Metacognition and Mindset: The Keys to Increasing Student Learning

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Louisiana State University

Metacognition

The ability to:

- think about your own thinking
- be consciously aware of yourself as a problem solver
- monitor, plan, and control your mental processing (e.g. “Am I understanding this material, or just memorizing it?”)
- accurately judge your level of learning
- know what you know and what you don’t know


Power of Metacognitive Learning Strategies

Sydnie’s Story: Intro and emails

- First encounter on September 23, 2013
- Email on October 14, 2013
- Email on January 9, 2014
- Email on January 20, 2014
- Email on May 7, 2014
Why haven’t most students developed these skills?

It wasn’t necessary in high school

Data from UCLA Higher Education Research Institute (HERI
First Year Student Survey – 2010 - 2014

<table>
<thead>
<tr>
<th>Year</th>
<th>% who spent &lt; 6 hrs/wk on homework</th>
<th>% who graduated with an A average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>62.7</td>
<td>48.4</td>
</tr>
<tr>
<td>2011</td>
<td>60.5</td>
<td>48.7</td>
</tr>
<tr>
<td>2012</td>
<td>58.6</td>
<td>48.5</td>
</tr>
<tr>
<td>2013</td>
<td>56.6</td>
<td>52.8</td>
</tr>
<tr>
<td>2014</td>
<td>57.1</td>
<td>55.1</td>
</tr>
</tbody>
</table>

http://www.heri.ucla.edu/
Faculty Must Help Students Make the Transition to College

Help students identify and close “the gap”

- current behavior → current grades
- productive behavior → desired grades

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
The Story of Two Students

- **Travis**, junior psychology student
  - 47, 52, **82, 86**  B in course

- **Dana**, first year physics student
  - 80, 54, **91, 97, 90 (final)**  A in course

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A Reading Strategy that Works: SQ3R (4R or 5R)

- **Survey** (look at intro, summary, bold print, italicized words, etc.)
- **Question** (devise questions survey that you think the reading will answer)
- **Read** (one paragraph at a time)
- **Recite** (summarize in your own words)
- **Record or wRite** (annotate in margins)
- **Review** (summarize the information in your words)
- **Reflect** (other views, remaining questions)

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Problem Solving is Essential to Student Success!

Homework system that can be taught

- **Study material first**, before looking at the problems/questions
- **Work example problems** (without looking at the solutions) until you get to the answer
- **Check** to see if answer is correct
- If answer is not correct, **figure out where mistake was made**, without consulting solution
- **Work homework** problems/answer questions as if taking a test
Why the Fast and Dramatic Increase?

It’s all about the strategies, and getting them to engage their brains!

Counting Vowels in 45 seconds

How accurate are you?

Count all the vowels in the words on the next slide.

What we know about learning

• Active learning is more lasting than passive learning
  -- Passive learning is an oxymoron*

• Thinking about thinking is important
  – Metacognition**

• The level at which learning occurs is important
  – Bloom’s Taxonomy***


Bloom’s Taxonomy

[Diagram showing Bloom’s Taxonomy]

When we teach students about Bloom’s Taxonomy...

They GET it!
How do you think students answered?

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

How students answered (2008)

At what level of Bloom’s did you have to operate to make A’s or B’s in high school?

1. Remembering
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How students answered (2013)

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1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating

How do you think students answered?

At what level of Bloom’s do you think you’ll need to operate to make A’s in college courses?

1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating

How students answered (in 2008)

At what level of Bloom’s do you think you’ll need to operate to make an A’s in college?

1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating
How students answered (in 2013)

At what level of Bloom’s do you think you’ll need to operate to make A’s in college?

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2. Understanding
3. Applying
4. Analyzing
5. Evaluating
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How students answered (in 2014)

At what level of Bloom’s do you think you’ll need to operate to make A’s in college?

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2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating

How do we teach students to move higher on Bloom’s Taxonomy?

Teach them the Study Cycle*

*adapted from Frank Christ’s PLRS system
What happens when we teach metacognitive learning strategies, Bloom’s Taxonomy, and the Study Cycle to an entire class, not just individuals?
Performance in Gen Chem I in 2011 Based on One Learning Strategies Session*

<table>
<thead>
<tr>
<th></th>
<th>Attended</th>
<th>Absent</th>
</tr>
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<tbody>
<tr>
<td>Exam 1 Avg:</td>
<td>71.65%</td>
<td>70.45%</td>
</tr>
<tr>
<td>Exam 2 Avg:</td>
<td>77.18%</td>
<td>68.90%</td>
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<tr>
<td>Final course Avg*:</td>
<td>81.60%</td>
<td>70.43%</td>
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<tr>
<td><strong>Final Course Grade:</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
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The one 50-min presentation on study and learning strategies was followed by an improvement of one full letter grade


Performance in Gen Chem 1202 Sp 2013 Based on One Learning Strategies Session

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<tr>
<td>Exam 1 Avg:</td>
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<td>69.27%</td>
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<td>Homework Total:</td>
<td>169.8</td>
<td>119.1</td>
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<td>Final course Avg*:</td>
<td>82.36%</td>
<td>67.71%</td>
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<tr>
<td><strong>Final Course Grade:</strong></td>
<td><strong>B</strong></td>
<td><strong>D</strong></td>
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</table>

The 50-min presentation on study and learning strategies was followed by an improvement of two letter grades

Performance in Gen Chem 1202 Sp 2015 Based on One Learning Strategies Session

<table>
<thead>
<tr>
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<th>Attended</th>
<th>Absent</th>
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<tbody>
<tr>
<td>Exam 1, 2, 3 Avg:</td>
<td>68.14%</td>
<td>69.67%</td>
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<td>Exam 4 Avg:</td>
<td>83.45%</td>
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<td>Final Exam Avg:</td>
<td>80.98%</td>
<td>75.24%</td>
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<tr>
<td>Final course Avg*:</td>
<td>84.90%</td>
<td>78.83%</td>
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<tr>
<td><strong>Final Course Grade:</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
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</table>

The 50-min presentation on study and learning strategies after exam 3 was followed by an improvement of one letter grade
Professor Ningfeng Zhao’s Exam Averages

Intervention: One fifty minute learning strategies session after Exam 1


Professor Nina Stein’s Exam Averages

<table>
<thead>
<tr>
<th>EXAM</th>
<th>AVERAGE</th>
<th>AVERAGE</th>
<th>AVERAGE*</th>
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<tbody>
<tr>
<td>1</td>
<td>69.25</td>
<td>70.06</td>
<td>77.42</td>
</tr>
<tr>
<td>2</td>
<td>79.40</td>
<td>73.33</td>
<td>86.17</td>
</tr>
<tr>
<td>3</td>
<td>70.35</td>
<td>73.38</td>
<td>85.12</td>
</tr>
<tr>
<td>Final</td>
<td>66.00</td>
<td>63.06</td>
<td>82.17</td>
</tr>
</tbody>
</table>

*The semester I did the study skills workshop

Intervention: One twenty minute learning strategies session after Exam 1

Nina Stein, University of Connecticut, personal communication, April 4, 2015
Two Valuable References

Teaching Unprepared Students. 
Sterling, VA: Stylus Publishing

Nilson, Linda. (2013) Creating Self-regulated Learners 
Sterling, VA: Stylus Publishing

Help Students Develop the Right Mindset

Mindset* is Important!

- **Fixed Intelligence Mindset**
  Intelligence is static
  You have a certain amount of it

- **Growth Intelligence Mindset**
  Intelligence can be developed
  You can grow it with actions

New York: Random House Publishing
Responses to *Many* Situations are Based on Mindset

<table>
<thead>
<tr>
<th></th>
<th>Fixed Intelligence Mindset Response</th>
<th>Growth Intelligence Mindset Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenges</td>
<td>Avoid</td>
<td>Embrace</td>
</tr>
<tr>
<td>Obstacles</td>
<td>Give up easily</td>
<td>Persist</td>
</tr>
<tr>
<td>Tasks requiring effort</td>
<td>Fruitless to Try</td>
<td>Path to mastery</td>
</tr>
<tr>
<td>Criticism</td>
<td>Ignore it</td>
<td>Learn from it</td>
</tr>
<tr>
<td>Success of Others</td>
<td>Threatening</td>
<td>Inspirational</td>
</tr>
</tbody>
</table>

Which mindset about intelligence do you think *most students* have?

**Fixed**

**Growth**

Which mindset about student intelligence do you think *most faculty* have?

**Fixed**

**Growth**
Which mindset about student intelligence do you think *most STEM faculty* have?

- **Fixed**
- **Growth**

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**Email from a Spring 2011 Chemistry 1201 Student**

“...Personally, I am not so good at chemistry and unfortunately, at this point my grade for that class is reflecting exactly that. I am emailing you inquiring about a possibility of you tutoring me.”

April 6, 2011

“I made a 68, 50, (50), 87, 87, and a 97 on my final. I ended up earning a 90 (A) in the course, but I started with a 60 (D). I think what I did different was make sidenotes in each chapter and as I progressed onto the next chapter I was able to refer to these notes. **I would say that in chemistry everything builds from the previous topic.**”

May 13, 2011

Semester GPA: 3.8

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**LSU Analytical Chemistry Graduate Student’s Cumulative Exam Record**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>9/04 Failed</td>
<td>10/05 Passed</td>
</tr>
<tr>
<td>10/04 Failed</td>
<td>11/05 Failed</td>
</tr>
<tr>
<td>11/04 Failed</td>
<td>12/05 Passed best in group</td>
</tr>
<tr>
<td>12/04 Failed</td>
<td>1/06 Passed</td>
</tr>
<tr>
<td>1/05 Passed</td>
<td>2/06 Passed</td>
</tr>
<tr>
<td>2/05 Failed</td>
<td>3/06 Failed</td>
</tr>
<tr>
<td>3/05 Failed</td>
<td>4/06 Passed last one!</td>
</tr>
<tr>
<td>4/05 Failed</td>
<td>5/06 N/A</td>
</tr>
</tbody>
</table>

Began work with CAS and the Writing Center in October 2005.

2005 – 2006

10/05 Passed
11/05 Failed
12/05 Passed best in group
1/06 Passed
2/06 Passed
3/06 Failed
4/06 Passed last one!
5/06 N/A
Hello Dr. Kelley.

I am struggling at Xavier and I REALLY want to succeed, but everything I've tried seems to end with a "decent" grade. I'm not the type of person that settles for decent. What you preached during the time you were in Dr. Privett's class last week is still ringing in my head. I really want to know how you were able to do really well even despite your circumstances growing up. I was hoping you could mentor me and guide me down the path that will help me realize my true potential while here at Xavier. Honestly I want to do what you did, but I seriously can't find a way how to. Can I please set up a meeting with you as soon as you're available so I can learn how to get a handle on grades and classes?

Oct. 24, 2011

Hey Dr. Kelley, I made an 84 on my chemistry exam (compared to the 56 on my first one) using your method for 2 days (without prior intense studying). Thanks for pointing me in the right direction. I'll come by your office Friday and talk to you about the test.

Nov. 3, 2011

Hey Dr. Kelley! I have increased my Bio exam grade from a 76% to a 91.5% using your system. Ever since I started your study cycle program, my grades have significantly improved. I have honestly gained a sense of hope and confidence here at Xavier. My family and I are really grateful that you have taken time to get me back on track.

The Power of Metacognitive Learning Strategies
From an instructor's perspective

Lynn Futral*, Psychology
Southern Crescent Technical College, Griffin, GA

"It just hit me that since I have incorporated the Metacognition: success through understanding learning styles, learning strategies, and study skills...students are actually retaining this information. When I compare the data from two years...I can clearly remember how distressed I was that students weren't retaining this information—but the test scores I am receiving today (end of the semester grading), I am just blown away."

*email received on 5/9/2015
Data from Psych Prof at Southern Crescent TC
Received on 1/8/2014

Sample of 9 “at risk” students

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</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>Exam 2</td>
<td>Exam 3</td>
<td>Exam 4</td>
<td>Final Exam</td>
</tr>
<tr>
<td>62.67</td>
<td>77.00</td>
<td>78.20</td>
<td>82.00</td>
<td>82.6</td>
</tr>
</tbody>
</table>

“The final exam was comprehensive. The students were placed in teams and each team was assigned three chapters to review to the class in preparation for the final exam.”

More Feedback
From Professor Lynn Futral

“I have the most wonderful students this semester— engaged, prepared, participative and positive. I owe it all to teaching them the learning strategies you presented in the workshop.”

11/14/2014

A significant percentage of these students felt that this was a life-changing experience...My whole teaching style changed because of YOU!!!

3/16/2015

Final Reflection Questions
Who is *primarily* responsible for student learning?

a) the student  
b) the instructor  
c) the institution
Who do you think *students* say is *primarily* responsible for student learning?

- a) the student
- b) the instructor
- c) the institution

The reality is that...

when *all three* of these entities take *full responsibility* for student learning, we will experience a *significant increase* in student learning, retention, and graduation rates!

Conclusion

We *can* significantly increase learning by...

- teaching students *how* to learn
- making learning *visible*
- *not judging* student potential on initial performance
- encouraging students to *persist in the face of initial failure*
- encouraging the *use of metacognitive tools for deep and integrative learning*
Useful Websites

• www.cas.lsu.edu
• www.howtostudy.org
• www.varklearn.com
• www.drearlbloch.com

Additional References

*Excellent student reference

A New Reference