Classroom Assessment Techniques (CATs)

CAT – a *tool used to collect useful feedback about student learning* in the classroom

Some Easy to Use CATs

**CAT 1: Background knowledge probe**
- Essentially a pre-test with short answer or multiple choice types of questions on items students should already know in order to succeed in a learning activity.

**CAT 2: Focused listing**
- Talk with students before class about the content or facilitate a brief brainstorming session where students outline what they know about a topic. Record the results.

**CAT 3: Think-pair-share**
- Think (1-2 minutes) –
  - Pose a question with some depth for students to ponder
  - Have students write their thoughts down
- Pair (1-2 minutes) –
  - Student discuss their responses with a colleague
- Share (1-3 minutes) –
  - Volunteers discuss findings with the group
CAT 4: The Minute Paper

• What is it?
  – Two questions
    • What was the most important thing you learned in this class?
    • What important question remains unanswered?

• Why use it?
  – Efficient
  – Adaptable
  – Requires students to actively assess own learning

CAT 4: The Minute Paper (cont.)

• How do you implement it?
  – Choose material
    • Determine what chunk of information you are assessing
    • Adapt the questions to your needs
  – Plan class time
    • To use the minute paper
    • To report the results
  – Plan resources
    • Display questions: PowerPoint slides, overhead, etc.
    • Acquire data: index cards, half-sheet of paper, etc.
  – Explain expectations
    • Time to complete
    • Type/length of answer desired
  – Have students Complete the CAT
  – Analyze and Report results
    • Organize responses (tally words, common themes, etc.)
    • Write plan to address teaching/learning issues now and/or in the future
      • Deliver feedback to class

Adapted from Cross and Angelo
CAT 5: Directed Paraphrasing

• What is it?
  – Explanation for a particular audience
  – Short summary of a topic, process, etc.

• Why use it?
  – Improves communication skills: translate information for a particular audience
  – Requires higher level thinking (synthesis)
  – Develops skills in generalization, writing, management, etc.

Adapted from Cross and Angelo

CAT 5: Directed Paraphrasing (ex)

• Paraphrase in 3-4 short sentences why gravity is still present even though an astronaut is experiencing “zero g” for the following audiences:
  – Your little brother – so he can pass an oral exam
  – Your intern at NASA – so she can determine orbit altitudes correctly

• Use 10 minutes and the note card provided (one paraphrase on each side) to give your answers. You may work with a partner.
CAT 5: Directed Paraphrasing (cont.)

- How do you implement it?
  - Define a scenario
    - Choose important concept, theory, argument, technique, etc.
    - Define a realistic audience to write/speak to
    - Practice yourself and adjust scenario
  - Plan class time
    - To do the activity in class
    - To report the results
  - Plan resources
    - Display topic and scenario: PowerPoint slides, overhead, etc.
    - Acquire data: index cards, half-sheet of paper, etc.
  - Explain expectations
    - Time to complete
    - Type/length of paraphrase desired
  - Have students complete the CAT
  - Analyze and report results
    - Organize responses (level of quality)
    - Find patterns: accuracy, suitability to audience, effectiveness
    - Write plan to address teaching/learning issues now and/or in the future
    - Deliver feedback to class

Adapted from Cross and Angelo

CAT 6: Documented Problem Solutions

- What is it?
  - Written explanation of each step in a solution
  - “Show and tell” protocol to diagnose student thinking processes

- Why use it?
  - Determine how students are attacking problems
  - Assess student understanding of techniques they are using
  - Develops skills in generalization, writing, problem-solving, math, outlining, etc.

Adapted from Cross and Angelo
**CAT 6 – Documented Problem Solutions (ex. pt 1)**

- Estimate the percent of blood flow in your heart that can be cleaned by a machine with a filter of cross-sectional area of 0.000600m² with a maximum rated flow speed of 1.00cm/s.
- Use the engineering problem solving methodology and explain your calculations in 3-6 steps. Write explanations for steps on the left and technical work on the right. You have 25 minutes.

<table>
<thead>
<tr>
<th>Problem Statement</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>f=7% of heart blood volume pumped that can flow through a 60cm² area at 1cm/s</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Governing Equations</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\dot{m}_m = \rho v A)</td>
<td>heart rate: R = 60 beats/min</td>
</tr>
<tr>
<td>(\dot{m}_h = \dot{V} \rho)</td>
<td>heart pump volume: V = 100 cm³/beat</td>
</tr>
<tr>
<td>(\dot{V} = R \left[\text{beat}\right] \dot{V}_{cm^3}\left[\text{beat}\right])</td>
<td>blood density: (\rho = 1.00\text{g/cm}^3)</td>
</tr>
</tbody>
</table>

| \(\frac{\dot{m}_m}{\dot{m}_h} \times 100\%\) | \(f\)% of heart blood volume pumped that can flow through a 60cm² area at 1cm/s |

**Calculations**

- Find machine mass flow rate
  \(\dot{m}_m = \rho v A = (1\left[\text{g/cm}^3\right]) \times (1\left[\text{cm/s}\right]) \times (6\left[\text{cm}^2\right]) = 6\left[\text{g/s}\right]\)

- Find heart volume rate
  \(\dot{V} = RV = (60\left[\text{beat/min}\right]) \times (100\left[\text{cm}^3\right]) \times (\frac{1}{60}\left[\text{min}\right]) = 100\left[\text{cm}^3/s\right]\)

- Find heart mass flow rate
  \(\dot{m}_h = \dot{V} \rho = (100\left[\text{cm}^3/s\right]) \times (\frac{\rho}{3}\left[\text{g/cm}^3\right]) = 100\left[\text{g/s}\right]\)

- Find fraction in machine and convert to %
  \(f = \frac{\dot{m}_m}{\dot{m}_h} \times 100\% = \frac{6\left[\text{g/s}\right]}{100\left[\text{g/s}\right]} \times 100\% = 6\%\)
CAT 6: Documented Problem Solutions

(Cont.)

- How do you implement it?
  - Define 1-3 problems
    - Choose appropriate difficulty
    - Solve them yourself while documenting your steps and adjust
    - Write them up for the students
  - Plan class time
    - To do the activity in class
    - To report the results
  - Plan resources
    - Display problems and scenario: PowerPoint slides, overhead, handout, etc.
    - Acquire data: assign in class, assign as homework, assign in lab, etc.
  - Explain expectations
    - Time to complete (at least twice as long as you took)
    - Emphasize procedure over correct answer (not grading this)
  - Have students complete the CAT
  - Analyze and Report results
    - Organize responses (level of quality)
    - Find patterns in: common approaches, where mistakes occur, skipped steps, etc.
    - Write plan to address issues now and in the future
    - Deliver feedback to class

Adapted from Cross and Angelo

Resources

