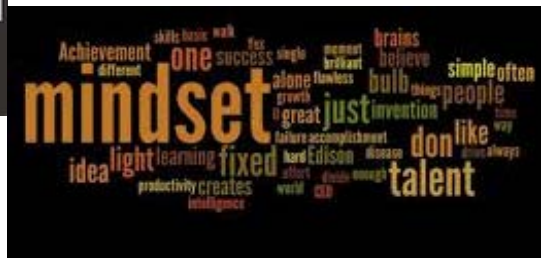
Get Students to Focus on *Learning* Instead of *Grades*: Metacognition and Mindset are Key!



Saundra Yancy McGuire, Ph.D.
Retired Asst. Vice Chancellor & Professor of Chemistry
Director Emerita, Center for Academic Success
Louisiana State University

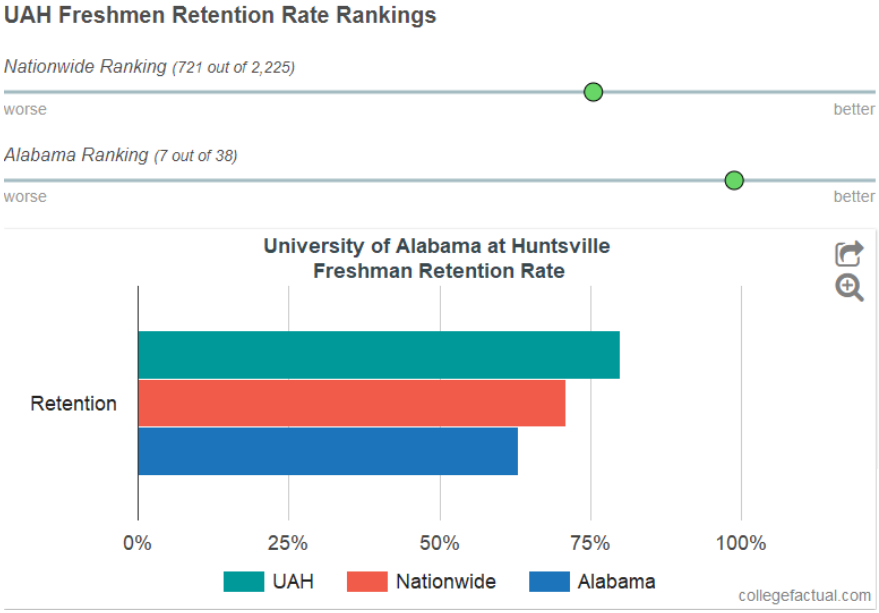
Mission

…Our mission is to explore, discover, create, and communicate knowledge, while **educating individuals** in leadership, innovation, **critical thinking**, and civic responsibility and **inspiring a passion for learning**.

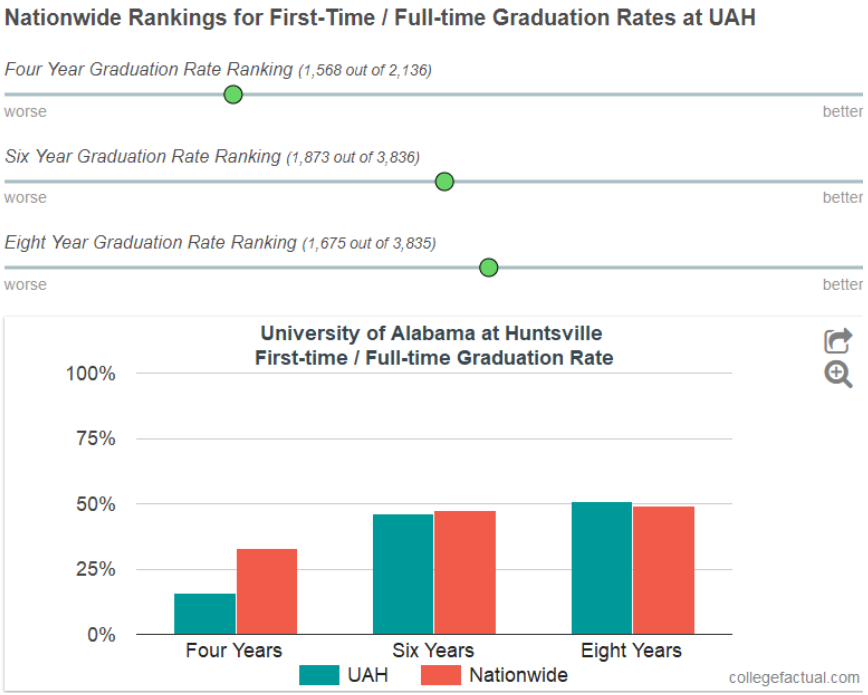
Vision

The University of Alabama in Huntsville will be a preeminent, comprehensive, technological research-intensive university known for **inspiring and instilling the spirit of discovery, the ability to solve complex problems, and a passion for improving the human condition** – a university of choice where technology and human understanding converge.

UAH Retention and Graduation Rates



UAH Retention Rate is 80.0%
National Average is 71.0%
Alabama Average is 63.0%



Six-Year Graduation Rate is 46.6%
National Average is 47.6%

Expected UAH Rate is 72.1%

www.collegefactual.com/colleges/north-dakota-state-university-main-campus/academic-life/graduation-and-retention/

How Can UAH Improve These Rates?

- Teach Students Metacognitive Learning Strategies
- Help Students Develop the Right Mindset to Improve Their Confidence
- Motivate Students to Implement Effective Metacognitive Learning Strategies

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

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), The nature of intelligence (pp.231-236). Hillsdale, NJ: Erlbaum

Why aren't most students already academically capable?

It wasn't necessary

Data from UCLA Higher Education Research Institute (HERI)
First Year Student Survey – 2010 - 2016

http://www.heri.ucla.edu

How do you think most students would answer the following?

- What did most of your teachers in high school do the *day before the test*?
- What did they *do* during this activity?
- What grade would you have made on the test if you had gone to class *only* on the day before the test?

Faculty Must *Help Students Make the Transition to College*

Help students identify and **close "the gap"**

current *behavior* → ***current grades***

productive *behavior* → ***desired grades***

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
- Update on July 26, 2016 Cum GPA 3.5
- Email on February 7, 2017 Cum GPA 3.6

Fall Sem GPA 4.18

Sydnie Landry, BS in Biology, May 2017

Louisiana State University

Final Semester GPA: 3.77

Applying to Medical School

Intended Specialty: Dermatology

Effective Homework Strategy

- **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**

Impact of Using Homework Strategy

Sydnie L.

First Year Biology Pre-Med Honors College Student

Email on January 20, 2014

I started to use the "Get more out of your homework" method. **I reviewed my notes right before attempting my homework problems, and tried to work the problems *without help from the solutions manual or tutors*. If I still could not get the right answer, I'd look at my notes again to get a hint, but *not to study the problem and mimic it step by step*…**

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

Power of Teaching to Master Learning

Clint's Story: Baby Groot and the Licensure Exam

Guardians of the Galaxy

- First encounter on October 29, 2015 at EKU
- Email on January 18, 2016
- Msg on April 14, 2016
- Msg on June 11, 2016

https://www.youtube.com/watch?v=BEPbXYzE5_Y

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

Travis, *junior psychology student*
47, 52, 82, 86

Problem: Reading Comprehension

Solution: Preview text before reading*

Develop questions*

Read one paragraph at a time

and paraphrase information

* Developing an anticipatory set

A Reading Strategy that Works: SQ5R

- **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)

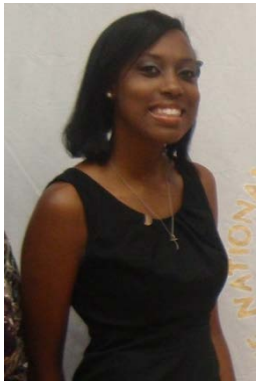
First Voyage of Christopher Columbus

WITH HOCKED GEMS FINANCING HIM/ OUR HERO BRAVELY DEFIED ALL SCORNFUL LAUGHTER/ THAT TRIED TO PREVENT HIS SCHEME/ YOUR EYES DECEIVE/ HE HAD SAID/ AN EGG/ NOT A TABLE/ CORRECTLY TYPIFIES THIS UNEXPLORED PLANET/ NOW THREE STURDY SISTERS SOUGHT PROOF/ FORGING ALONG SOMETIMES THROUGH CALM VASTNESS/ YET MORE OFTEN OVER TURBULENT PEAKS AND VALLEYS/ DAYS BECAME WEEKS/ AS MANY DOUBTERS SPREAD FEARFUL RUMORS ABOUT THE EDGE/ AT LAST/ FROM NOWHERE/ WELCOME WINGED CREATURES APPEARED/ SIGNIFYING MOMENTOUS SUCCESS

Dooling, J.D. and Lachman, R. Effects of Comprehension on Retention of Prose, *Journal of Experimental Psychology,* (1971), Vol. 88, No. 2, 216-222

Dana, *first year physics student*

80, 54, 91, 97, 90 (final)



Problem: Memorizing formulas and using www.cramster.com

Solution: Solve problems with no external aids and test mastery of concepts

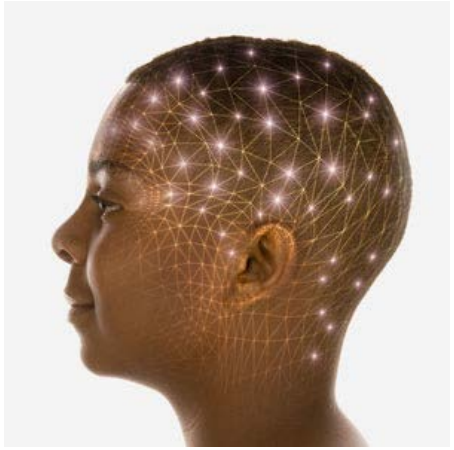
Dana Lewis, MS in Medical Physics, 2015

Univ of Texas Graduate School
of Biomedical Sciences at Houston
Thesis research at UT MD Anderson Cancer Center

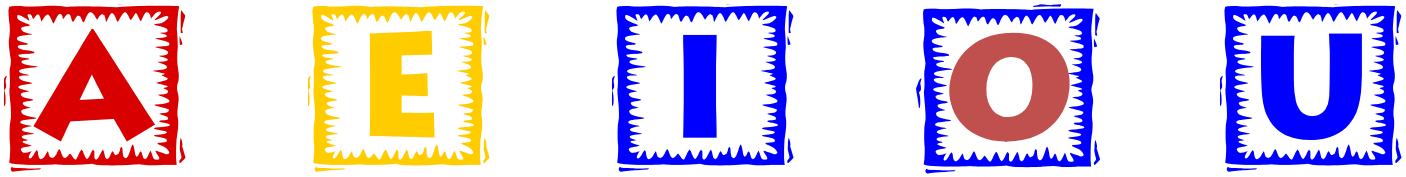
Practicing Medical Physicist as of 8/28/2016
when she completed her residency!

Why is Fast and Dramatic Increase Possible?

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.

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?

Dollar Bill
Dice
Tricycle
Four-leaf Clover
Hand
Six-Pack
Seven-Up
Octopus

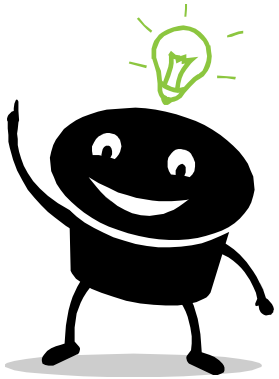
Cat Lives
Bowling Pins
Football Team
Dozen Eggs
Unlucky Friday
Valentine’s Day
Quarter Hour

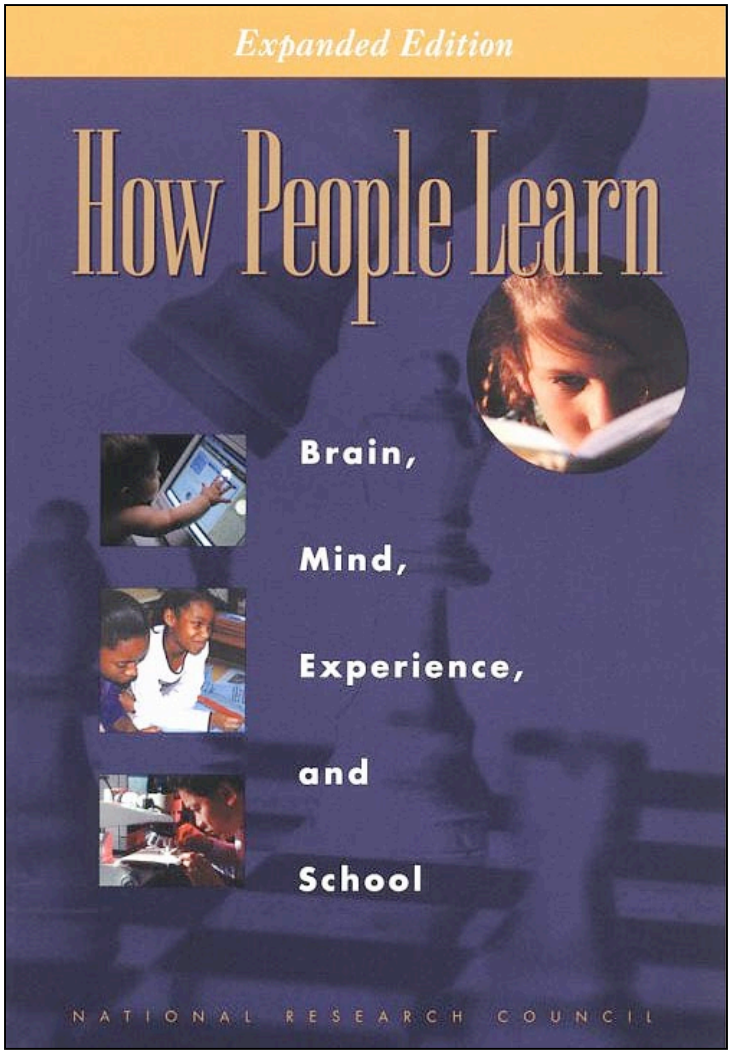
NOW, how many words or phrases do you remember?

What were two major *differences* between the two attempts?

1. We knew what the task was

2. We knew how the information was organized





Bransford, J.D., Brown, A.L., Cocking, R.R. (Eds.), 2000. *How people learn: Brain, Mind, Experience, and School.* Washington, DC: National Academy Press.

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***

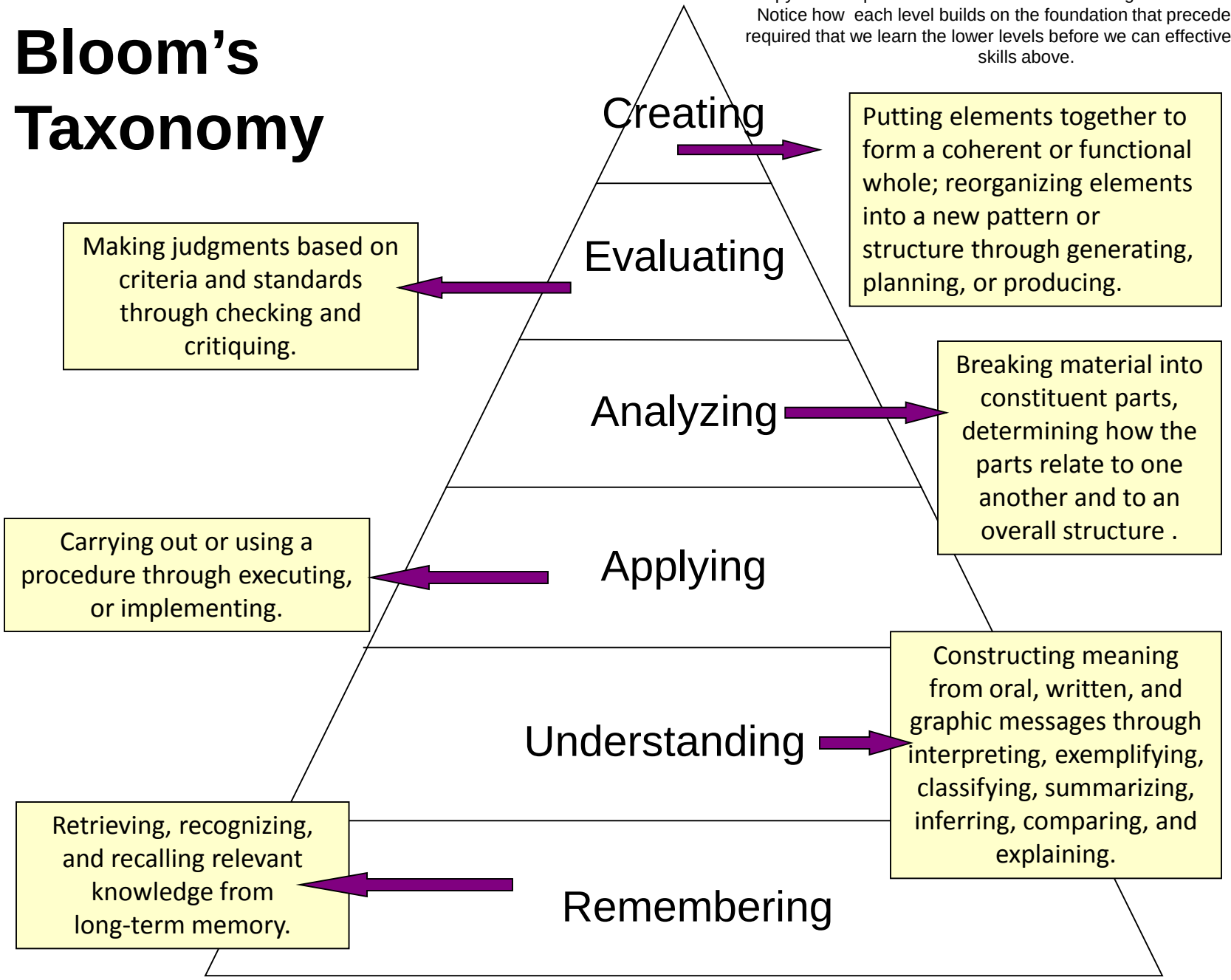
*Cross, Patricia, "Opening Windows on Learning" League for Innovation in the Community College, June 1998, p. 21.

** Flavell, John, "Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry." *American Psychologist*, Vol 34(10), Oct 1979, 906-911.

*** Bloom Benjamin. S. (1956). *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain.* New York: David McKay Co Inc.

Bloom's Taxonomy

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·

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 do you think students answered?

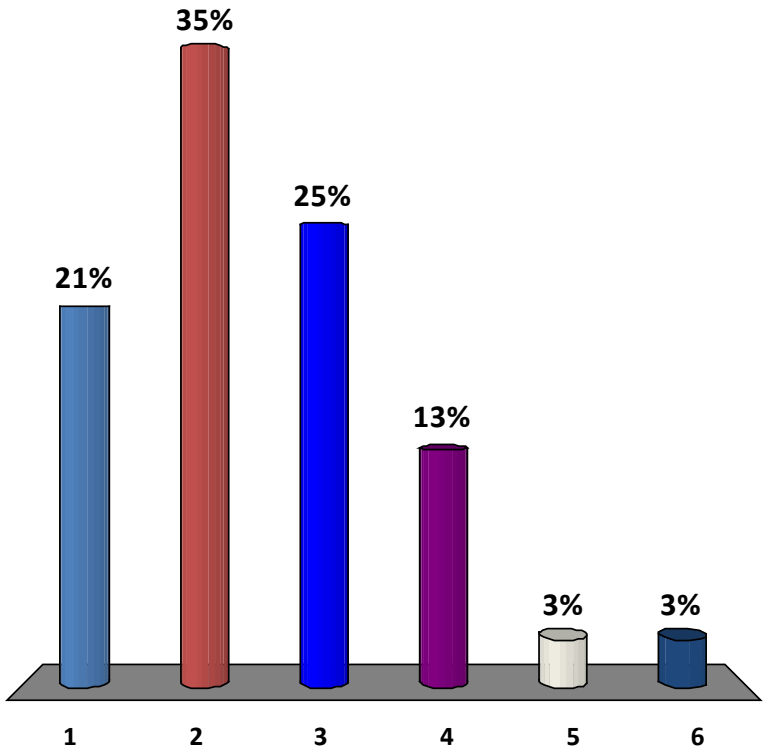
At what level of Bloom's do you think you'll need to operate to make A's in college courses?

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

How students answered (2008)

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

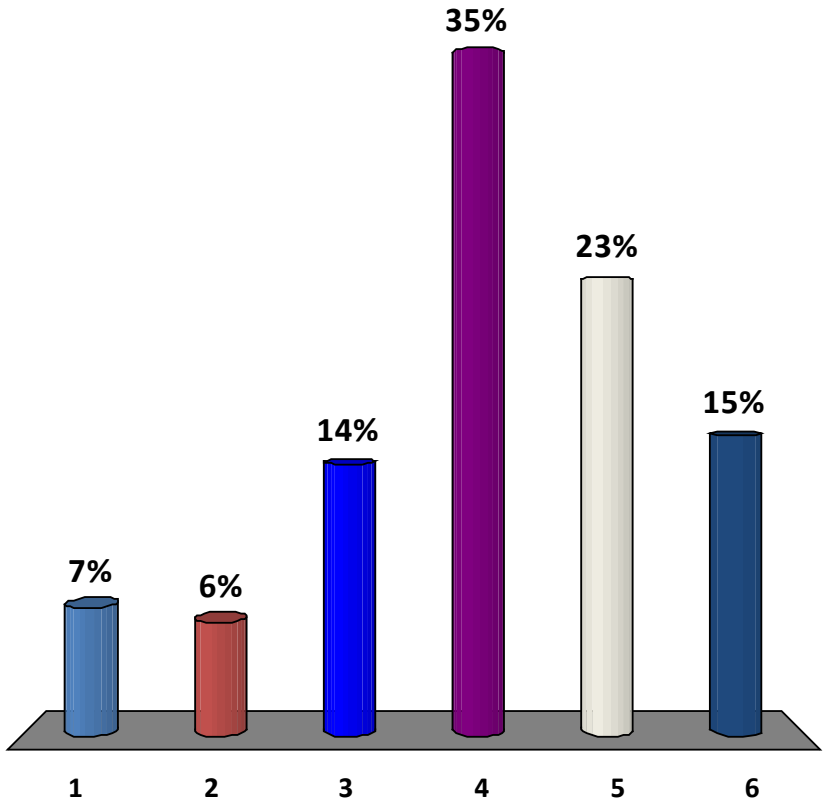
1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating



How students answered (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 (2013)

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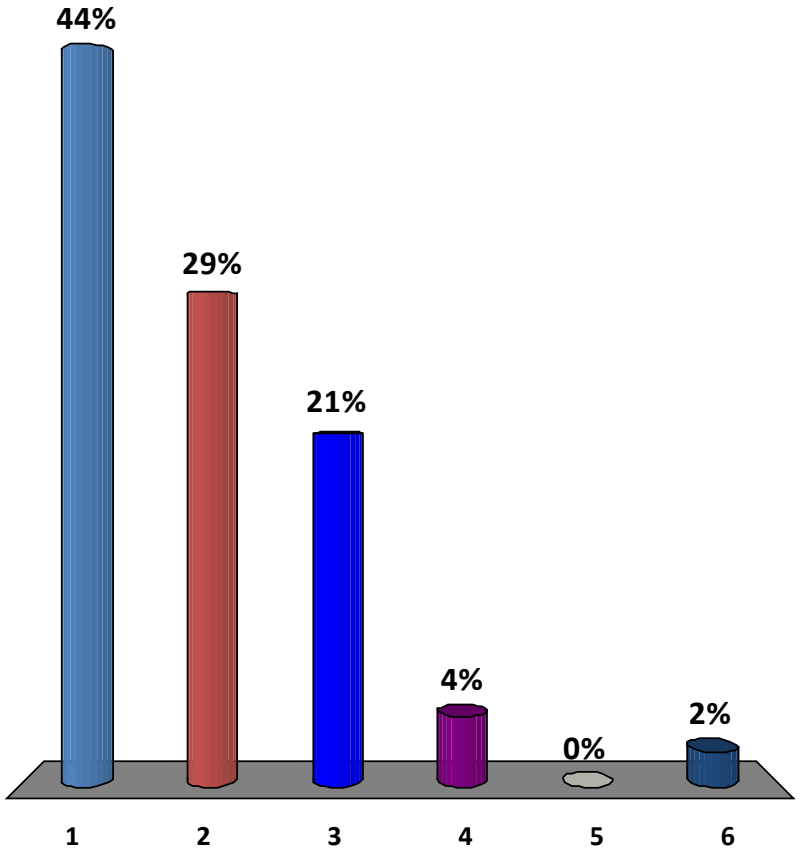
3. Applying
4. Analyzing
5. Evaluating
6. Creating



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?

1. Remembering
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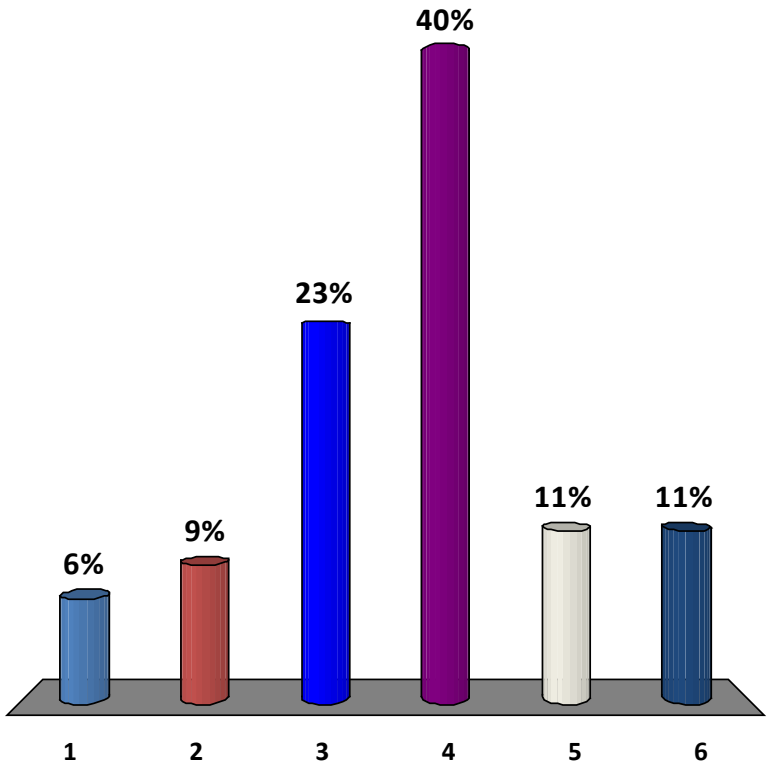
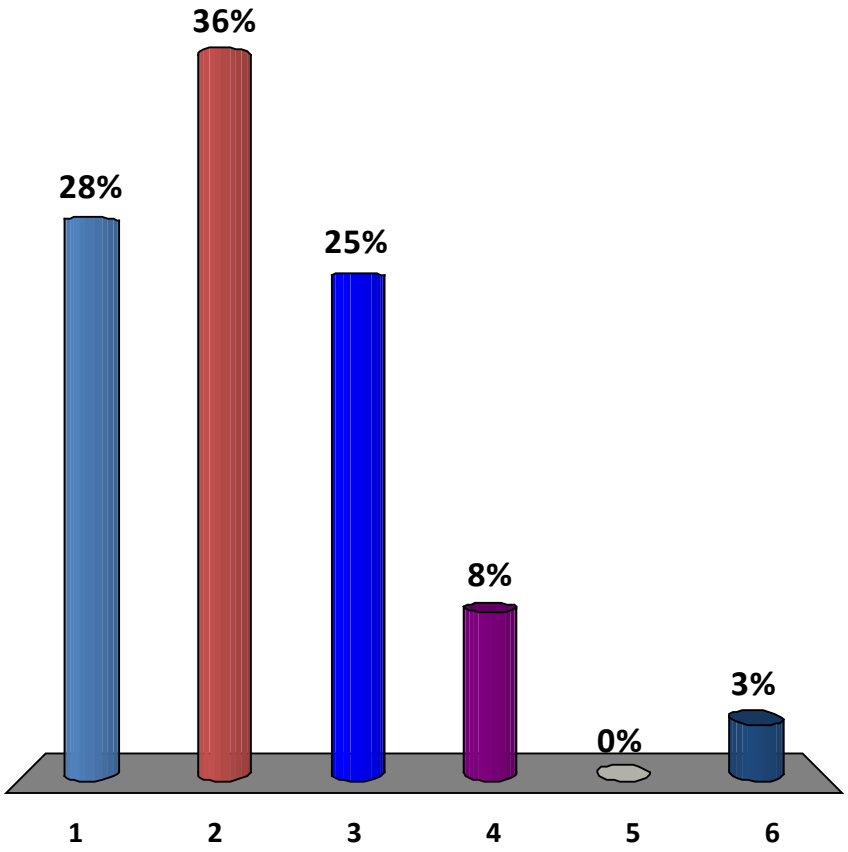


How students answered (2014)

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

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



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?

1. Remembering
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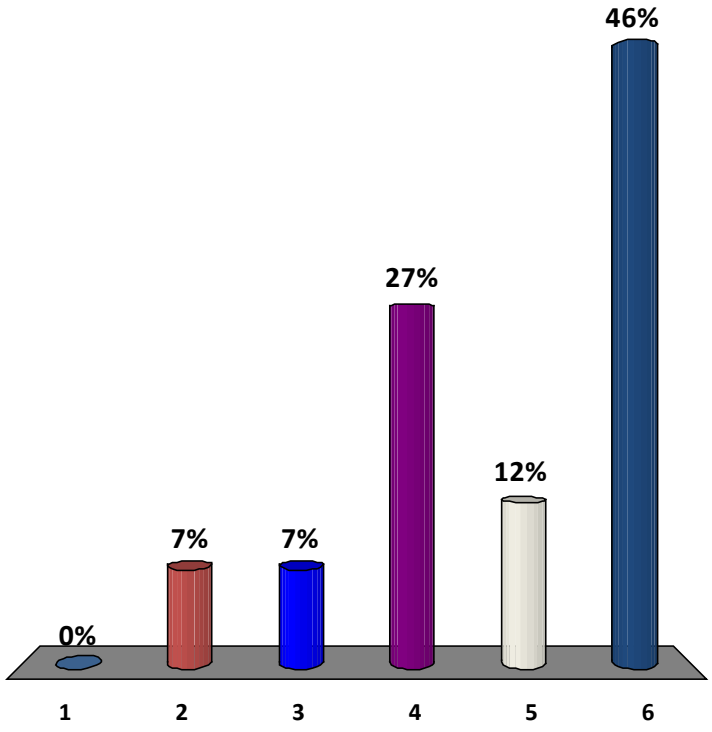
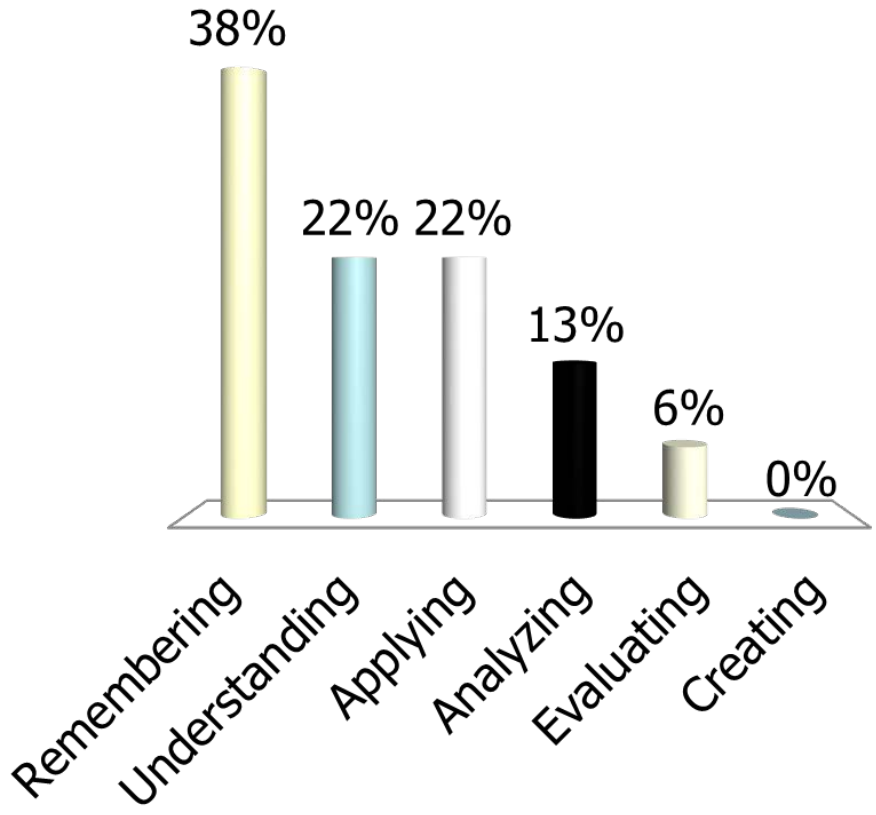


How students answered (2017)

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

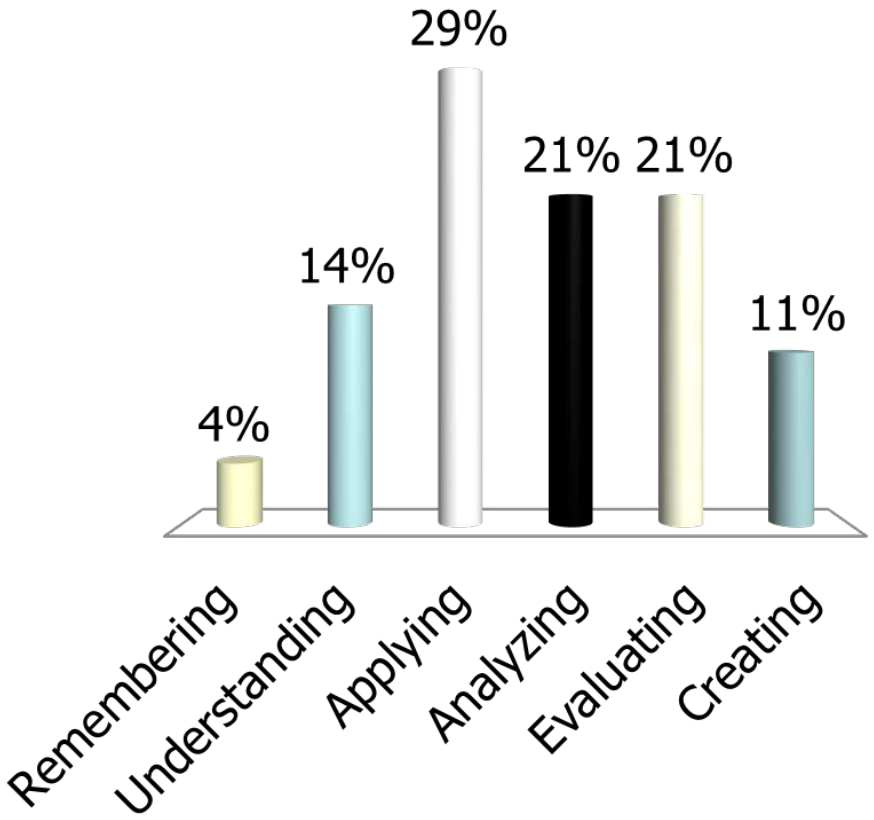
1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating



How students answered (in 2017)

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

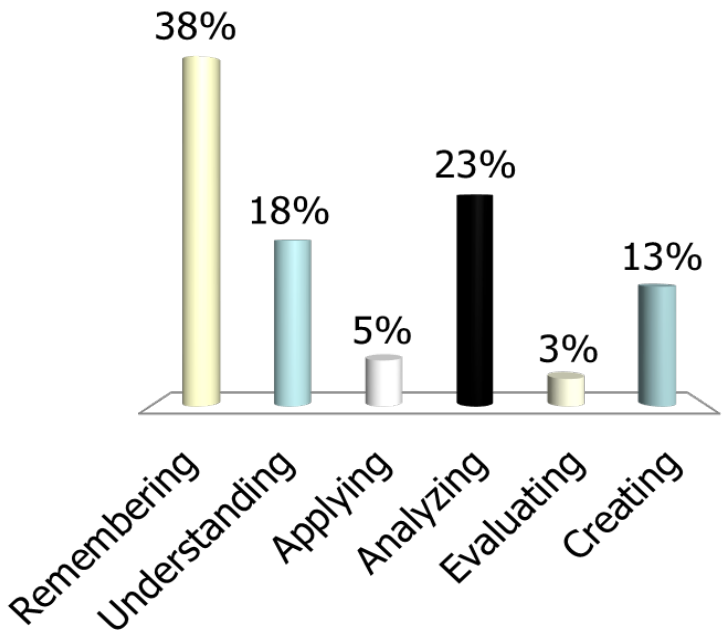
1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating



How students answered (in 2018)

At what level of Bloom's do you think you'll need to operate to make A's and B's in high school?

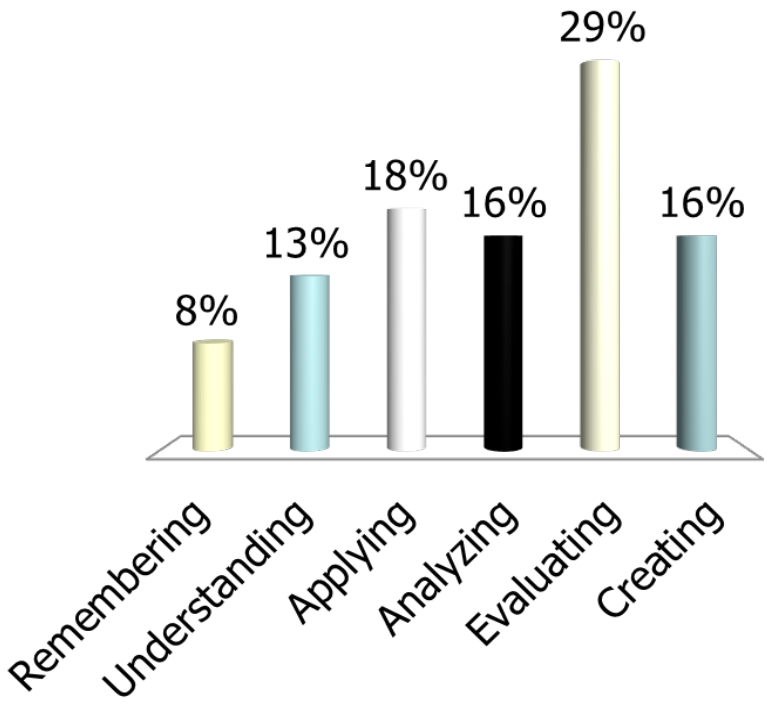
1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating



How students answered (in 2018)

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

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

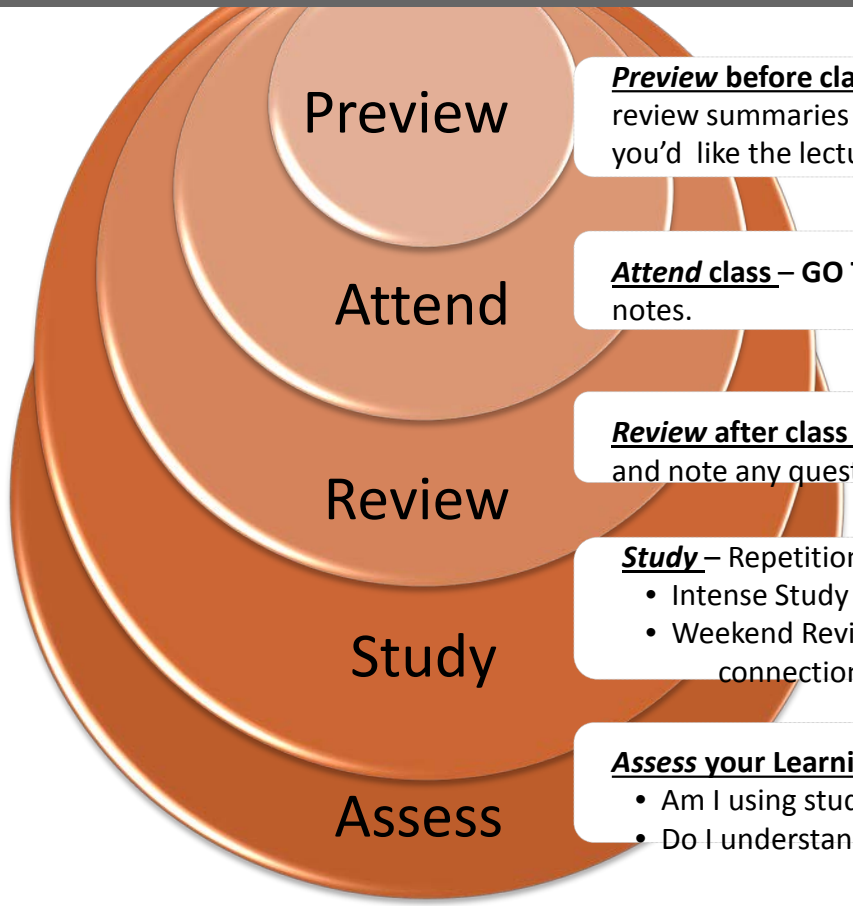


How do we teach students to move *higher* on Bloom's Taxonomy?

Teach them the Study Cycle*

adapted from Frank Christ's PLRS system

The Study Cycle



***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?

*Intense Study Sessions

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**

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*

	Attended	Absent
Exam 1 Avg:	71.65%	70.45%
Exam 2 Avg:	77.18%	68.90%
Final course Avg*:	81.60%	70.43%
Final Course Grade:	**B**	**C**

The one 50-min presentation on study and learning strategies was followed by an improvement of one full letter grade

***Cook, E.; Kennedy, E.; McGuire, S. Y. *J. Chem. Educ.*, 2013, 90 (8), 961–967**

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

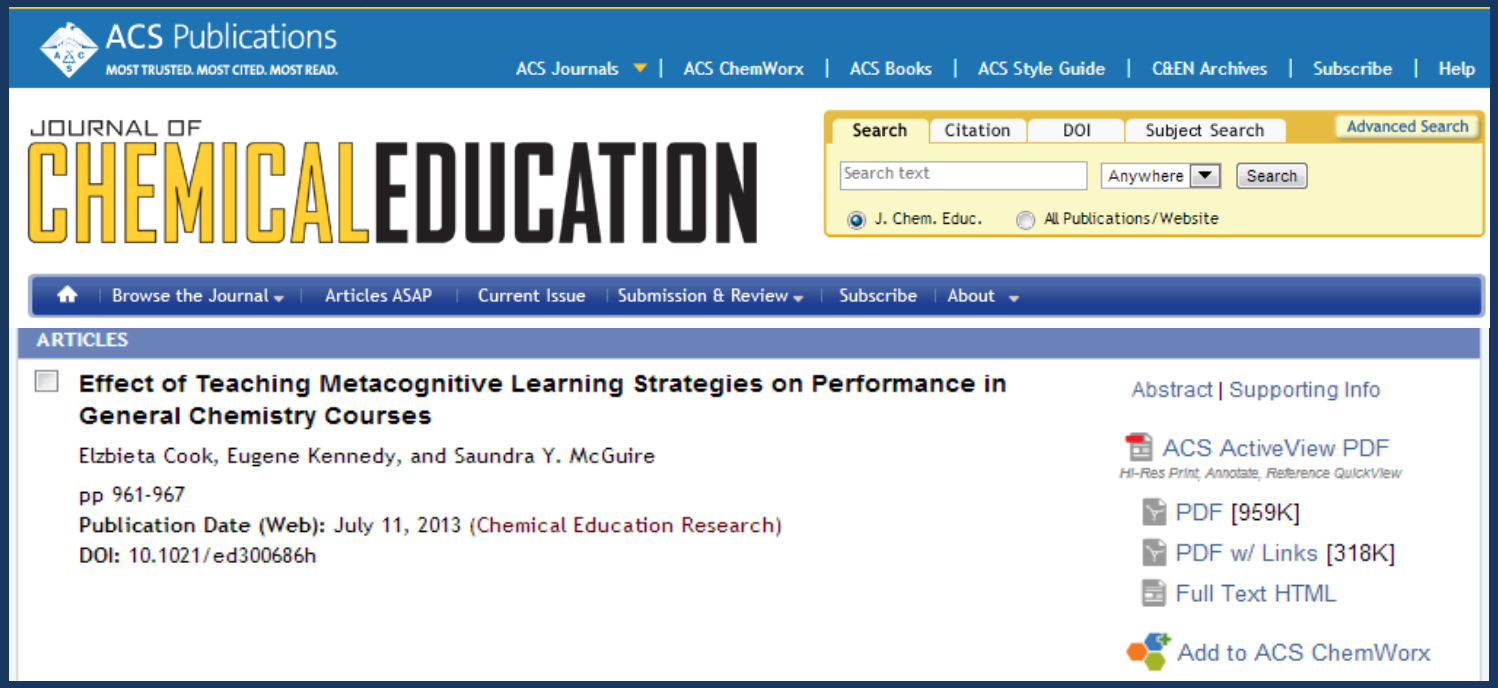
	Attended	Absent
Exam 1 Avg:	71.33%	69.27%
Homework Total:	169.8	119.1
Final course Avg*:	82.36%	67.71%
Final Course Grade:	**B**	**D**

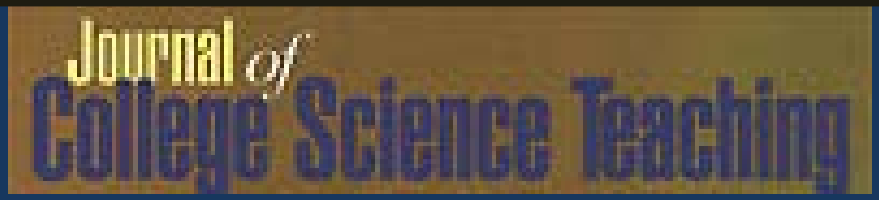
The 50-min presentation on study and learning strategies was followed by an improvement of two letter grades

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

	Attended	Absent
Exam 1, 2, 3 Avg:	68.14%	69.67%
Exam 4 Avg:	83.45%	75.91%
Final Exam Avg:	80.98%	75.24%
Final course Avg*:	84.90%	78.83%
Final Course Grade:	**B**	**C**

The 50-min presentation on study and learning strategies *after exam 3* was followed by an improvement of one letter grade





Metacognition: An Effective Tool to Promote Success in College Science Learning*

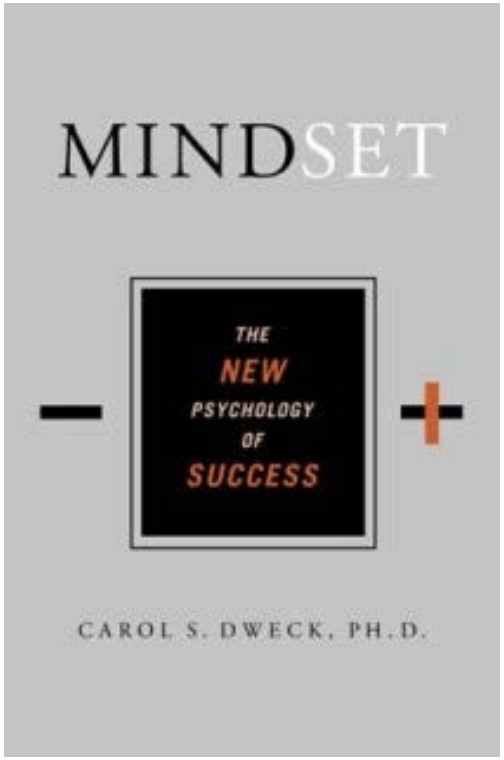
Ningfeng Zhao[1], Jeffrey Wardeska[1], Saundra McGuire[2], Elzbieta Cook[2]

[1]Department of Chemistry, East Tennessee State University

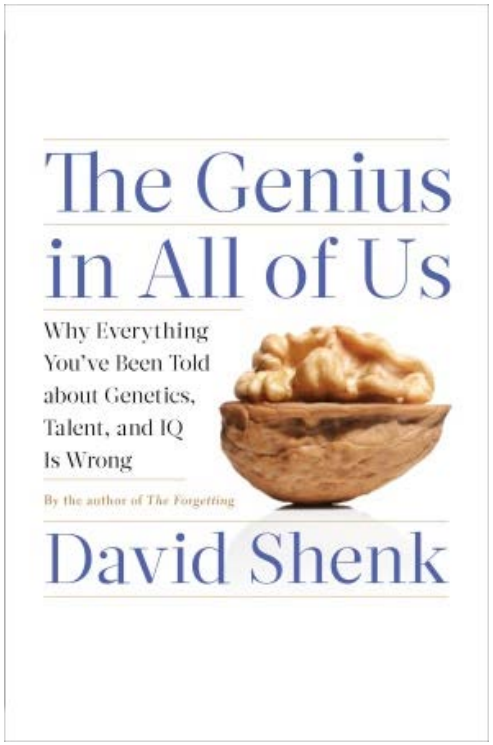
[2]Department of Chemistry, Louisiana State University

*March/April 2014 issue of JCST, Vol. 43, No. 4, pages 48-54

Help Students Develop the Right Mindset

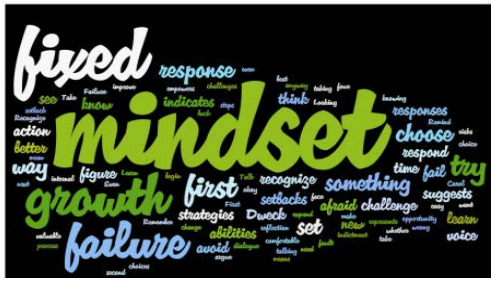


Dweck, Carol, 2006. *Mindset: The New Psychology of Success.* New York: Random House Publishing



Shenk, David, 2010. *The Genius in All of Us: Why Everything You've Been Told About Genetics, Talent, and IQ Is Wrong. New York: Doubleday*

*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

Dweck, Carol (2006) *Mindset: The New Psychology of Success.* New York: Random House Publishing

Responses to *Many* Situations are Based on Mindset

	Fixed Intelligence Mindset Response	Growth Intelligence Mindset Response
Challenges	*Avoid*	*Embrace*
Obstacles	*Give up easily*	*Persist*
Tasks requiring effort	*Fruitless to Try*	*Path to mastery*
Criticism	*Ignore it*	*Learn from it*
Success of Others	*Threatening*	*Inspirational*

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

1. Fixed
2. Growth

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

1. Fixed
2. Growth

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

1. Fixed
2. Growth

Email from a General Chemistry Student Spring 2011

"…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

LSU Analytical Chemistry Graduate Student's Cumulative Exam Record

2004 – 2005	
9/04	Failed
10/04	Failed
11/04	Failed
12/04	Failed
1/05	Passed
2/05	Failed
3/05	Failed
4/05	Failed

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

Dr. Algernon Kelley, December 2009

From a Xavier University student to Dr. Kelley in Fall 2011

Oct. 17, 2011

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 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.**

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*

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 an **increase** in academic capability, confidence, retention, and graduation rates!

Useful Websites

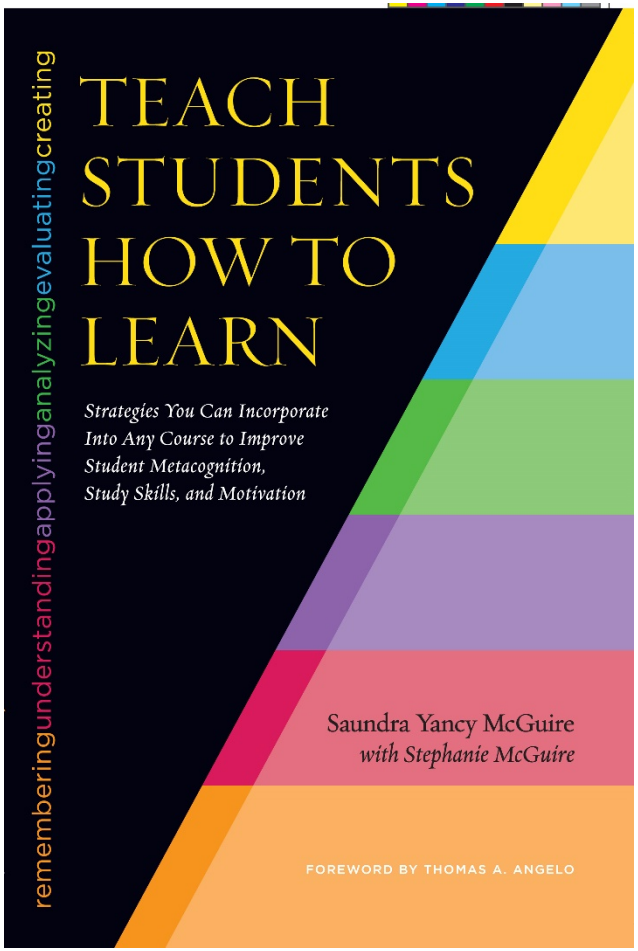
- www.lsu.edu/students/cas/
- www.howtostudy.org
- www.vark-learn.com
- www.drearlbloch.com

References

- Bruer, John T. , 2000. *Schools For Thought: A Science of Learning in the Classroom. MIT Press.*
- Bransford, J.D., Brown, A.L., Cocking, R.R. (Eds.), 2000. *How people learn: Brain, Mind, Experience, and School.* Washington, DC: National Academy Press.
- Christ, F. L., 1997. *Seven Steps to Better Management of Your Study Time*. Clearwater, FL: H & H Publishing
- Cromley, Jennifer, 2000. *Learning to Think, Learning to Learn: What the Science of Thinking and Learning Has to Offer Adult Education*. Washington, DC: National Institute for Literacy.
- Ellis, David, 2014. *Becoming a Master Student*.* Boston: Cengage Learning.
- Hoffman, Roald and Saundra Y. McGuire. (2010). Learning and Teaching Strategies. *American Scientist ,* vol. 98, pp. 378-382.
- McGuire, S.Y. (2015). *Teach Students How to Learn: Strategies You Can Incorporate into Any Course to Improve Student Metacognition, Study Skills, and Motivation*. Sterling, VA: Stylus
- Nilson, Linda, 2004. *Teaching at Its Best: A Research-Based Resource for College Instructors.* Bolton, MA: Anker Publishing Company.
- Pierce, William, 2004. Metacognition: Study Strategies, Monitoring, and Motivation.
  http://academic.pg.cc.md.us/~wpeirce/MCCCTR/metacognition.htm

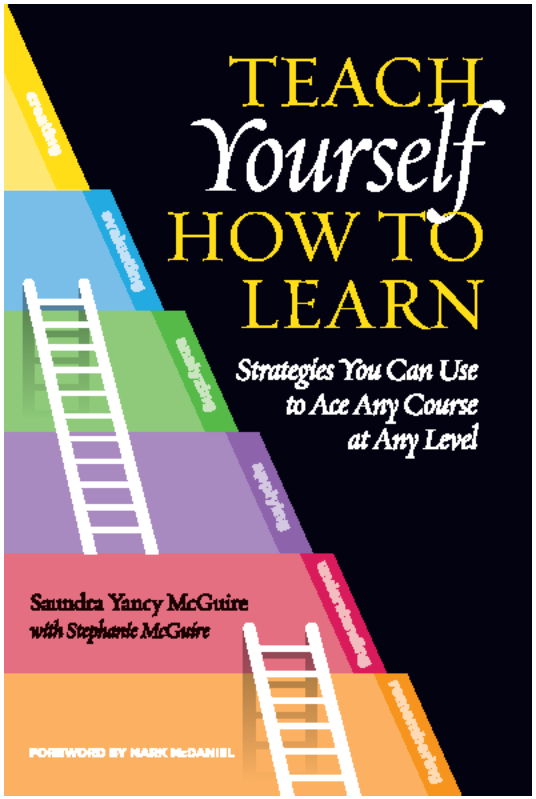
*Excellent student reference

A Recent Reference



***McGuire, S.Y. (2015). Teach Students How to Learn: Strategies You Can Incorporate into Any Course to Improve Student Metacognition, Study Skills, and Motivation*. Sterling, VA: Stylus**

Just out in January…
A Book for Students



McGuire, S.Y. (2018). Teach Yourself How to Learn: Strategies You Can Use to Ace Any Course at Any Level. Sterling, VA: Stylus