# Equity and Excellence for All Students: Metacognition Is The Key!


**Saundra Y. McGuire, Ph.D.**
**Ret. Assistant Vice Chancellor & Professor of Chemistry**
**Director Emerita, Center for Academic Success**
**Louisiana State University**

# What Do Equity and Excellence Look Like?

- **Equity**

  reducing the discrepancy in educational outcomes between low-income versus

  high- income students and minority versus majority students.

- **Excellence**

  fostering among all students a high level of knowledge and skills necessary for success in the 21st Century

https://www.kaganonline.com/grants/Excellence&Equity.pdf

Texas Wesleyan UNIVERSITY

# Mission

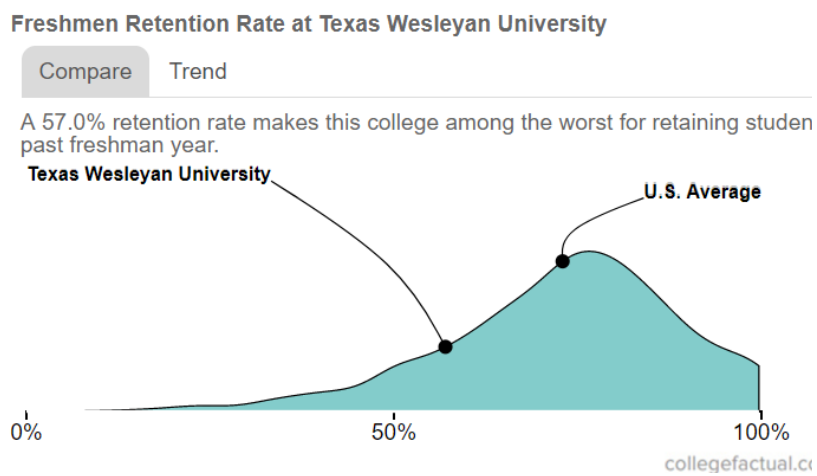
… to **develop students to their full potential as individuals** and as members of the world community…

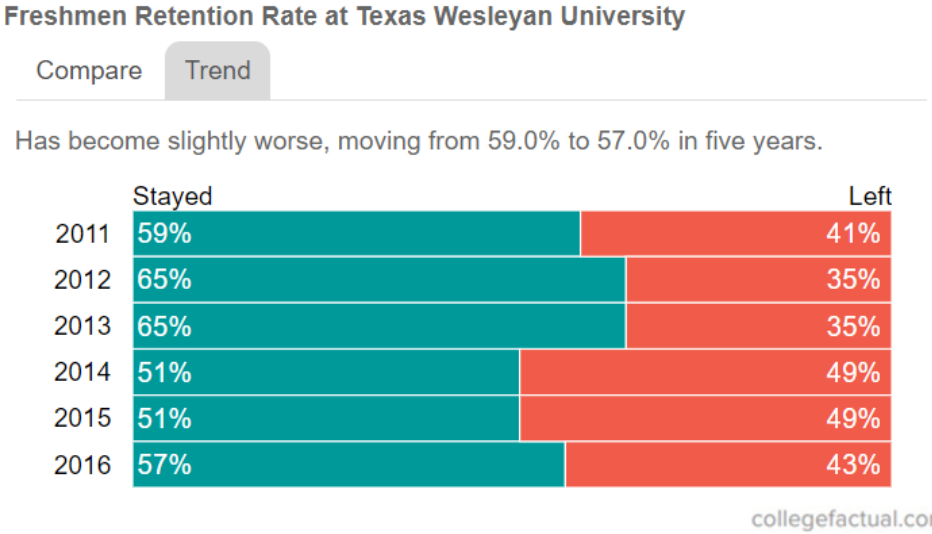
…committed to the principles **that *each* student deserves personal attention…**

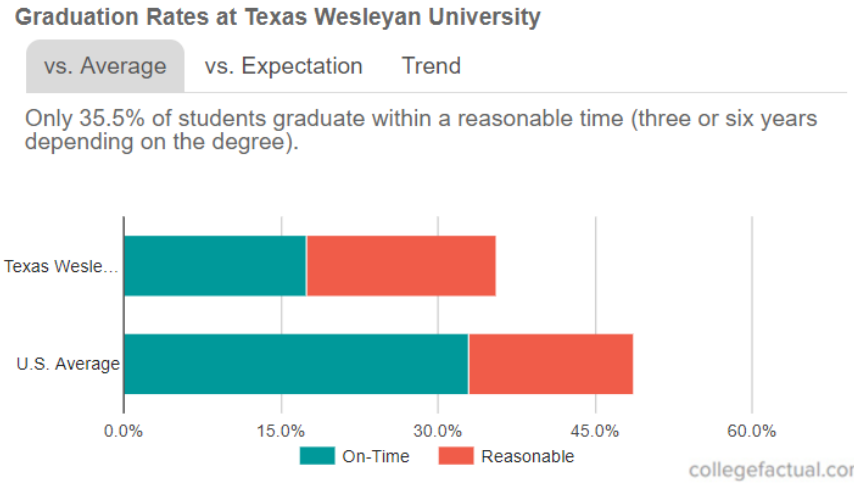
…endeavors to create a learning environment where ***each* student is provided an opportunity to pursue *individual* excellence…**

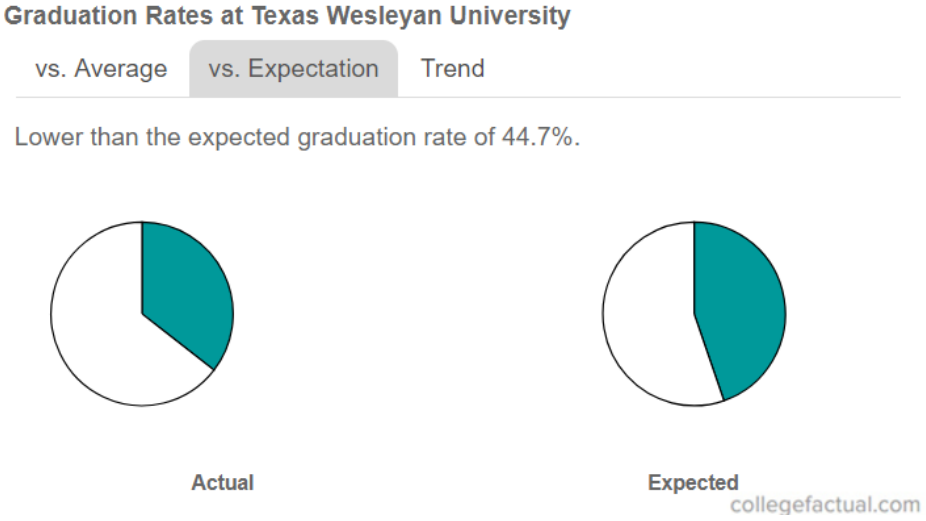
…actively seeks and employs faculty and staff with **commitment and dedication to teaching, *inspiring* and serving students.**

# TXWES Retention and Graduation Rates




https://www.collegefactual.com/colleges/texas-wesleyan-university/academic-life/graduation-and-retention//

# How Can TXWES Improve These Rates?

- Teach Students *How* to Learn
- Help Students Develop the Right Mindset
- Motivate Students to Implement Effective Metacognitive Learning Strategies
- Successfully Implement the QEP

# Critical Thinking is *Invaluable* for Success in the 21st Century


# Metacognition is Crucial for Helping *All* Students Think Critically

# What is 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

# Marsha's Email
# Demonstrating the Power of Metacognition

Dr. McGuire,

THANK YOU BEYOND ALL THANKS for your guidance and patience**... I managed to get all A's this semester**: On my last final today at 3, I scored 112 out of 100... I am so happy and overjoyed! I wanted to share the good news and tell you that I totally support everything that you guys do and I want to help others in the same way that you helped me. I am truly appreciative and want to thank you for EVERYTHING!!

P.S. I believe **my GPA has gone from a sad probation 2.77 to a Happy FREE 3.38**... so I"M FREE from the academic shackles!!!

I learned many key concepts from Dr. McGuire (metacognition, critical thinking, expert learner, and you must know the why's, how's, and what if's). I am grateful to God that He allowed our paths to not only cross, but also become intertwined for these last few years.

Dr. McGuire, you are my academic angel. You encouraged me and helped me to *regain confidence in myself when I felt that I was falling* short. I believe you were placed in my life to remind me that *I am capable of achieving what statistics say that I am not*. For that, I am grateful. Thank you for investing in my future and seeing beyond who I am on a transcript.

# **Marsha Cole – Ph.D.**

Research Chemist

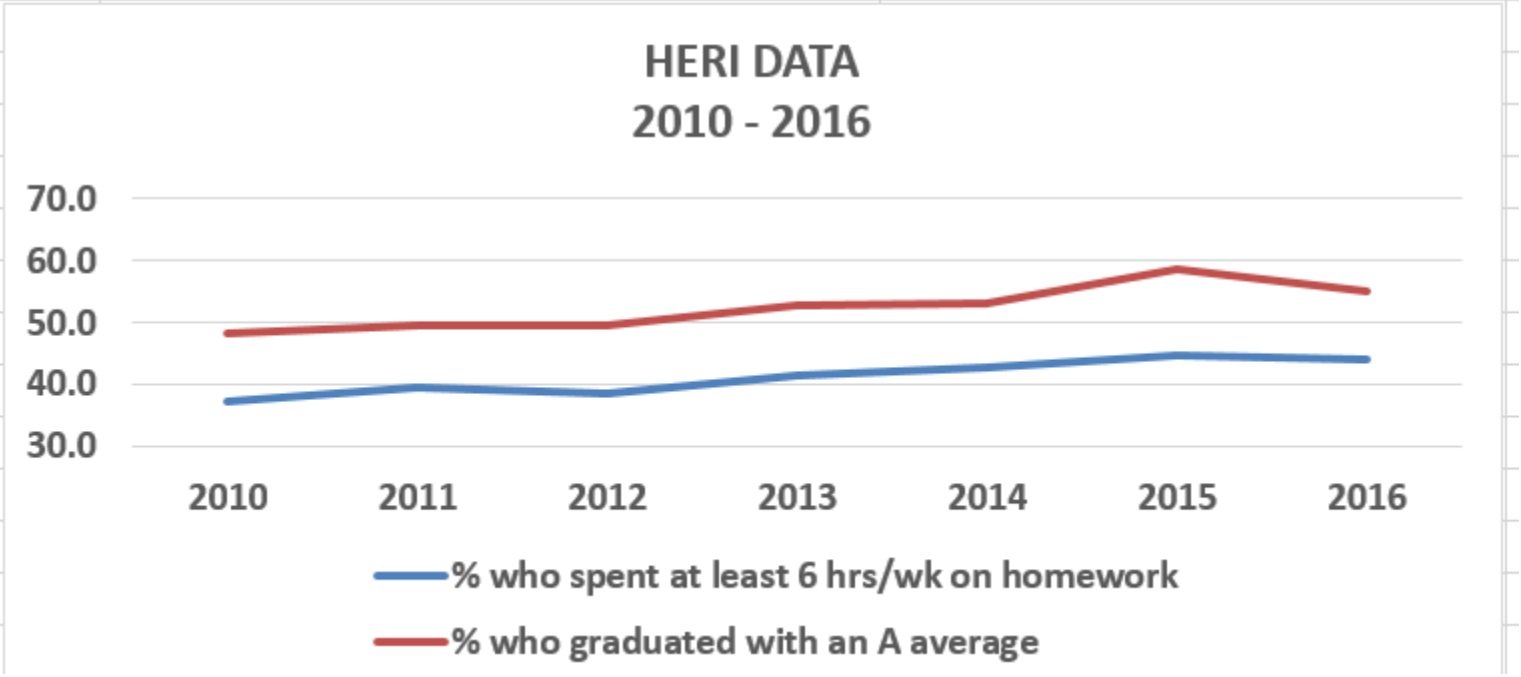
U.S. Department of Agriculture

# Why haven't most students developed metacognitive skills?

**It wasn't necessary in high school (or in some cases not even in college)**

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

| | % who spent at least 6 hrs/wk on homework | % who graduated with an A average |
|---|---|---|
| 2010 | 37.3 | 48.4 |
| 2011 | 39.5 | 49.7 |
| 2012 | 38.4 | 49.5 |
| 2013 | 41.4 | 52.8 |
| 2014 | 42.9 | 53.1 |
| 2015 | 44.8 | 58.7 |
| 2016 | 44.0 | 55.1 |




http://www.heri.ucla.edu

achieve more®

SAT®

# 2013 SAT® Report on COLLEGE & CAREER READINESS



## EXECUTIVE SUMMARY

The College Board's *2013 SAT® Report on College & Career Readiness* reveals that fewer than half of all SAT takers in the class of 2013 graduated from high school academically prepared for the rigors of college-level course work. This number has remained virtually

Report: Skills Gap Increasing in Higher Ed-to-Business Talent Pipelines

Report: Technology Purchases Driving up Back-to-School Shopping Budgets



Research

# ACT Alarmed by U.S. Student Test Results

By Dian Schaffhauser | 08/26/15

This year's ACT results show 31 percent of students still unready for college in English, math, reading or science — every subject tested by the assessment organization. That's a figure that has not changed since 2012, when it was slightly higher. Fewer than a fifth of those students can be expected to go on to earn a college degree within six years.



## MOST POPULAR ARTICLES

1 Research Uncovers MOOC Cheating Strategy

2 Three-Quarters of Students Say More Tech Would Improve Their Learning

3 Connected Data Unveils Transporter Network Storage Connector

4 E-Texts and the Future of the College Bookstore

# Faculty Must *Help Students Make the Transition to College*

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

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


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

# 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?

# 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

# 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)

# 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

# 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 on-line solutions help for problems

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

# Dana Lewis –
## Master's Degree in Medical Physics
## Univ of Texas MD Anderson Cancer Center

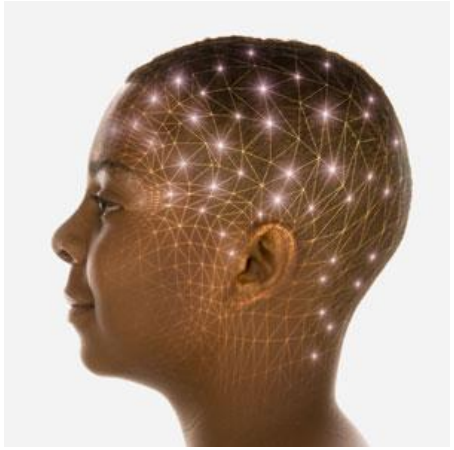

Practicing Medical Physicist as of 8/28/2016 when she completed her residency!

# Homework Strategy that is Essential to Student Success!

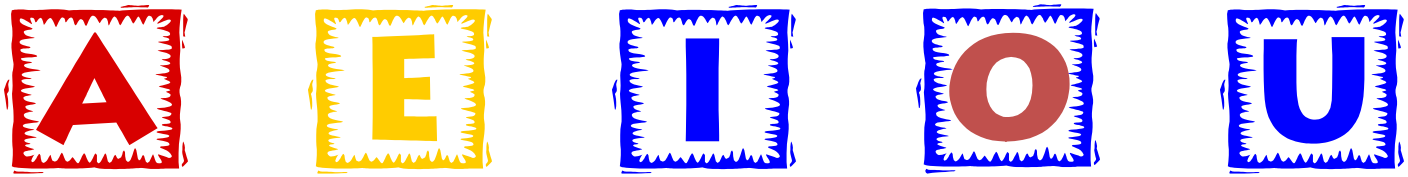
- **Study material first,** before looking at the problems/questions
- **Work example problems** (without looking at the solutions) until you get to the answer
- **Check** to see if **answer** is correct
- If answer is not correct, **figure out where mistake was made**, without consulting solution
- **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.*

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

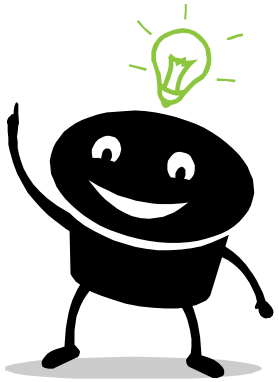
Cat Lives
Bowling Pins
Football Team
Dozen Eggs
Unlucky Friday
Valentine’s Day
Quarter Hour

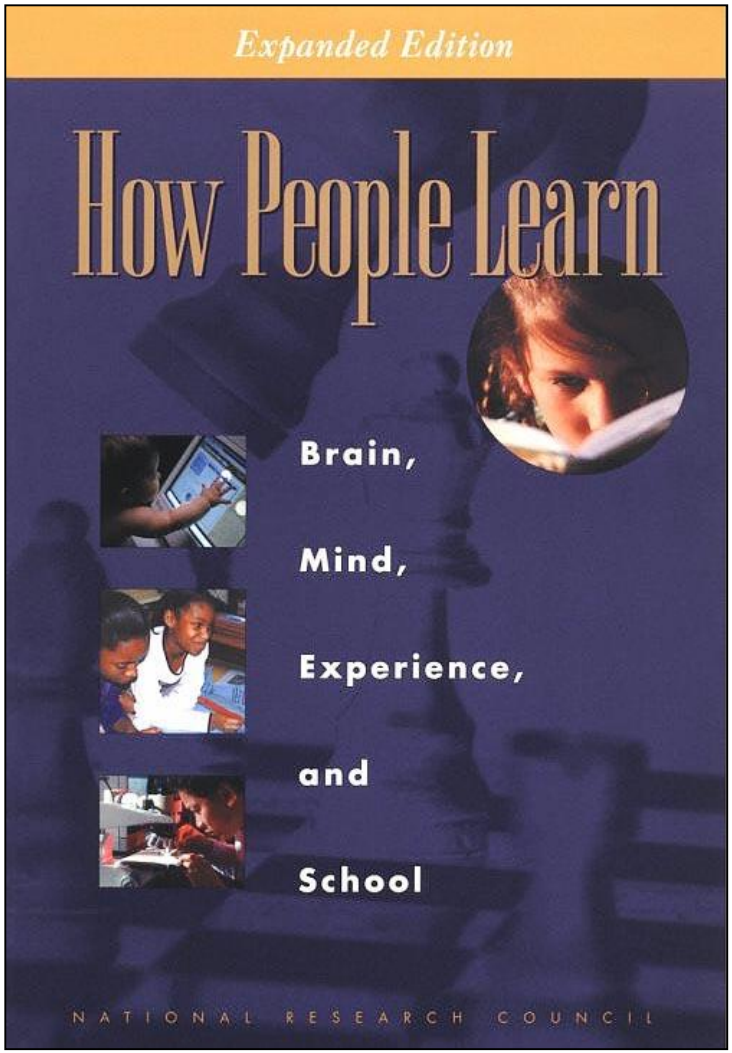
NOW, how many words or phrases do you remember?

# 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***

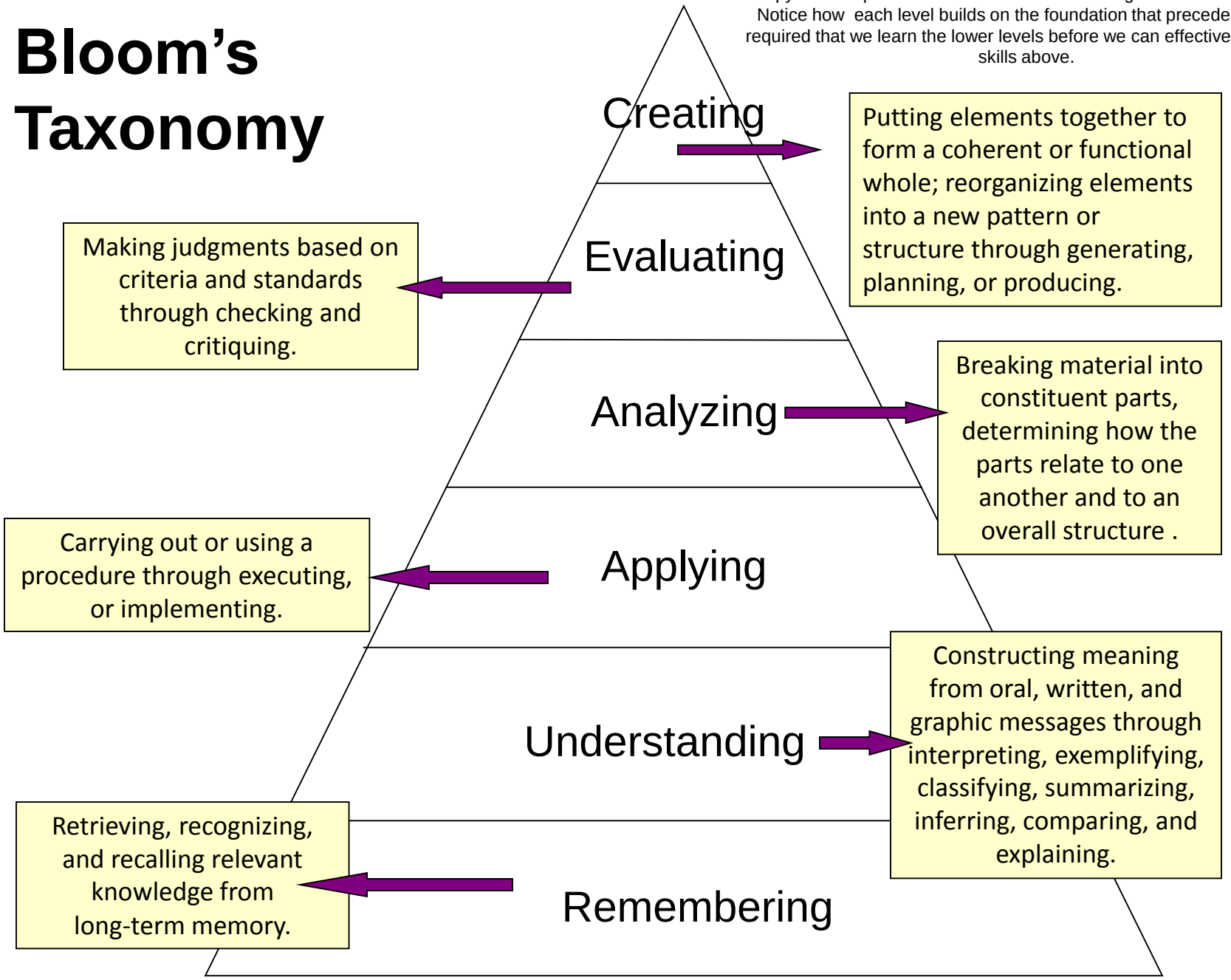
*Cross, Patricia, "Opening Windows on Learning" League for Innovation in the Community College, June 1998, p. 21.

** 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 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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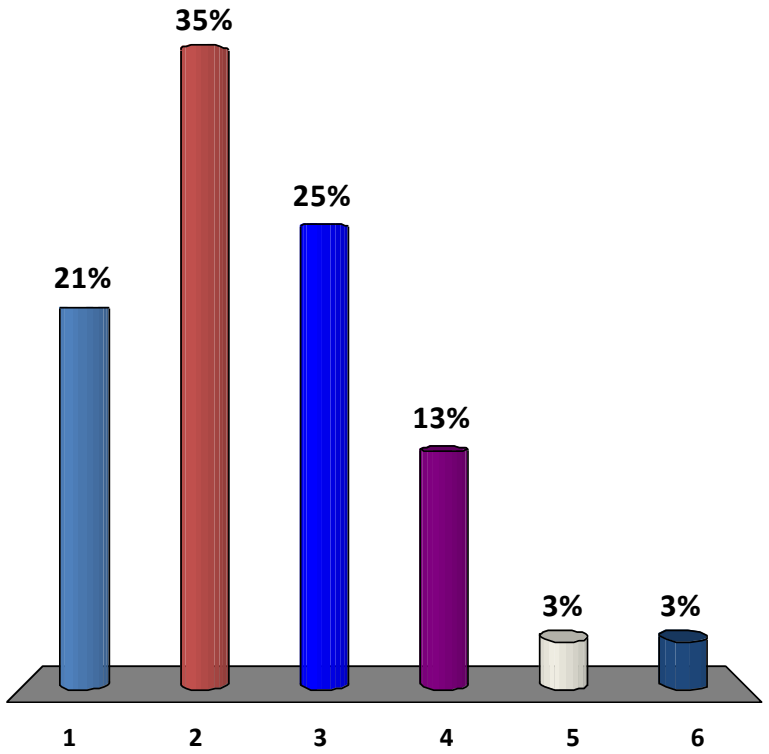

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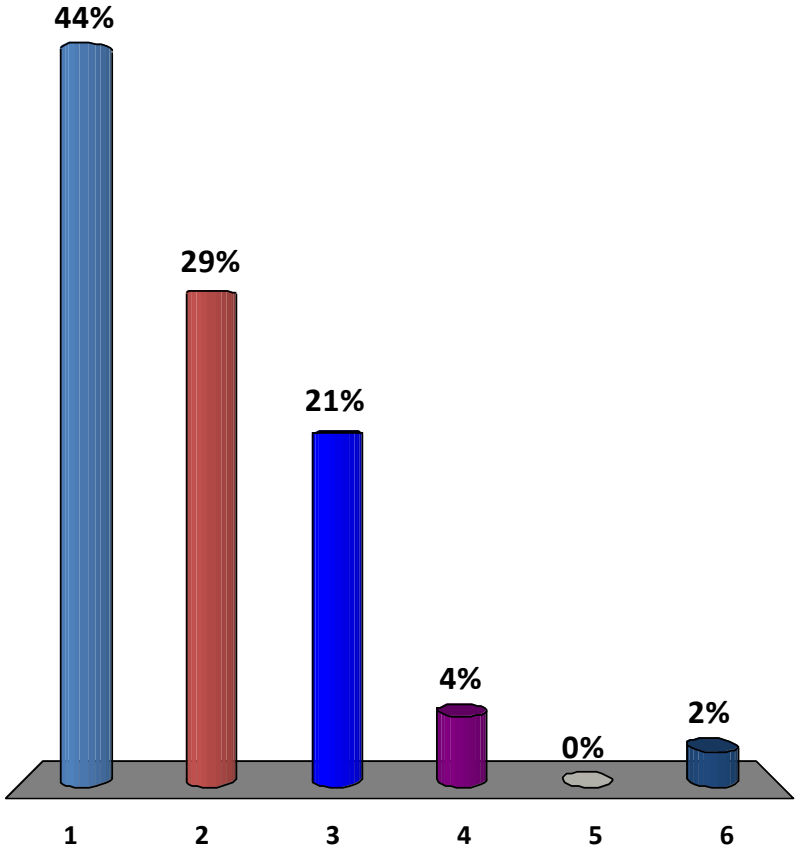
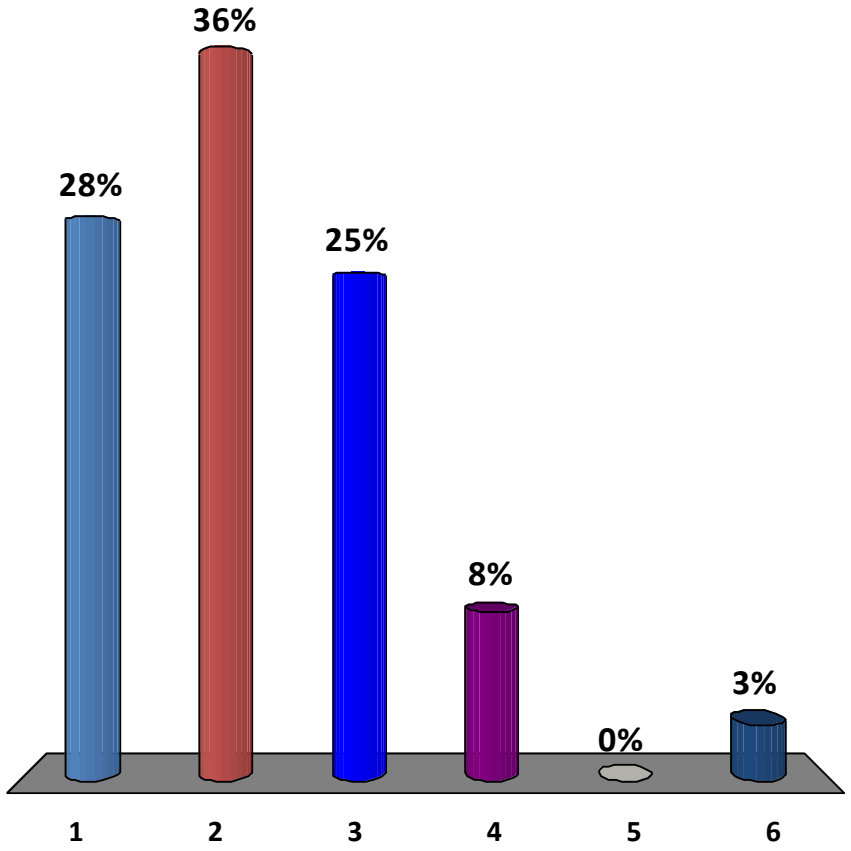


# *How students answered (2014)*

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

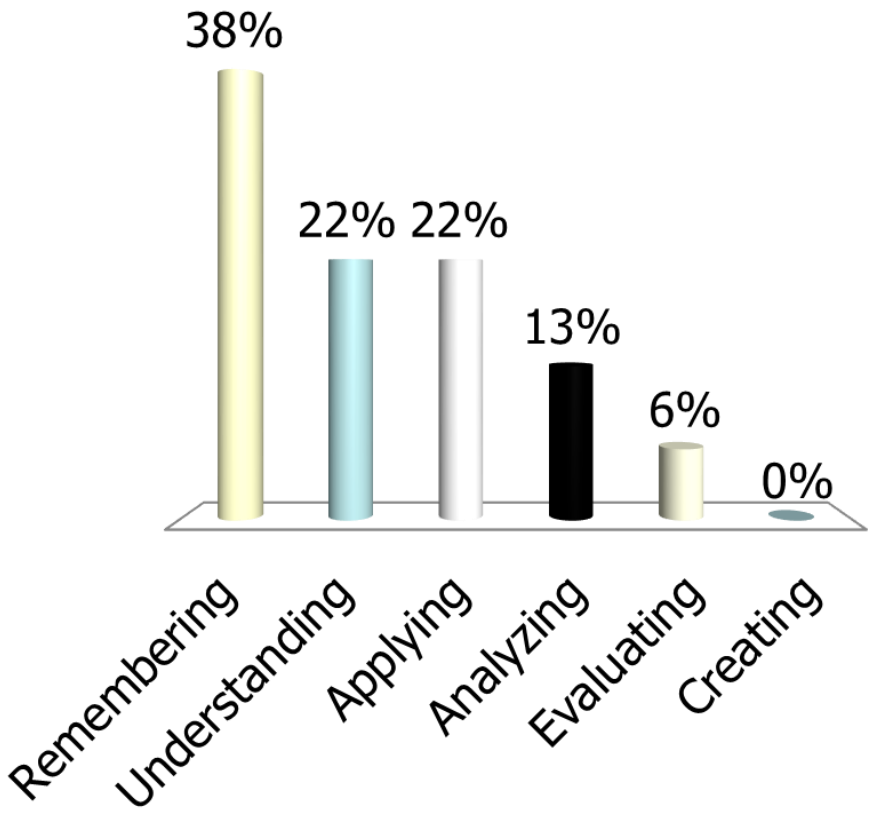
1. Remembering
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating



# *How students answered (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 do you think students answered?*

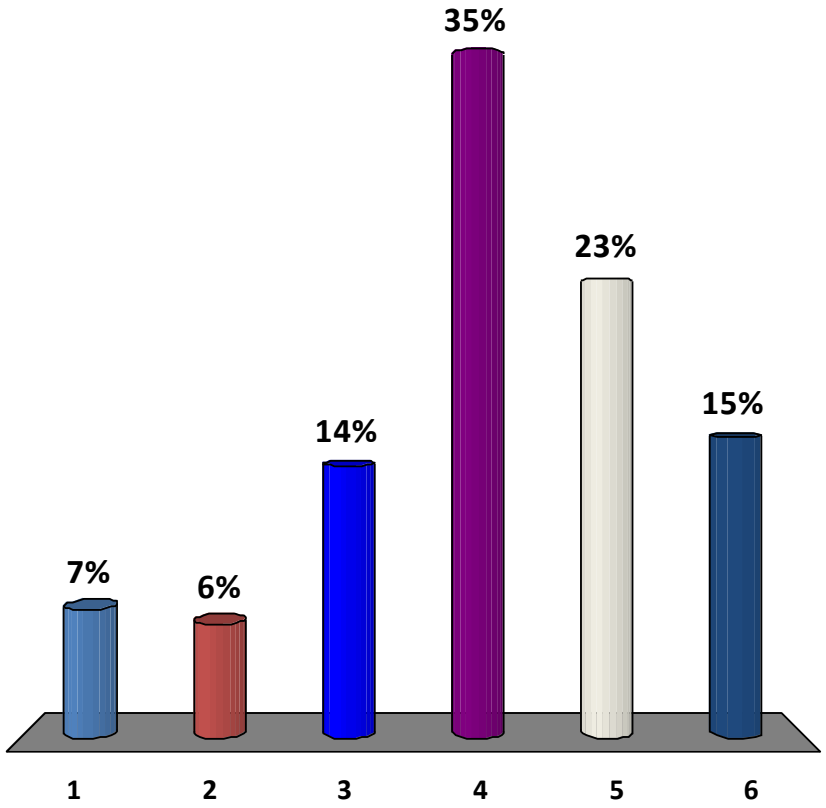
At what level of Bloom's do you think you'll need to operate to make A's in college courses?

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?

1. Remembering
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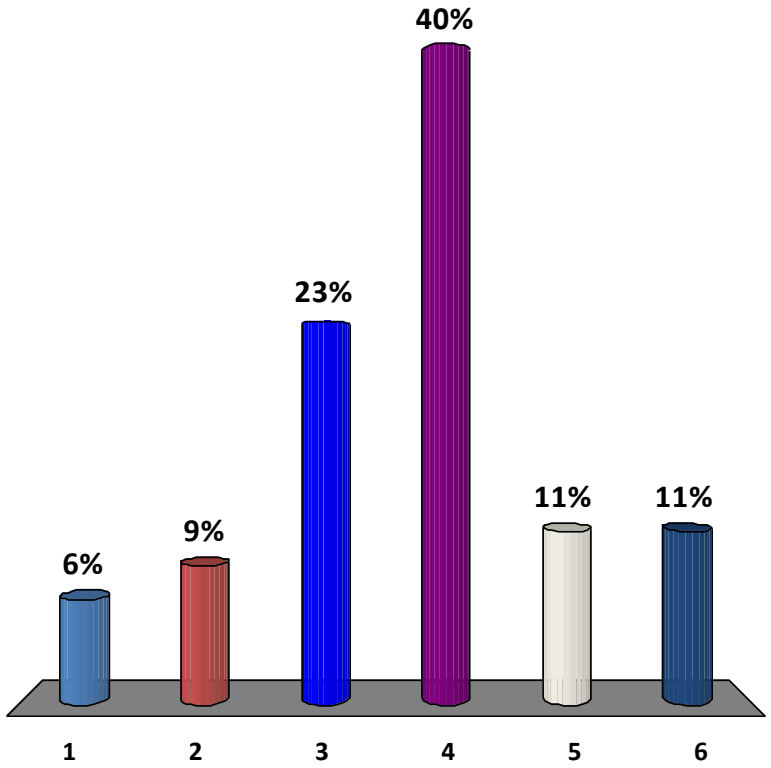

# *How students answered (in 2014)*

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

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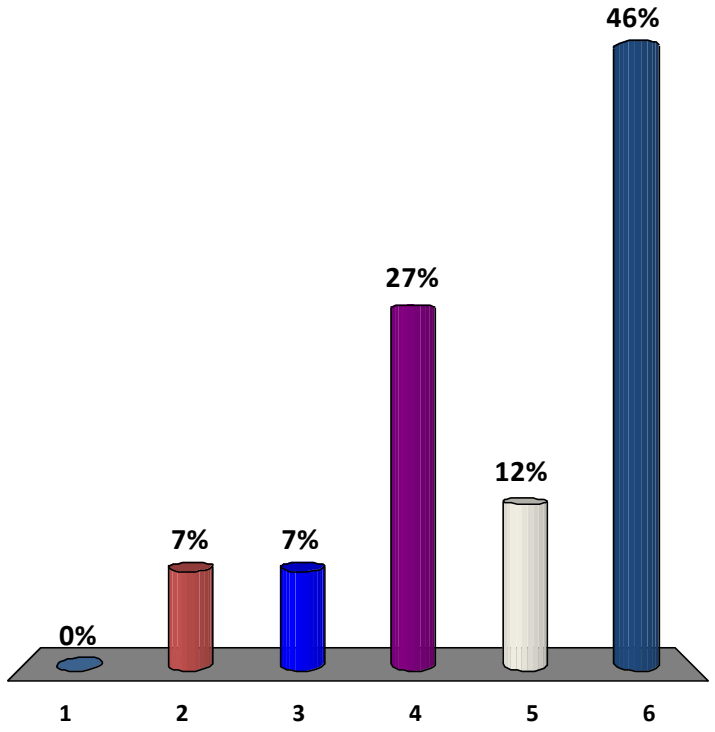

# *How students answered (in 2017)*

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

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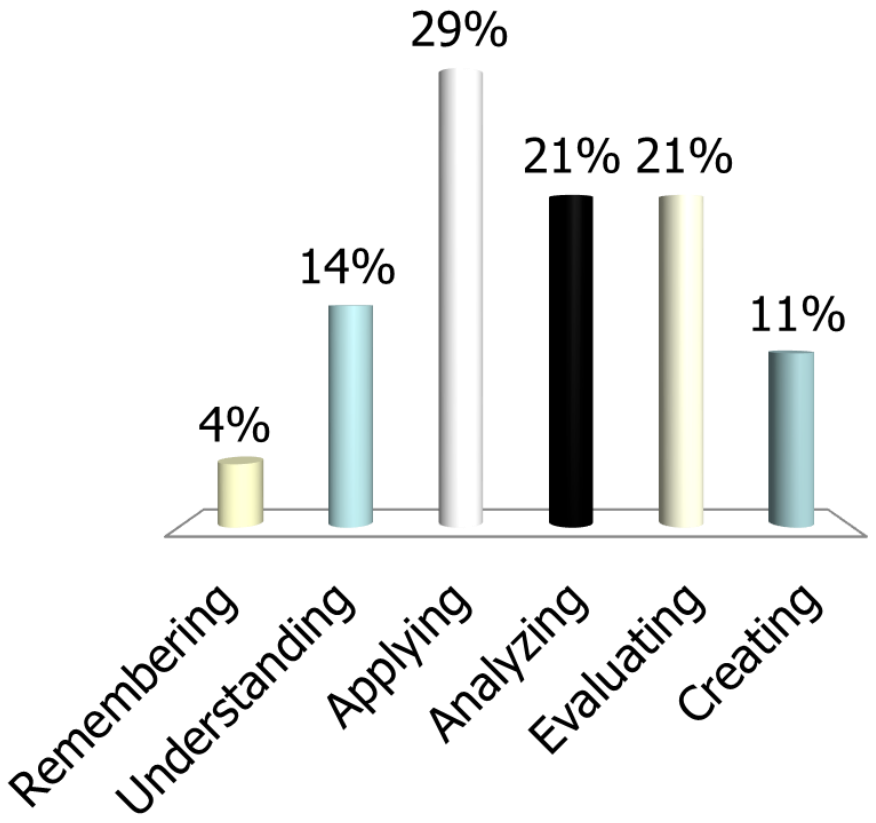
6. Creating

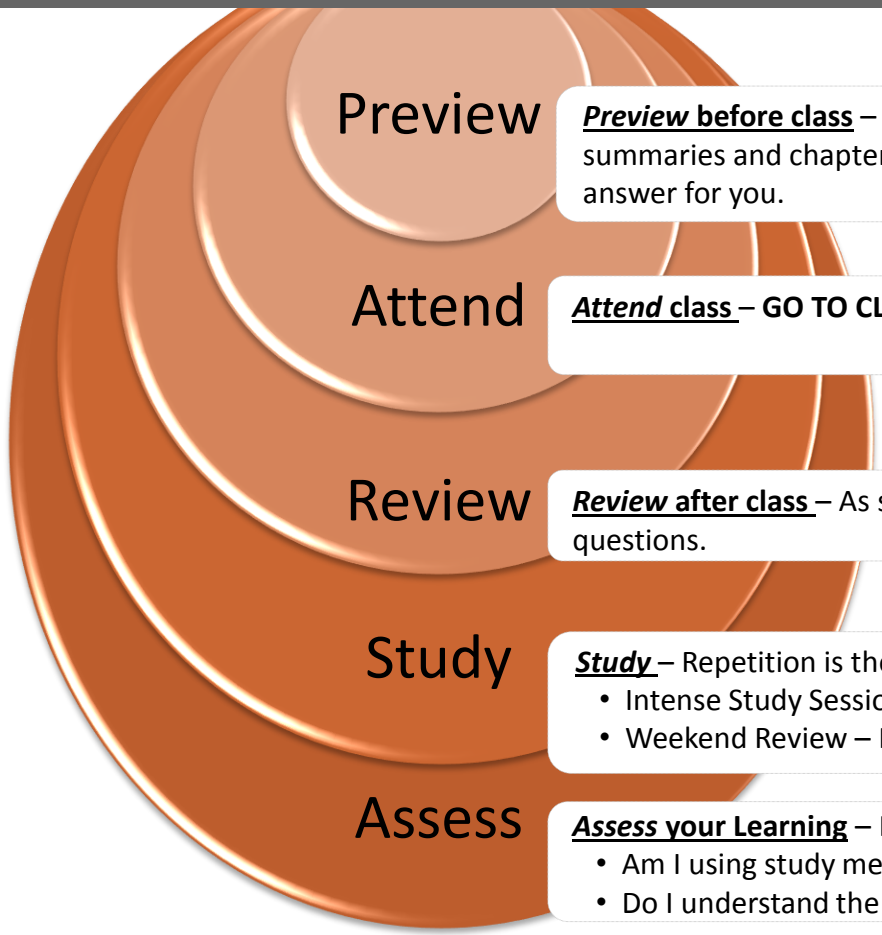


# How do we teach students to move higher on Bloom's Taxonomy?

## 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** |

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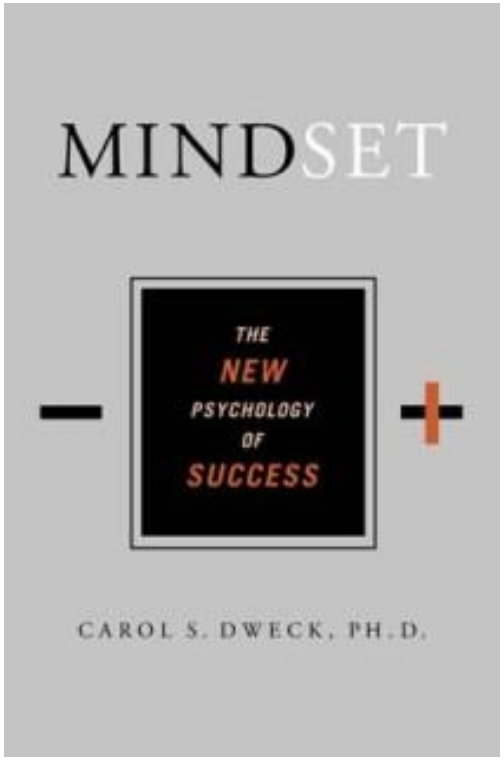
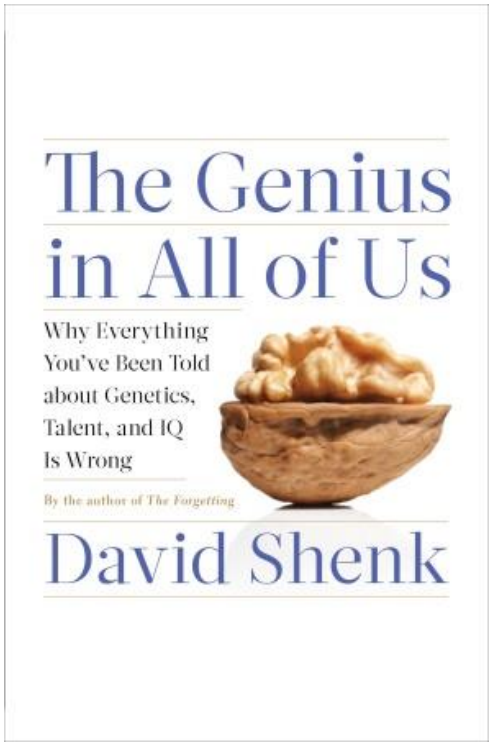
# Help All Students Develop the Right Mindset




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 *student* intelligence do you think *most faculty* have?

1. Fixed
2. Growth

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

1. Fixed
2. Growth

# *Email from a Spring 2011 General Chemistry 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

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

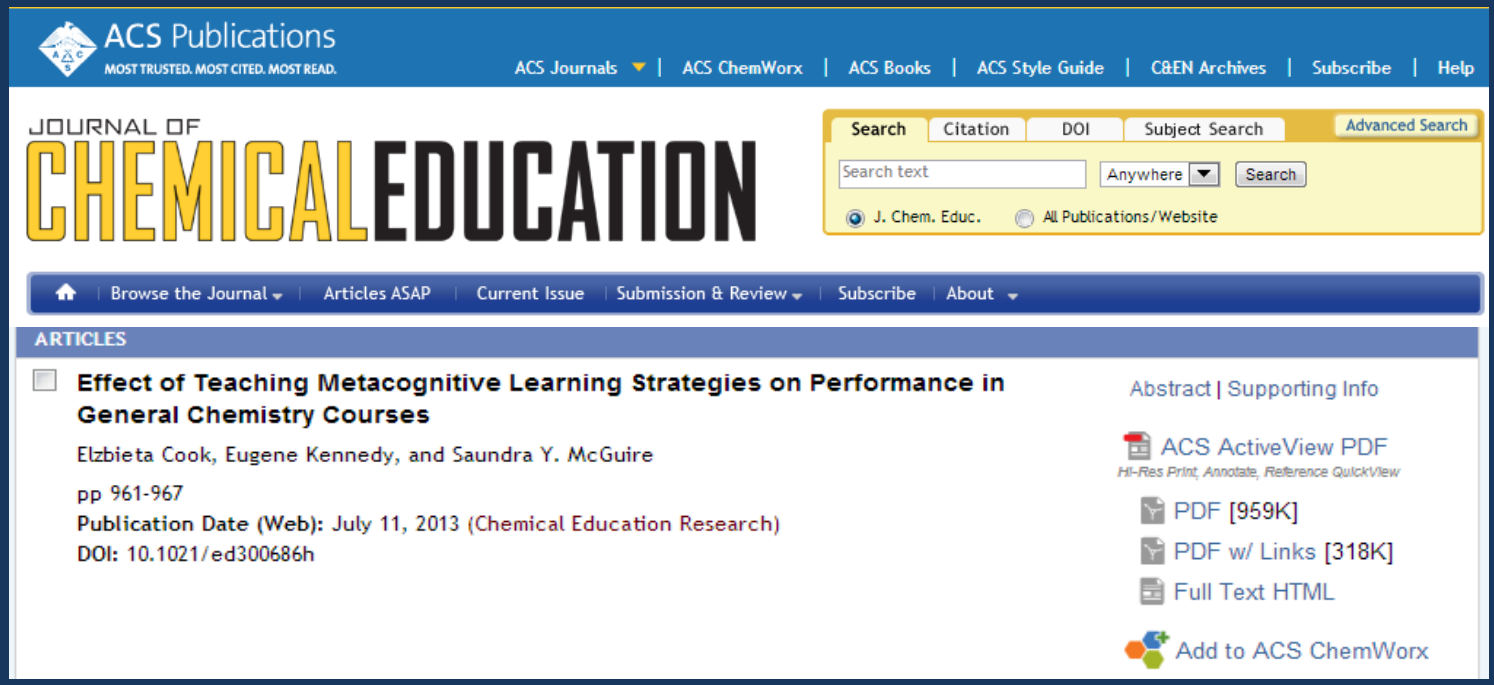
| | Attended | Absent |
|---|---|---|
| Exam 1 Avg: | 71.33% | 69.27% |
| Homework Total: | 169.8 | 119.1 |
| Final course Avg*: | 82.36% | 67.71% |
| **Final Course Grade:** | **B** | **D** |

**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**




Journal of College Science Teaching

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

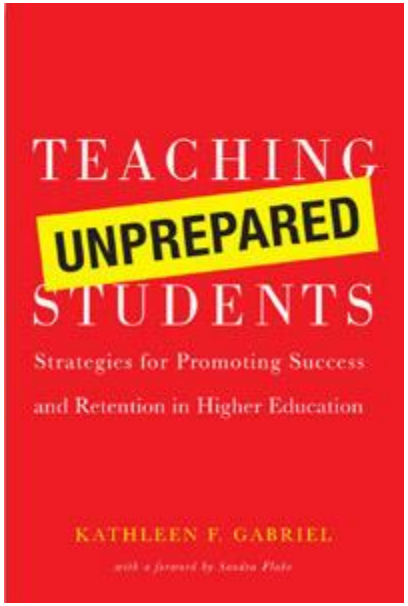
**Ningfeng Zhao[1], Jeffrey Wardeska[1], Saundra McGuire[2], Elzbieta Cook[2]**

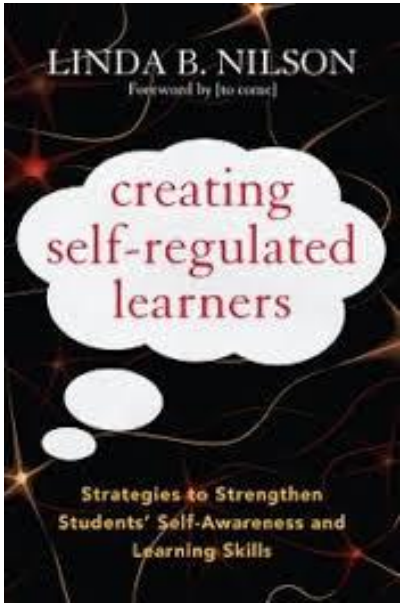
[1]Department of Chemistry, East Tennessee State University

[2]Department of Chemistry, Louisiana State University

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

# Two Valuable References




**Gabriel, Kathleen F. (2008)**
***Teaching Unprepared Students.***
**Sterling, VA: Stylus Publishing**

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

# Effective Strategies for Teaching Unprepared Students*

- Establish High Expectations
- Emphasize Consistent Contact
- Interweave Assessment and Teaching
- Define Student Success
- Clarify Student Responsibility
- Establish a Learning Community of Scholars
- Meet Students Where They Are
- Help Students Determine Their Learning Style

*Gabriel, Kathleen F. (2008) *Teaching Unprepared Students.* Sterling, VA: Stylus Publishing

# Changes Faculty Have Made that *Improved* Learning and Performance

- **Provide learning strategies information to students after Test 1, and tell them about mindset**

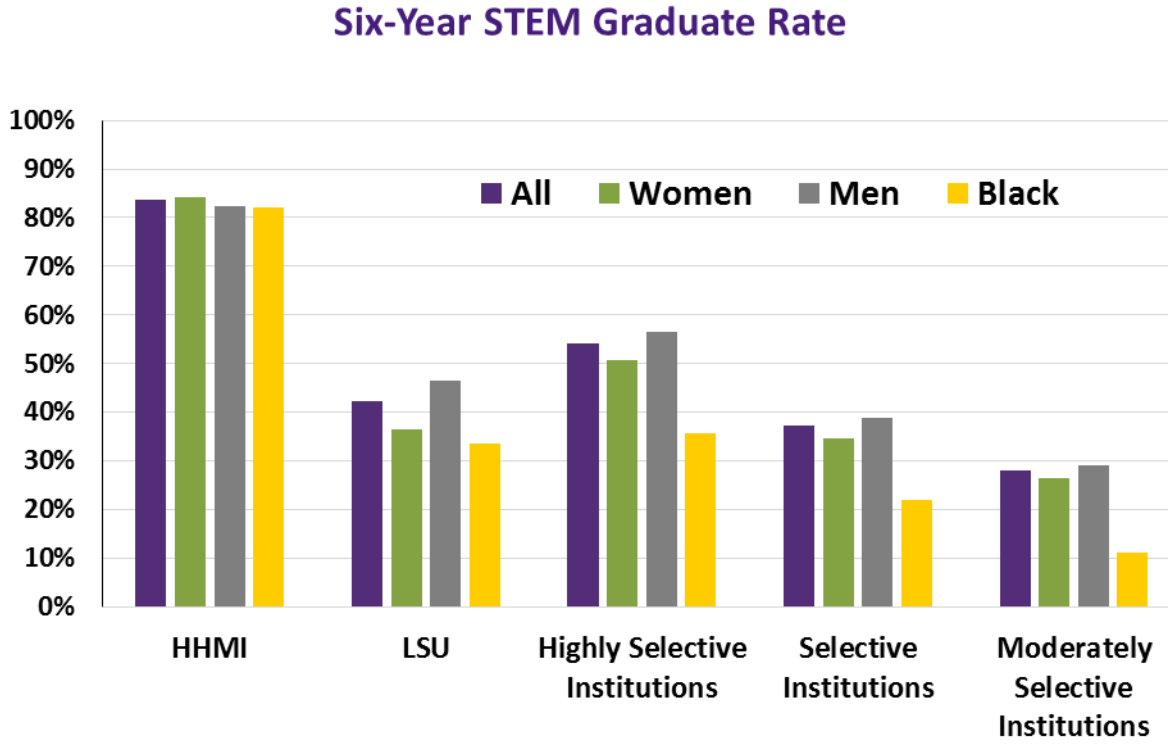
  *(Psychology Professor at Southern Crescent Technical College, 2013)*
- **Have students determine their learning style and write reflection on how they will use the information** *(Entomology Professor at LSU, 2009)*
- **Present one 50 minute session on metacognition, Bloom's Taxonomy, and the Study Cycle** *(Chemistry Professor at Middle Tennessee State University, 2012)*
- **Present one 20 minute session on Bloom's Taxonomy and Eight Learning Strategies,** *(Chemistry Professor at the University of Connecticut, 2014)*

# Knowledge of Metacognition Greatly Increases African American and Low Income Student Success

- They are less likely to have been cognitively challenged in high school
- They are less likely to be encouraged to stick with it
- They are more likely to experience the impact of a paradigm shift

# LSU-HHMI Professors Program

- 84% STEM Graduation Rate
  - 84% women
  - 83% men
  - 82% African-American



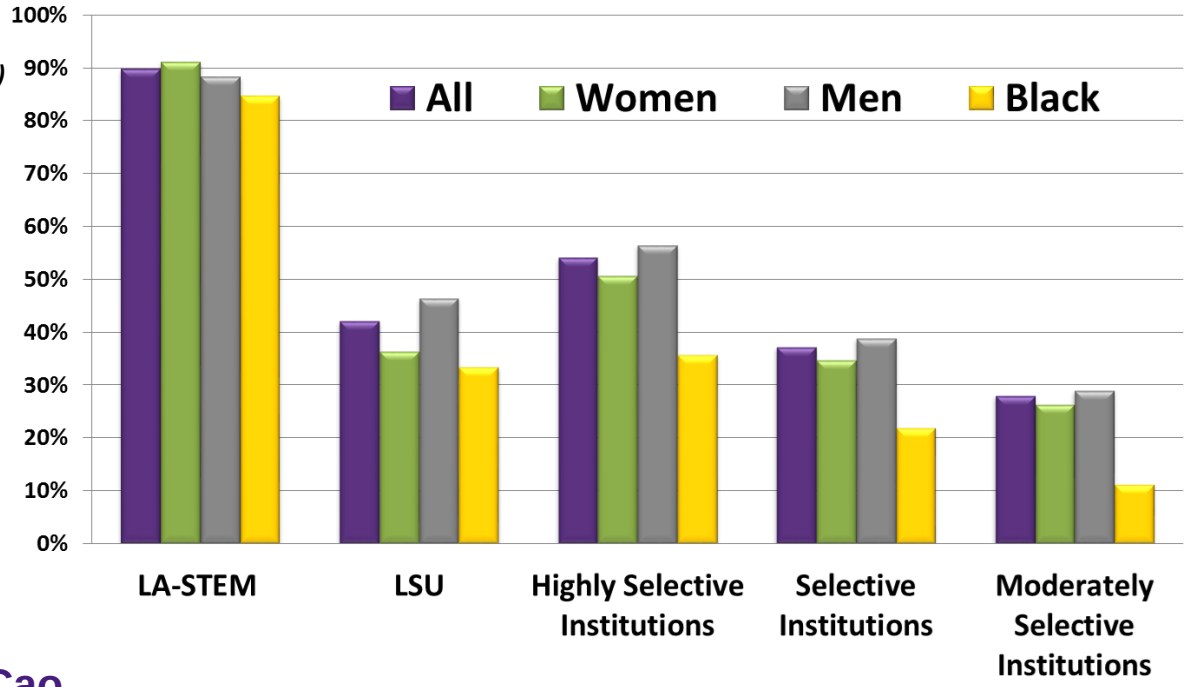

**Treva Brown, Chemistry**

- Pursuing PhD in chemistry at the University of New Orleans
- Louisiana Board of Regents Fellow

# LA-STEM Program Outcomes

- ***249* Scholars served** since 2003 *(with the 1st cohort in 2008)*
- ***146*** LA-STEM **Graduates** ***(through May 2015)***
- ***42%*** graduated with a min. **3.7 cum G.P.A.** ***(through May 2015)***
  - ***52%*** women graduates
  - ***31%*** minority graduates
- ***78%*** have completed or are pursuing **post-baccalaureate programs**

## Six-Year STEM Graduate Rate




## Dr. Tam Nguyen-Cao, Biological Sciences

- Cum Laude
- HHMI Gilliam Fellow
- PhD in Molecular Pathology at Wake Forest University
- Employed at the Rare Genomics Institute

## 90% Overall STEM Graduation Rate

*Data from the 2014-2015 STEM Retention Report prepared by the Center of Institutional Data Exchange and Analysis at the University of Oklahoma. LA-STEM Graduation Rate* ***includes all applicable scholars accepted into the program and graduates through May 2015****.*

# 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.**

# 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 equity and excellence for all students!

# An Awesome Resource!

Texas Wesleyan UNIVERSITY

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- Workshops
- Study Tips
- AVID Study Support
- Accommodations Testing
- Campus Resources
- ASC Staff
- News & Events
- Graduate Support Services

## Academic Success Center

### Success Starts Here

At the Academic Success Center, our staff members and student tutors are dedicated to helping you succeed.

## ACADEMIC CALENDAR

SEP 11 — Time Management & Test Anxiety 9/11/17

SEP 12 — Citation Management Workshop

SEP 13 — Learning Styles & Study Skills

SEP 14 — Student Recital: Voice Versa!

# 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 to increase critical thinking*

# Useful Websites

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

# Additional References


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- Christ, F. L., 1997. *Seven Steps to Better Management of Your Study Time*. Clearwater, FL: H & H Publishing
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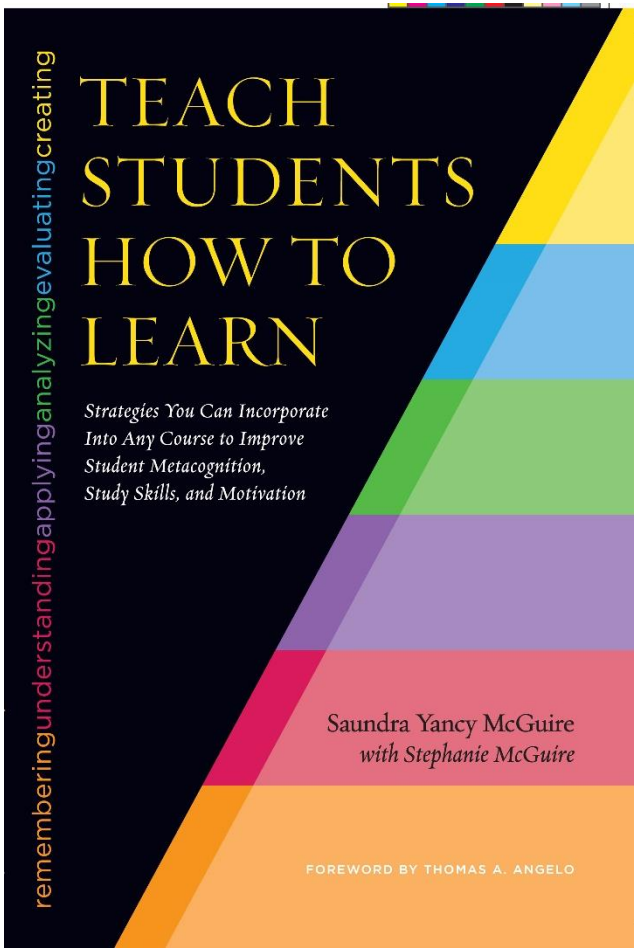
  *http://academic.pg.cc.md.us/~wpeirce/MCCCTR/metacognition.htm*

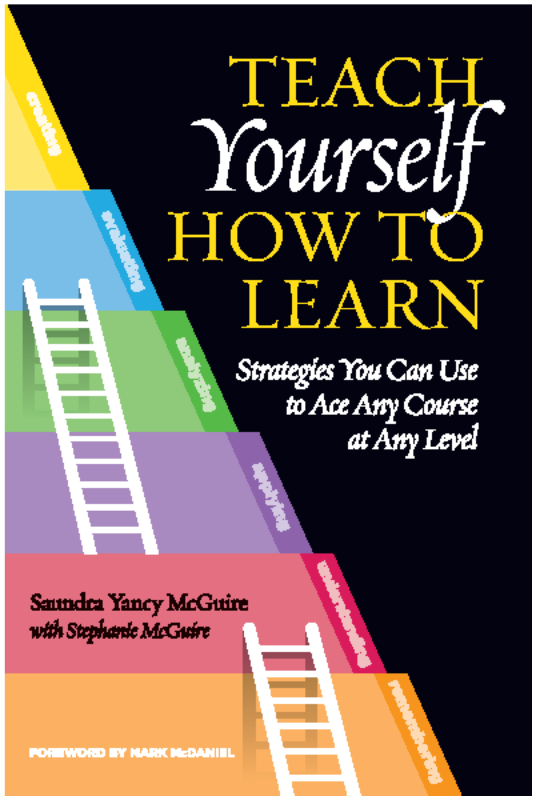

*Excellent student reference

# A New 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**

# Coming 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