug clearance by the kidneys to a worried patient. An economics student might be directed to paraphrase a point of tax policy to a corporate CEO. A philosophy student might be directed to paraphrase an ethics concept so that it is readily understood by a teenager. The twin challenges are *brevity* and *choice of language* to match the needs of the specified audience.

An instructor can collect and scan perhaps 70 Directed Paraphrases in about 10 minutes after class to assess whether students understand the concept and can translate it into appropriate terms.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 232-5.

Sample: Directed Paraphrasing

In 1-3 clear, concise sentences, please write your definition of *classroom assessment*, or at least what you think it should be. Construct a definition that would make sense to your faculty colleagues regardless of their academic disciplines.

Classroom Assessment is:

Assessing Group Effectiveness

The synergy possible in a group is remarkable. Frequently, students, workers in a corporation, instructors, and managers could do much more to cultivate that synergy. There is a need, early and overtly, for **Assessing Group Effectiveness** in order to place individual personalities in perspective, value the differences that arise, and meld diverse approaches into effective teamwork. *The most effective groups are the ones where everyone understands their unique jobs and then (of course) does them.*

This assessment technique focuses on the group task, not on its members. It asks group members individually and anonymously to identify their sense of the task(s) before them, explain the organization they see as necessary to accomplishing the task, and reflect on the diversity of talents and effectiveness of teamwork required to conclude the task successfully. The assessment should be undertaken early --- within a couple weeks of the group's formation. Ideally, the completed assessment forms circulate within the group, become the focus of constructive discussion, and are summarized by the group in a formal, written, one-page report. An instructor's role in providing feedback might consist of meeting with the group and orally reinforcing points of agreement and congruence, but identifying inconsistencies and differences as well. Responsibility for adjusting behavior to increase effectiveness rests with the group, not with the instructor. The entire process can be repeated later in the semester, especially if a group is having difficulty.

It is important to recognize that there is no assigned praise or blame here; individual group members are not asked to render judgment on anything beyond their own self-effectiveness. Nevertheless, this assessment method works best when trust, honesty, and courtesy are high.

An instructor might conduct an end-of-the-semester **Minute Paper** assessment focused on the groupwork experience ---or perhaps do something more complicated and detailed--- in order to gain summary knowledge of how each group viewed its own effectiveness, internal interactions, sense of fair play, enjoyment, and grades.

----after C.J. Walker, 1995. *Assessing group process: Using classroom assessment to build autonomous learning teams*, Assessment Update 7(6), Nov./Dec., p 4-5.

Sample: Assessing Group Effectiveness

Please answer all questions below from your own perspective. If you cannot answer a question, please state briefly why the information is unavailable.

1. What specific goal(s) is this group trying to accomplish? Please list the goal(s) in *your* priority order. Do you think the group basically agrees on the contents of this list?
2. What activities has the group specifically chosen to undertake or assign in order to achieve its goals? Which activities, if any, are particularly effective?
3. Does each group member have specific ---even unique--- responsibilities that help the group attain its goal(s)? List all group members by name and their individual responsibilities.

4. Do you find the work of your group stimulating and worth your time?

How many hours per week do you spend working with this group?

In the table below, enter the percentage of these hours spent in each category of effectiveness.

Very Effective	Effective	Marginally Effective	Not Effective

5. Does this group have the resources (*e.g.*, organization, communication, leadership, talents, time) to achieve its goals? What additional resources are needed for real effectiveness?

Background Knowledge Probe

Research suggests that, outside of socio-economic factors, the best predictor of student learning is what the student already knows before coming to class. Transference of knowledge from one domain to another is difficult. Students bring a lot of internalized old knowledge with them ---including their superstitions of how selves, societies, and solar systems operate. They glue new knowledge onto existing knowledge and, when it doesn't meld with the underlying structure, it often curls off when challenged like cheap veneer in a rain. The **Background Knowledge Learning Probe** assesses the mindset and language of students' private worlds. This allows the instructor to prepare a learning environment where the new knowledge is more likely to stick.

Background Knowledge Probes are about as hard to prepare as good multiple choice exams; they are also as easy to score. One needs only a few questions to sample students' predispositions, yet one shouldn't rely too heavily on what one probe reveals. Probes are useful at the beginning of individual topics as well as whole courses. The accompanying example in the right panel is from a second day Background Knowledge Probe of a 300-level general education bioethics course.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 121-5.

Sample: Bioethics Background Knowledge Probe

Instructions: For each term, concept, or principle below in bold print, please circle the letter that best mirrors your current knowledge or practice.

1. **Utilitarianism:**

- a. I have never heard of this term before.
- b. I have heard of this term before but I really don't understand what

it means.

- c. I have some idea of what this term means but I don't want to have to explain it.
- d. I have a clear idea of what this term means and can explain it.

2. Relative vs. Absolute Ethics:

- a. I have never heard of these terms before.
- b. I have heard of these terms before but I really don't understand what they mean.
- c. I have some idea of what these terms mean but the difference between them isn't clear.
- d. I have a clear idea of what these terms mean and can explain them both.

3. Genetic screening vs. genetic engineering:

- a. I have never heard of these terms before.
- b. I have heard of these terms before but I really don't understand what they mean.
- c. I have some idea of what these terms mean but the difference between them isn't clear.
- d. I have a clear idea of what these terms mean and can explain them both.

4. Basic (introductory college course) biological principles of genetics or ecology:

- a. I am unfamiliar with biological principles in both of these areas.
- b. I am somewhat familiar with biological principles in one of these areas.
- c. I am rather well acquainted with biological principles in one of these areas, but not both.
- d. I am somewhat familiar with biological principles in both of these areas.
- e. I am rather well acquainted with biological principles in both of these areas.

5. Personhood:

- a. I have never heard this term used before in an ethical sense.
- b. I have heard this term used in an ethical sense before but I really don't understand it.
- c. I have heard this term used in an ethical sense before and, if given time to think, could probably explain why it's important.
- d. I have a clear idea of what this term means and can explain its relevance to the bioethical issues of human and animal experimentation and abortion.

6. Ethics of teaching biology --- Evolution vs. creationism debate:

- a. I am unfamiliar with the debate.
- b. I know that the debate exists but am unfamiliar with the opposing

- arguments.
- c. I know that the debate exists and am somewhat familiar with the arguments.
- d. I am familiar with the debate and can explain the opposing arguments.
- e. I understand the debate and its arguments and can explain the bioethical issue involved.

Characteristic Features

Characteristic Features are those traits that help define a topic and differentiate it from others. This assessment technique is particularly useful for seeing whether students are separating items or ideas that are easily confused. By selecting especially critical differentiators, an instructor can both highlight and assess the students' use of analysis to help them characterize central concepts.

Because this assessment technique asks students to fill in blanks with plus and minus signs, scanning the results is easy and rapid; it is suitable for use in large classes. Even simple tallies will reveal the extent to which students are paying more attention to some traits and less attention to others.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 164-7.

Sample: Characteristic Features

Listed in the left-hand column below are features used to characterize or distinguish different approaches to the use of information in the classroom. Please place plus (+) signs where the features generally characterize either **Grades** or **Classroom Assessment**. Place minus (-) signs where the features are not characteristic.

Characteristic Feature	Grades	Classroom Assessment
1. More closely focused on improving learning and teaching rather than on recording results		
2. Used primarily at the end of a course or project		
3. Source material is usually collected anonymously		
4. Mostly quantitative and suitable for statistical analysis		
5. Directly mirrors student understanding of course material		
6. Emphasizes judgmental process and summative evaluation		
7. Results designed for official and external use		
8. Use of standardized and externally validated instruments preferred		
9. Requires training in research methods		
10. Results useful to instructors and students		

**"Correct" answers to
matrix in right panel**

- | | |
|--------|---------|
| 1. -/+ | 6. +/- |
| 2. +/- | 7. +/- |
| 3. -/+ | 8. -/- |
| 4. +/- | 9. -/- |
| 5. +/+ | 10. +/+ |

Goal Ranking and Matching

What do you, as a participant, hope to get out of a course, seminar, or workshop? What goals or expectations do you wish to satisfy? **Goal Ranking & Matching** is designed to help make goals and expectations visible to yourself and to assist you in discussing them with others, including the seminar presenter or course leader. If you do this exercise as a seminar presenter yourself, it also reveals the match between your goals and those of your audience.

This assessment is best done at or near the beginning of a course because it allows the instructor to adjust the syllabus explicitly to include student interests. Interested students get hooked, become active learners, and learn more. For this to be useful to an instructor, there must be a flexibility and willingness to ponder such questions as, "How well do student goals match with the those that the instructor thinks are most important?" "Are the instructor's goals significantly broader than those of the students?" "Do the students' estimates of difficulty, detail, and complexity match those of the instructor?"

An instructor can help students achieve some goals and connect them to the main course outline by incorporating special projects and group work into overall course design. And, if some goals just can't be realized, an early, honest response can align expectations in a positive way and prevent disappointments.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 290-4.

Sample: Goal Ranking & Matching

1. In the spaces below, please write 2-5 goals you hope to achieve ---specific things you want to learn--- by participating in this course or seminar.

What you want to learn?	Rank	Is it also the instructor's goal?	
		Yes	No
		Yes	No
		Yes	No
		Yes	No
		Yes	No
		Yes	No

2. Use the middle column to rank your goals in terms of their relative importance to you. The most important goal is ranked #1, the next most important #2, etc.

3. When you hear the presenter's goals, circle **Yes** in the right hand column next to each of your matching goals, regardless of rank. If you end up with goals left over, circle the appropriate **No** in the right hand column.

4. Prepare to mention or ask questions about any of your important goals that are not also in the presenter's list.

RSQC2

RSQC2 stands for **Recall, Summarize, Question, Comment, and Connect**. RSQC2 is an assessment device that encourages students to recall and review class information comprehensively. In so doing, it allows the instructor to compare students' perspectives against his or her own. Students who are less skilled at organizing information and applying it to the supporting foundation of the course ---or who are having difficulty figuring out the instructor's own perspective--- are among those most likely to benefit from this assessment.

RSQC2 works like this: Students take two minutes to *recall* and list in rank order the most important ideas from a previous day's class. Then they take another two minutes to *summarize* those points in a single sentence in order to "chunk" the information. Next, students are asked to write one major *question* that they want answered. Finally, students identify a thread or theme to *connect* this material to the course's major goal. As an option, students may add a *comment* regarding their confidence in or wariness of the specific course content.

RSQC2 is a powerful and multifaceted assessment tool that takes time to administer and evaluate. The *Recall, Summary, and Question* sections are amplifications of the Minute Paper (go one click back to main Classroom Assessment menu). The *Connect* feature is key because it forces students (and the instructor) to confront course structure. Exactly what is the relationship of this topic to the overall course plan? Why is this material important? Student feedback through RSQC2 may be crucial for aiding an instructor to identify where students really need help the most but get it the least --- on relationships between ideas.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 344-8.

Sample: RSQC2

Recall:

Summarize:

Question?

Comment:

Connect:

The Guided Essay

The **Guided Essay** is one way to make reflective judgment visible. Based on the Reflective Judgment Interview, the guided essay can be used to assess the assumptions that students use when trying to solve ill-structured problems (sometimes called *messes*). It yields feedback to students on the approaches they take when they deal with matters of real controversy and provides information to their instructors on the level of sophistication present as students define and defend their positions.

Less mature students may remain locked in an authoritarian model of learning. Others may be unwilling to admit that some opinions really are better than others and that their own cherished ideas may need to be replaced with something rationally superior. This assessment can make visible the notion that a really good argument, statistical or otherwise, is one that convinces a reasonable skeptic. In short, the assessment reveals the capacity of students consciously to integrate various parts of the curriculum that got them to this point.

The Guided Essay is not limited to topics involving statistics or research design. Because it relies upon a written response rather than an oral interview, it suffers from the usual shortcomings of student essays: Reluctance, resistance, and regurgitation. If one can get past these, however, the exercise reveals much about how students use ---or don't use--- other parts of the curriculum and how they are hindered by their assumptions.

The accompanying example is designed to foster critical thinking beyond mere number crunching in an upper division physiology course. Its purpose is to acquaint students with the interpretation of statistical results that appear in scientific inquiries of controversial issues and are used to support a conclusion. The statistics themselves can be very elementary. This assessment requires the instructor to read one-page essays and, therefore, its use requires an appropriate commitment of time.

---P.K. Wood and C.L. Lynch, 1998. *Campus strategies: Using guided essays to assess and encourage reflective thinking*. Assessment Update 10(2) (March-April): 14-5.

Sample: The Guided Essay

The purpose of this Guided Essay is not to uncover how much you know or whether you think there is a single right answer. Rather, its purpose is acquaint you with the assumptions that you bring with you when you approach a controversial question. Please answer the questions in an integrated essay (don't just answer question #1, #2, #3...) that is no longer than one, printed, single-spaced manuscript page. Focus on the issue and on clear exposition rather than on the rules of composition.

Consider an obstetrical researcher interested in the relationship between maternal nutrition and the appearance of gestational hypertension. The researcher acquires both a nutritional inventory and maternal blood pressures during pregnancy, delivery, and recovery. The correlation coefficient between the two sets of measurements is .6 at a level of statistical significance of .01.

Guided Essay Questions

1. Does this study convince you that gestational hypertension is related to maternal nutrition? On what do you base your opinion and conclusion?
2. Reconsider: How *confident* are you that your conclusion is correct?
3. Could people *reasonably* disagree with your conclusion regarding the relationship of gestational hypertension to maternal nutrition?
4. Suppose two people *do* disagree. Is the relationship of gestational hypertension to maternal nutrition simply a matter of opinion, with neither opinion being any better or any worse than the other? Or is one really right and the other really wrong?
5. Could experts *in this discipline* reasonably disagree about whether this study shows that gestational hypertension is related to maternal nutrition?
6. Could experts *in statistics* reasonably disagree about whether this study shows that gestational hypertension is related to maternal nutrition?
7. Do *you* recommend that a researcher in obstetrics consult an expert in statistics about the results of this study? Why so?
8. Reconsider your own comments, the purpose of this course, and the guided essay itself. To what degree is this exercise appropriate for an upper-level physiology course? Is this guided essay both comprehensive and focused? Does it ignore ideas essential to your understanding whether gestational hypertension is related to maternal nutrition? Does what you have learned about statistical inference and research design give you new insight into this question? What other topics in this course would you likely find more understandable if accompanied by a similar approach?

The Muddiest Point

The concept of the **Muddiest Point** arose when Harvard's Professor Mosteller, after 42 years of distinguished teaching in statistics, figured that no matter how polished they seemed, some classroom explanations could still be improved. So he asked his students to write down what was *least* clear to them. Actually, asking students to identify that which is least understood is an interesting and potentially powerful integrative exercise because it requires students, first, to rate their own understanding across several topics and, second, to ponder, if even momentarily, *why* one particular topic should be selected as *least* understood.

The Muddiest Point assessment should be used with discretion. Focusing on muddiest points too often can be discouraging for both students and instructors because of the tendency to emphasize the negative.

Instructors can collect and scan perhaps 100 Muddiest Points in 15 minutes. If 25% of the class mentions the same Muddiest Point, the instructor might want to schedule added class

time on the subject. At a 20% threshold, the instructor might want to focus a tutorial on it. At a 15% level, the instructor might distribute an explanatory handout.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 154-8.

Sample: The Muddiest Point

What has been the "muddiest" point so far in this session? That is, what topic remains the least clear to you?

Transfer and Apply

Transfer & Apply is an *intentional* way of prompting members of a class or audience to recognize ideas they have learned and consciously *transfer* them to applications in their own environment. Transference of learned material is recognized as one of the hardest cognitive achievements. A good (and expensive!) education can fall off like a poorly attached veneer if students don't practice thinking about how what they've learned applies to situations outside of the site where they learned it. The need for this practice fits every discipline and students of all ages and abilities!

One Chinese proverb goes something like, "Given a person a fish and he eats for a day; teach him how to fish and he eats for a lifetime." Without doubt, many principles of freshwater stream fishing can be applied (that is, they transfer) to deepwater ocean fishing. The number of people who do not readily see which ones and how is amazingly large.

If the theory or principle taught in class is complex, students may generate applications more successfully by working in pairs or small groups.

An instructor can scan perhaps four Transfer & Apply assessment forms per minute to see whether students are grasping the theory or principles taught in class. Audiences with maturity and experience are particularly able to benefit from taking time to Transfer & Apply. Collecting their responses is not necessary.

---T.A. Angelo and K. P. Cross, 1993. *Classroom Assessment Techniques*, 2nd ed. San Francisco: Jossey-Bass., p. 236-9.

Sample: Transfer & Apply

Please take a moment to recall ideas, techniques, strategies, and tactics we've discussed --- plus those you've thought up--- to this point in the session. Quickly list as many possible applications as you can. Don't filter or censor yourself; these are possibilities. You can always assess the practical nature and evaluate the desirability of these applications to your own classroom/lab/studio/home environment later.

<p>Write some intriguing ideas, techniques, strategies, and tactics from this session.</p>	<p>Write some possible applications to my own classroom/lab/studio/home.</p>
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