Metacognition: The Key to Acing Courses!

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Frank L. Christ Outstanding Learning Center Award
Presidential Recognition
White House Oval Office
November 16, 2007
The Story of Three Students

- Travis, junior psychology student  
  47, 52, **82, 86** B in course
- Joshua, first year chemistry student  
  68, 50, 50, **87, 87, 97, 90** (final) A in course
- Dana, first year physics student  
  80, 54, **91, 97, 90** (final) A in course
How’d They Do It?

They became expert learners by using metacognition!

They studied to LEARN, not just to make the grade!
Reflection Questions

• What’s the difference, if any, between *studying* and *learning*?

• For which task would you work harder:
  A. Make an A on the test
  B. Teach the material to the class?
To Ace STEM Courses
(and everything else!)

- Stay in *learn* mode, not *study* mode

- Study as if you have to *teach* the material, not just make an A on the test
Use Metacognition to Become an Expert Learner
Metacognition

The ability to:

• think about thinking
• be consciously aware of oneself as a problem solver
• to monitor and control one’s mental processing
• to be aware of the type of learning that you are doing
Counting Vowels in 45 seconds

How accurate are you?

Count all the vowels in the words on the next slide.
Dollar Bill
Dice
Tricycle
Four-leaf Clover
Hand
Six-Pack
Seven-Up
Octopus
Cat Lives
Bowling Pins
Football Team
Dozen Eggs
Unlucky Friday
Valentine’s Day
Quarter Hour
How many words or phrases do you remember?
Let’s look at the words again...

What are they arranged according to?
<table>
<thead>
<tr>
<th>Dollar Bill</th>
<th>Cat Lives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dice</td>
<td>Bowling Pins</td>
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<td>Tricycle</td>
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<td>Quarter Hour</td>
</tr>
<tr>
<td>Octopus</td>
<td></td>
</tr>
</tbody>
</table>

What are the words arranged according to?
NOW, how many words or phrases do you remember?
What were two major differences between the 1\textsuperscript{st} and 2\textsuperscript{nd} attempts?
1. We knew what the task was

2. We knew how the information was organized
Turning Yourself into an Efficient, Expert Learner

- Do “think aloud” exercises
- Constantly ask yourself “why” and “what if” questions
- Always test your understanding by verbalizing or writing about concepts; practice retrieval of information
- Move your activities higher on the Bloom’s taxonomy scale by comparing and contrasting, thinking of analogies, thinking of new pathways, etc.
Bloom's Taxonomy

- **Remembering**: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.

- **Understanding**: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.

- **Applying**: Carrying out or using a procedure through executing, or implementing.

- **Analyzing**: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure.

- **Evaluating**: Making judgments based on criteria and standards through checking and critiquing.

- **Creating**: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.

This pyramid depicts the different levels of thinking we use when learning. Notice how each level builds on the foundation that precedes it. It is required that we learn the lower levels before we can effectively use the skills above.

http://www.odu.edu/educ/llschult/blooms_taxonomy.htm
At what level of Bloom’s did you have to operate to make A’s or B’s in high school?

1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating
At what level of Bloom’s do you have to operate to make A’s in college?

1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating
How do you move yourself higher on Bloom’s Taxonomy?

Use the Study Cycle with Intense Study Sessions!
Reflect

Review the Study Cycle

1. Set a Goal (1-2 min) Decide what you want to accomplish in your study session
2. Study with Focus (30-50 min) Interact with material—organize, concept map, summarize, process, re-read, fill-in notes, reflect, etc.
3. Reward Yourself (10-15 min) Take a break—call a friend, play a short game, get a snack
4. Review (5 min) Go over what you just studied

*Intense Study Sessions

Preview before class—Skim the chapter, note headings and boldface words, review summaries and chapter objectives, and come up with questions you’d like the lecture to answer for you.

Attend class—GO TO CLASS! Answer and ask questions and take meaningful notes.

Review after class—As soon after class as possible, read notes, fill in gaps and note any questions.

Study—Repetition is the key. Ask questions such as ‘why’, ‘how’, and ‘what if’.
- Intense Study Sessions* - 3-5 short study sessions per day
- Weekend Review—Read notes and material from the week to make connections

Assess your Learning—Periodically perform reality checks
- Am I using study methods that are effective?
- Do I understand the material enough to teach it to others?
Effective Metacognitive Strategies

- Always solve problems without looking at an example or the solution
- Memorize everything you’re told to memorize
- Always ask why, how, and what if questions
- Test understanding by giving “mini lectures” on concepts
- Spend time on each course every day
- Use the Study Cycle with Intense Study Sessions
- Visit the Learning Commons on a regular basis
- Aim for 100% mastery, not 90%!
Which One of the Next Two Slides More Accurately Describes YOUR Actions to Date in Your Courses?
Top 5 Reasons Folks Did Not Do Well on Test 1 in General Chemistry

1. Didn’t spend enough time on the material
2. Started the homework too late
3. Didn’t memorize the information I needed to
4. Did not use the book
5. Assumed I understood information that I had read and re-read, but had not applied
Top 5 Reasons Folks Made an A on Test 1:

1. Did preview-review for every class
2. Did a little of the homework at a time
3. Used the book and did the suggested problems
4. Made flashcards of the information to be memorized
5. Practiced explaining the information to others
At the end of the presentation, they were given a survey to determine their self-assessment of their use of the strategies, and were divided into groups:

**Group 1: students who did not use the strategies**
**Group 2: students who used the metacognitive learning strategies**

The results are shown below:

<table>
<thead>
<tr>
<th>Use of Strategies</th>
<th>Av. on Exams 1 and 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students who did not use the strategies</td>
<td>58 and 54</td>
</tr>
<tr>
<td>Students who used the metacognitive learning strategies</td>
<td>95 and 80</td>
</tr>
</tbody>
</table>

*Using the strategies makes the difference!*
Comments from Engineering Students about what they changed for Test 3*

• I changed my study habits by doing the homework early. I also started reading some of the material before going to the class. The most effective was spending more time on the material.

• I started studying for the exam sooner. I also took more time to do the homework. I reviewed/rewrote my notes from class.

• I studied for the class as close to everyday as possible.

• I got together with other classmates and helped them with their weakness and of course they helped me with mine as well.

*class average increased from 65.7% to 80.5%!
So, What Can You Do, Starting Now, to Pursue Your 4.0 this semester?

- Spend more time studying  
  (at least 2 hours/week for every hour in class)
- Aim for higher learning levels and 100% understanding  
- Use office hours and study groups productively
- Use the Study Cycle  
  with Intense Study Sessions
- Use Metacognition to Study Smarter!!!
Writing Exercise

What strategy will you commit to implementing?

If you don’t start it within the next 48 hours...

... you probably never will.