Instructional Delivery Techniques & Checking for Understanding Tactics

** denotes assessment method. Note: Assessment methods are classroom assessment techniques (CATs) - typically ungraded, in-class techniques to check understanding.*

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Appendix

Classroom Assessment Techniques

Think-Pair-Share*

How Does It Work?
1) Think. The teacher provokes students' thinking with a question or prompt or observation. The students should take a few moments (probably not minutes) just to THINK about the question.
2) Pair. Using designated partners, nearby neighbors, or a deskmate, students PAIR up to talk about the answer each came up with. They compare their mental or written notes and identify the answers they think are best, most convincing, or most unique.
3) Share. After students talk in pairs for a few moments (again, usually not minutes), the teacher calls for pairs to SHARE their thinking with the rest of the class. She can do this by going around in round-robin fashion, calling on each pair; or she can take answers as they are called out (or as hands are raised). Often, the teacher or a designated helper will record these responses on the board or on the overhead.

Why Should I Use Think-Pair-Share?
We know that students learn, in part, by being able to talk about the content. But we do not want that to be a free-for-all. Think-Pair-Share is helpful because it structures the discussion.

Students follow a prescribed process that limits off-task thinking and off-task behavior, and accountability is built in because each must report to a partner, and then partners must report to the class.

Because of the first stage, when students simply THINK, there is Wait Time: they actually have time to think about their answers. Because it is silent thinking time, you eliminate the problem of the eager and forward students who always shout out the answer, rendering unnecessary any thinking by other students. Also, the teacher has posed the question, and she has EVERYONE thinking about the answer, which is much different from asking a question and then calling on an individual student, which leads some students to gamble they won't be the one out of 30 who gets called on and therefore they don't think much about the question. Students get to try out their answers in the private sanctuary of the pair, before having to "go public" before the rest of their classmates. Kids who would never speak up in class are at least giving an answer to SOMEONE this way. Also, they often find out that their answer, which they assumed to be stupid, was actually not stupid at all...perhaps their partner thought of the same thing. Students also discover that they rethink their answer in order to express it to someone else, and they also often elaborate on their answer or think of new ideas as the partners share. These, it seems, are powerful reasons to employ Think-Pair-Share in order to structure students' thinking and their discussion.

More info on Think-Pair-Share here.

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Turn and Talk*

How does it work?

1. Question
Pose a question or prompt for students to discuss and tell them how much time they will have. A one-to-two minute discussion is most productive.

2. Turn
Have students turn to a specific partner. Pair students using *Eyeball Partners, Shoulder Partners, or Clock Partners* (see variations below). Partner assignments should be set up beforehand so that students can quickly and easily pair up.

3. Talk
Set a timer for the allotted time, and have students begin discussing the assigned question or prompt. When time is up, ask partners to share thoughts and ideas from their discussion.

Here is a video of a teacher using turn-and-talk in action.

When to Use

Use Turn and Talk at any time during a lesson to encourage accountable talk:

- As a warm-up activity to discuss previous lesson or homework assignment
- After five to seven minutes of oral or written input, to help student process what they have just heard or read
- During class discussions as a way for students to discuss ideas before sharing them with the class
- As a closing activity so that students can review what was learned in the lesson
- As a clarification tool for a complex problem or new guiding question posed by the teacher

More info on Turn and Talk.

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Stop and Jot*

How does it work?

1. Stop
Ask students to create a place where they will be taking notes for the day - this could be in evernote, a notebook, or a standard form you're using for your class. This will serve as their "stop box."mon

2. Jot
At least once during a lesson, stop and ask an important question for students to respond to in their "stop box."

3. Share
Reconvene and ask volunteers share one or two responses with the whole class, or model your own response. These boxes also help students later by serving as a study tool, highlighting

important information about the topic.

When to Use

Use Stop and Jot at any point in the lesson to provide processing time and note-taking assistance for students:

- Before introducing new material to activate prior knowledge
- Before a new lesson to help assess what students already know
- During the middle of a lesson to provide opportunity for students to make sense of the material
- During a lesson as a check for understanding
- After the lesson to provide closure, check understanding, and clarify any misunderstandings

Variations

Jot-Pair-Share
Similar to *Think-Pair-Share,* a student jots down his or her own thoughts, pairs with a partner to exchange ideas, and then partners share their ideas with the rest of the class.

Quick Jot
Students are given between 60 to 90 seconds to respond to a given question or statement posed by the teacher.

More info on Stop-and-Jot.

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Wait Time

How does it work?
When asking the class a discussion question, be sure to wait for the response. It is a good idea to wait a minimum of six seconds for students to formulate their answers. The silence is uncomfortable for students and it is likely that someone will provide an answer.
Joan's note: after waiting for response and not getting any answers you can repeat the question and ask someone specific for an answer. Use your intuition to choose a good candidate using cues such as facial expression or body language.

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Give me Five

How does it work?
When asking a discussion question, tell the class that you want at least five answers. When the first student provides an answer, say "That was a good start, give me another answer." Continue until you get at least five answers. Make sure to have enough wait time to get responses. This is a good technique to engage more students in the discussion. You can also

say, “I would like answers from students who have not had the opportunity to participate yet today.”

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Fist to Five*

How does it work?

At key points throughout the lecture, take the pulse of the class by asking students to give you a “fist to five” about how well they understand the concept. Students put up five fingers if they really understand, a zero if they have no idea what’s going on, etc. For adults, feel free to frame for them that even though they might feel a bit silly at first, this will give you a quick assessment of how well they get it and will help you tailor the lesson for their class.

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The Rule of Ten and Two

How does it work?

For every ten minutes of lecture, students should have at least two minutes to talk to each other about what is being presented. Here is an analogy to think about. A college lecture is like a stick of gum. It is only when students chew the gum that they get something out of it. It is important for students to interact with the material in order to retain the information and become engaged in learning.

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60-60, 30-30

How does it work?

In this discussion technique, students are asked to find a partner. They decide who is number one and who is number two. Number one must talk about the topic for 60 seconds without stopping. No questions can be asked during this time. Then student number two must talk about the topic for 60 seconds without repeating the ideas discussed by number one. Again no questions are asked. Then student number one responds or adds to the discussion for 30 seconds. Then student number two does the same. The instructor asks for five students to stand and share ideas with the group. The instructor can facilitate the volunteering by circulating around the room and listening in on the groups. When the instructor hears a good idea, he or she asks the student to report on their ideas at the end of the discussion. This technique also works well for reviewing a topic.

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Something I Have Learned and Something I Can Use*

How does it work?

Use this activity at the end of class. Have students find a partner for discussion. Have students

decide who is number 1 and who is number 2 in the discussion pair. Student number 1 discusses for 30 seconds something they have learned and something they can use. Student number 2 discusses the same question for 30 seconds. Then there is open discussion for one minute. Ask for volunteers to share with the class what they have learned and how they can use it.

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Preview the Topic

How does it work?

Briefly introduce a topic for discussion. Divide students into groups (4-5 students per group) and ask them to brainstorm everything they know about the topic. Appoint a recorder and a reporter for each group. The recorder takes notes on the ideas. The reporter shares ideas with the class.

Have each group share one idea and then go to another group. Once an idea has been presented, it cannot be repeated by other groups. Alternate groups until there are no more new ideas. This is a great starting point for discussion and provides the background for presenting new ideas. Here is an example:

How should students prepare for a group WDI project?

In this example, students would share ideas with the small group. Then reporters would share the best ideas with the class. The instructor would use the discussion as an introduction to the topic of working effectively in a group in order to create a good project, and add ideas and a summary to the discussion.

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Begin the Class with a Check- in*

How does it work?

Spend a couple of minutes at the beginning of the class with one of these questions:

- What is something good that happened to you since the last class?
- What is distracting you from being fully present is class today?
- Do you have any news to share with the class?

Ask for volunteers to answer the question. The Check- in has several good outcomes:

1. The instructor gets to know students in the class. The atmosphere in the class is more personal.
2. This is motivating for some students.
3. The instructor knows about problems that students are facing.

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Stand Up if You Agree*

How does it work?

Ask students to stand up if they agree with a statement or reverse the procedure and have students stand up if they disagree. This gets students out of their seats and focuses their attention on the discussion.

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Think Pair Share Variations*

How does it work?

Think-Tweet/Hipchat-Share: Students think of response and then generate a Tweet, or 140 character representation of a Tweet.

- Rather than Twitter students could use Today's Meet or hipchat.
- The Today's Meet/hipchat back channel could be Tweeted out by teacher to include global sharing and perspectives.

Think-Text-Share: If students are allowed to use cell phones in class, rather than verbally pairing their ideas they could text each other. Then share with full group.

Think-Pair-Wordle-Share: Teacher poses a question such as what are all the words you can think of to describe _____. (character in book, historical figure, etc…) Students think individually, then share ideas with partner to develop one Wordle between the two of them. Then share with group.

Think-Blog-Respond:

- Student begins by thinking of blog post ideas
- Student creates his/her own post
- Reader responds

The post becomes the "pair" on a much larger scale. Another aspect of the "pair" is that a blog post is meant to be read by another person. The author's ideas are shared through the post. When the reader responds, this is yet another venue for sharing understanding with the writer.

More info on Think-Pair-Share variations here.

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Documentation Scavenger Hunt

How does it work?

Give students questions that you want them to go find the answers for in the documentation. If this is an individual activity, each student is responsible for researching their own set of answers. If it's a group activity, give tasks that are complex enough that the team has to leverage the combined research power of the group to complete.

For an example from one of our WDI instructors, Jen Aprahamian, see here.

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Jigsaw

How does it work?

A jigsaw is a cooperative learning strategy that enables each student of a "home" group to specialize in one aspect of a learning unit. Students meet with members from other groups who are assigned the same aspect, and after mastering the material, return to the "home" group and teach the material to their group members.

Just as in a jigsaw puzzle, each piece--each student's part--is essential for the completion and full understanding of the final product. If each student's part is essential, then each student is essential. That is what often makes the Jigsaw instructional strategy very effective.

What is its purpose?
Jigsaw learning allows students to be introduced to material and yet maintain a high level of personal responsibility. The purpose of Jigsaw is to develop teamwork and cooperative learning skills within all students. In addition it helps develop a depth of knowledge not possible if the students were to try and learn all of the material on their own. Finally, because students are required to present their findings to the home group, Jigsaw learning will often disclose a student's own understanding of a concept as well as reveal any misunderstandings.

How can I do it?

In its simplest form, the Jigsaw instructional strategy is when:

1. Each student receives a portion of the materials to be introduced;
2. Students leave their "home" groups and meet in "expert" groups;
3. Expert groups discuss the material and brainstorm ways in which to present their understandings to the other members of their "home" group;

4. The experts return to their “home” groups to teach their portion of the materials and to learn from the other members of their “home” group

More info here. More history about how the jigsaw technique developed can be found here.

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Whip Around

How Does it Work?

1. Question
Pose a prompt that has multiple answers. Have students write down as many responses as possible.

2. Whip Around
“Whip” around the room, calling on one student at a time. Have students share one of their responses. When called on, students should not repeat a response; they must add something new.

3. Discuss
After completing the whip around, have students discuss which ideas and themes showed up most in their responses.

When to Use

Use Whip Around to encourage responses from all students in the class:

- During Guided Practice to get students talking about the material just covered
- As a warm up activity to discuss highlights from yesterday’s lesson
- As a closing activity to summarize information covered in the lesson
- To have students provide evidence from a text

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1-2 Pairs

How Does it Work?

One instructor (BEWD in SF) says to his class: "Raise two fingers if you understand the material well." "Raise one finger if you understand this material OK." "Now, 1 find a 2 and sit next to them. While you work through this exercise, only 1's can type."

When to Use:

That seemed to inspire folks who typically don't talk to one another (seems like skill level clings to skill level) to work together. Also not allowing 2's to type away while 1's remain confused. This, to date, has been our most bonded class :)

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Exit Slips* or Tickets

How Does it Work?

Exit slips are a student self-reporting strategy that can help you check for understanding, identify misunderstandings, learner engagement and interest levels.

At the end of class, give people a piece of paper or google form with the following three components:

- Ask students: “What was today’s objective?”
- Give them a short performance task
- Ask students: “On a scale of 1-5, how well do you feel like you understood today’s objective?

– OR –

3-2-1: Ask students to answer these 3 prompts on a slip of paper to hand to you as their ‘ticket’ out the door at end of class:

- 3 Things I learned today
- 2 Ideas I found interesting
- 1 Question I still have

– OR –

Metacognition: Allows for students to process what they did in class and why it was done. At the end of class, have students complete a table similar to the one below. Collect & provide feedback at the start of the next class.

- What did we do?
- Why did we do it?
- What did I learn today?
- How can I apply it?

- What questions do I still have about it?

GA Example:

- UXD Exit Ticket Survey

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Teach Backs*

From Eric Lindow, veteran computer science teacher:

“I do think the teach-back is a powerful idea. In some casual research I discovered that the term is widely used in healthcare; doctors and nurses are trained to have their patients ‘teach-back’ the medical instructions they have been given. Apparently research shows that the information retention rate is something like 40-80% greater when the technique is used.

As you may recall, I picked up the idea when I was on the NYSAIS visiting committee for SAR academy, where I heard about and observed a teach-back in the math department. In that case a student had about 20 minutes to explain how to solve some medium difficulty logarithmic equations. I’m not sure I saved my materials from that visit, I usually keep them for a while but a quick search in my office didn’t turn them up. I’ll look for them some more, but in the meantime I can tell you how I implemented the idea in my programming classes last year:

Each student was tasked to select a topic to teach back to the rest of the class, drawn from what they had learned/were working on individually. Since this is a project based workshop, I got a wide range of proposals. I worked with each student to refine their plans to fit the overall goals and requirements of the assignment. The specifics were:

1) Their topic had to be some kind of programming skill or procedure that would be accessible to the rest of the students and at the same time something that most of them would not have deep experience with.

2)The topic had to be small enough that it could be presented in 20-30 minutes

3)All students in advance would need to be given access and setup instructions for the relevant tools

4) All students would be expected to do some kind of in class activity based on the topic

5) An additional bonus assignment would be offered for students who wanted to pursue the topic further

6) The student ‘teacher’ would help assess how well the other students did with the material.

How this happened varied with the topic.

All of my advanced students did one of these last year, and it worked out quite well. I was pleased and impressed both with the diversity of the topics presented and the time and engagement that the students put into their presentations. Based on what I remember off the top of my head, some of the topics presented were:

1) Designing and testing algorithm efficiency of various methods of prime number generation
2) How to create a Chrome plug-in
3) How the classic sort algorithms (such as insertion, bubble, heap) work and which is better under various conditions
4) Designing a basic graphic game framework in Eclipse (all the students were already familiar with the platform)
5) Clipping predictable smaller elements from a larger graphic
6) Using constructive solid geometry through OpenSCAD to design complex 3d objects
7) Using add-on graphic libraries in Processing to create a game within a fully rendered 3D space
8) Using Processing to save and render choreographic dance instructions"

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Memory Matrix*

How does it work?

Ask students to categorize new terms or information by placing in the correct place in the matrix below (usually used for Webb's wheel of knowledge category I).

	Paradigm	**Type system**	**Use-case**
Ruby	Object Oriented	Dynamic	Back-end
JavaScript	Object Oriented	Dynamic	Front-end
Haskell	Functional	Static	Back-end

Link

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Prior Knowledge Inventory*

How it works:
Instructors: Write 2 or 3 short simple questions for use at the beginning of a course (or at the start of a new unit or lesson) prior to introducing an important new topic to determine what students already know about the topic/subject or what their perceptions are on a topic.

Students: Answer questions via small note cards (physical) or private submission (to one instructor, for example) on HipChat (virtual).
Instructor collects and sorts data:
Fast Analysis: sort responses into "prepared" and "not prepared" [for this lesson/ activity/starting point] piles.
Detailed analysis: classify answers as the following :
four categories: [-1] = erroneous; [0] = not relevant; [+1] = some relevance; [+2] = significant

Examples:

1. You must learn Ruby before you learn Javascript. *Strongly Agree Agree Disagree Strongly Disagree [....Before a lesson on Javascript]*
2. Define the components of good documentation [....*before group project or lesson on ReadMe / Change log].*
3. What are two ways you can check the rate limit of a given API? [....before projects or exploring working with different APIs, etc]

Why It Works: Uncovers incorrect or incomplete knowledge, attitudes, or values that may be barriers to new learning. Quick method to determine *where students are at* (diagnostic of sorts) in their knowledge so that instructors can adapt lesson, better measure delta of lesson from start to finish.

When to Use: First thing in class; when transitioning to new material; anytime you want to determine students' prior knowledge or misconceptions about an upcoming topic. Also can be helpful in drawing out misconceptions in how information relates to each other and tease out if students can determine how the past concept might relate to the new concept.

Result: Instructors can determine what common misperceptions might interfere with course learning. Helps students recognize and understand misconceptions/preconceptions early on in order to better integrate correct information into revised knowledge structure.

With this feedback you can...: Determine the most effective starting point for a given lesson and the most appropriate level at which to begin instruction. Can also be used as pre- and post-assessments.

Source, Slide 7

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Focused Listing*

How does it work? After a lecture ("I do"), showing a short video explaining a concept, or a short activity ("we do"), instructor chooses a single important term or concept from a particular lesson or class session [past or present] and directs students to list several ideas that are closely related to that "focus point."

Examples:

- Write 5 or 6 words or phrases that define… [programming in Node.js].
- Define 3 to 4 concepts related to … [command line basics].
- After watching a film or slides, list terms to describe… [the scrum process].
- List six important characteristics of …[test-driven development].

Why does it work? Forces students to test their knowledge of a concept immediately in a low-stakes way. Demonstrates associations and depth of knowledge around new material (recall).

When to use? Any time! When you want to know how much new material students are retaining or are able to recall in the moment. Also a great tactic to use for review because students' answers will come from working memory (demonstrating if these concepts are part of working memory..)

Result: Students check knowledge recall. Instructors determine how much information is being absorbed real-time (after lecture, we do activities, individual practice, etc.)

With this feedback you can…: Determine where more emphasis might be needed in future lessons, make midpoint corrections, and measure the class' progress in learning one element(s) of the course content.

Source, slide 9

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Student-Generated Quiz/Test/Morning Exercise Questions*

How does it work? Students write test questions- Questions that test hard (or soft) skills in multiple formats - Multiple choice, T/F, Fill-In the Blank, Essay- for specified topics and model answers. Students submit answers with their questions. (Alternatively, just submitting questions is a lower- energy alternative if you want to 'add' this technique to another activity)

Instructors: Tally the types of questions students propose and look at the range of topics the questions span. Use the questions in class at random (if they are good!) and point out why they

are good.

Examples:

-

Why does it work? This technique forces students to select what they believe is the most 'question-worthy' (importance of concepts); practice thinking about what they 'should be able to do' as a result of course content (i.e. on a quiz assessing their skills); allow students to self-correct based on their ability to write or not write their own questions and answers

An alternative method of determining what students know - challenges them to think about problems in different ways. And a fun activity - vet questions for validity/relevance, put them into a hat, and let students pick which question they'll have to answer.

When to use? Could be a light homework assignment - have students submit a question that parallels the activities or tests the skills covered that day in class, submit via HipChat or email, and the instructors will choose one to use the next day for the quiz/morning exercise.

Result: Lots of quiz questions and answers ready to use (after vetting).

With this feedback you can…: determine at least four aspects of student learning:

- What students consider the most important or memorable content,
- What students understand as fair and useful test questions, and
- How well students can answer the questions they have posed.
- Alerts instructors to when students have inaccurate expectations about upcoming quizzes, projects, assignments, etc.

Source, slide 24

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3 Things*

The activity: Students list 3 things that a fellow student might misunderstand about a topic. Discuss with shoulder partner, or other student grouping.

Why it works: Students empathize with others in the class while simultaneously addressing ideas which they may also misunderstand. It provides the opportunity to check for understanding, clarify, and restate important information.

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Participation Survey*

How does it work?

Traditionally this is used to gauge student participation levels during group work to assign marks/grades appropriately. The idea is to ask each student to rate themselves and their partners based on participation and technical competency.

When to use:

For our purposes this type of survey can help to expose underperforming teams, and give frustrated students an outlet to voice their concerns. This technique might also give you more detailed information about struggling students.

An example of this type of survey can be downloaded from Pair Programming-in-a-box. See either page 20 in the PDF, or the file '5_PAIR_PROGRAMMING_SamplePairProgrammingQuestionnaire.doc'.

Example questions: (see above link for more)

1. My partner's technical competency is (check one option to fill the blank):

Much better than mine _____

Somewhat better than mine _____

About the same as mine _____

Somewhat less than mine _____

Much less than mine _____

6. Contributed fully, fairly, and actively, to the best of ability, to the completion of the lab assignment.

You: Yes _____ No_____

Your Partner: Yes _____ No_____

Explain:

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Spot Check*

The activity: learners answer verbal questions by indicating their responses by stacking red/blue cups

After delivering a bunch of new information, quickly check for understanding without losing momentum by interjecting your presentation with this quick 5 minute check. Give everyone 2 cups, and assign a value to each color (ex: true/false). Run through a list of statements or short problems verbally, and ask students to stack one 'answer' cup on top of the other to indicate their answer.

Why it works: its fun, kinetic, and engages all participants in a friendly, low-pressure competition; much easier and quicker than a written quiz; provides instant feedback to you

Materials: 2 colors of plastic cups for each student (could be replaced with colored cards)

Video demonstration of 'Spot Check'

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56 different examples of formative assessment (for your consideration)*

A deck of brief, ready to use tactics to check your class's understanding. Lots of great ideas, many that are forgettable. Worth a look!

56 examples, deck

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Appendix:

Classroom Assessment Techniques

- **What are they?** Simple, non-graded, context-specific, **in-class** activities meant to give instructors and students **useful feedback** about the teaching-learning process. *Are students learning what I'm teaching? Do they understand? If not, where are the gaps?*
- **Purpose:**

- *To inform teaching; to improve learning.* To give instructors and students an opportunity to uncover misunderstandings *in class together* so gaps in learning can be addressed before leaving class.

- **What can we learn from them?** Instructors can use CATs to answer lots of different learning questions, depending on what information they seek (*see image below):*

Areas We Can Explore with CATs

Type of Learning Content	Question	CATs
Background Knowledge	What have students learned?	Prior Knowledge Inventory, Misconception/Preconception Check
Content/Material	What are students learning?	Focused Listing, Empty Outlines, Memory Matrix
Process/Barriers	How are students learning? What is hindering students?	Minute Paper, Muddiest (Clearest) Point, Punctuated (Clarification) Pauses, Fish Bowl
Application	How do students use knowledge/skills?	Directed Paraphrasing, Application Cards, Student-Generated Test/Quiz Questions
Study Skills	Do students have the tools needed?	Course-Related Self-Confidence Survey
Attitudes	What do students think/feel/value?	Reading Rating Sheet, Group Work Evaluation, Minute Papers

http://www.powershow.com/view.php?id=P1240280231TGbyE&t=Classroom+Assessment+Techniques
Adapted from Parkland College Center for Excellence in Teaching and Learning

Source, slide 5

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