Get Students to Focus on Learning Instead of Grades: Metacognition is the Key!

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Louisiana State University
2000 LSCHE Website Award Winner
2004 National College Learning Center Association
Frank L. Christ Outstanding Learning Center Award
Explore

- Tutoring Home Page
- Tutoring Centers Directory and Hours
- Subjects
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Inside Look

Eastern Kentucky University Tutoring Services

Tutor of the Month Nomination

Form

EUK offers free one-on-one tutoring, academic workshops, and group study sessions for multiple specific courses while

Eastern Kentucky University Tutoring Services

20?? F L Christ Outstanding Learning Center Award
Mission Statement

As a school of opportunity, Eastern Kentucky University fosters personal growth and prepares students to contribute to the success and vitality of their communities, the Commonwealth, and the world. Eastern Kentucky University is committed to access, equal opportunity, dignity, respect, and inclusion for all people, as integral to a learning environment in which intellectual creativity and diversity thrives.
Core Values

**intellectual vitality**, which is characterized by knowledge, scholarly inquiry, creativity, critical thinking, and curiosity...

**sense of community**, which is characterized by a supportive environment with strong relationships and a commitment to service, shared governance, collaboration, and unity of purpose

**cultural competency**, which is characterized by equitable opportunities and treatment, mutual respect, and the inclusion and celebration of diverse peoples and ideas

**excellence**, which is achieved through integrity, continuous quality improvement, and a focused emphasis on the personal and professional growth of students, faculty, and staff
Desired outcomes

• We will understand why some students do not know how to learn
• We will have concrete learning strategies that faculty can teach students to increase learning
• We will understand the role of mindset in motivation and learning
• We will view some of our students differently
• We will see positive changes in some students’ performance and self-perception
• We will spend time reflecting on improving our teaching and our students’ learning
Metacognition

The ability to:

- think about one’s own thinking
- be consciously aware of oneself as a problem solver
- monitor, plan, and control one’s mental processing (e.g. “Am I understanding this material, or just memorizing it?”)
- accurately judge one’s level of learning
- Know about one’s knowledge

Why don’t many students know how to learn or how to study?

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>49.7</td>
</tr>
<tr>
<td>2012</td>
<td>61.6</td>
<td>49.5</td>
</tr>
<tr>
<td>2013</td>
<td>58.6</td>
<td>52.8</td>
</tr>
<tr>
<td>2014</td>
<td>57.1</td>
<td>53.1</td>
</tr>
</tbody>
</table>

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

MIND THE GAP

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
Critical Reading is Essential to Learning

Reading skills that can be taught:

• Previewing before reading
• Activating relevant prior knowledge
• Constructing mental images
• Self-questioning
• Comprehension monitoring
• Summarizing
• Connecting new material to prior knowledge

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)
Problem: Reading Comprehension

Solution: Preview text before reading
Develop questions
Read one paragraph at a time and paraphrase information
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

Anticipatory set CAN interfere!

Let’s look at the car on the next slide...
Is this a 2-door or 4-door car?
Is this a 2-door or 4-door car?
Problem Solving is Essential to Student Success!

Homework system that can be taught

• Study information 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
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
Online Homework

- Can be a great learning tool
- Can be a detriment to student learning if used incorrectly
- Should be discussed in terms of effective learning strategies
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University

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81% of students said Chegg Study better prepared them for exams

- March 2013 Chegg Study survey with 876 respondents
Why Can Students Make Such a Fast and Dramatic Increase?

It’s all about the strategies!
Counting Vowels in 45 seconds

A E I O U

How accurate are you?

Count the vowels in the words on the next slide.
| Dollar Bill | Cat Lives |
| Dice       | Bowling Pins |
| Tricycle   | Football Team |
| Four-leaf Clover | Dozen Eggs |
| Hand       | Unlucky Friday |
| Six-Pack   | Valentine’s Day |
| Seven-Up   | Quarter Hour |
| Octopus    |           |
How many *items* on the list 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>
</tr>
<tr>
<td>Tricycle</td>
<td>Football Team</td>
</tr>
<tr>
<td>Four-leaf Clover</td>
<td>Dozen Eggs</td>
</tr>
<tr>
<td>Hand</td>
<td>Unlucky Friday</td>
</tr>
<tr>
<td>Six-Pack</td>
<td>Valentine’s Day</td>
</tr>
<tr>
<td>Seven-Up</td>
<td>Quarter Hour</td>
</tr>
<tr>
<td>Octopus</td>
<td></td>
</tr>
</tbody>
</table>
NOW how many *items* on the list do you *remember*?
What were two major differences between the 1st and 2nd attempts?
1. We knew what the task was

2. We knew how the information was organized
An Excellent Introduction

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

Old Version

Knowledge
Comprehension
Application
Analysis
Synthesis
Eval.

New Version

Remembering
Understanding
Applying
Analysing
Evaluating
Creating

Anderson & Krathwohl, 2001

Bloom’s Taxonomy

Remembering

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

Understanding

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

Applying

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

Analyzing

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

Evaluating

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

Creating

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

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

![Bar Chart]

- Level 1: Remembering (21%)
- Level 2: Understanding (35%)
- Level 3: Applying (25%)
- Level 4: Analyzing (13%)
- Level 5: Evaluating (3%)
- Level 6: Creating (3%)
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 (2013)
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
At what level of Bloom’s did you have to operate to make A’s and B’s in high school?

A. Remembering
B. Understanding
C. Applying
D. Analyzing
E. Evaluating
F. Creating

How students answered (2015)
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
2. Understanding
3. Applying
4. Analyzing
5. Evaluating
6. Creating

6%  9%  23%  40%  11%  11%
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 2014)
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**

*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**

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

**Review**

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

**Study**

*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**

*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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Time</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set a Goal</td>
<td>1-2 min</td>
<td>Decide what you want to accomplish in your study session</td>
</tr>
<tr>
<td>2</td>
<td>Study with Focus</td>
<td>30-50 min</td>
<td>Interact with material - organize, concept map, summarize, process, re-read, fill-in notes, reflect, etc.</td>
</tr>
<tr>
<td>3</td>
<td>Reward Yourself</td>
<td>10-15 min</td>
<td>Take a break – call a friend, play a short game, get a snack</td>
</tr>
<tr>
<td>4</td>
<td>Review</td>
<td>5 min</td>
<td>Go over what you just studied</td>
</tr>
</tbody>
</table>

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*Intense Study Sessions*
Researchers at CUNY's Graduate Center push 'self-regulated learning'
Starting from scratch: RIT program teaches first-year students how to learn

Project seeks to retain deaf, hard-of-hearing and first-generation STEM majors

Oct. 18, 2013
by Susan Gawlowicz
Follow Susan Gawlowicz on Twitter
Follow RITNEWS on Twitter

Starting college on the right foot—and in the right frame of mind—can make the difference between completing a bachelor’s degree and dropping out in the first or second year of school.

Rochester Institute of Technology is launching a $900,000 National Science Foundation-funded program to improve the retention of deaf, hard-of-hearing and first-generation undergraduates majoring in science, engineering and computer science. Between five and 10 percent of RIT’s students are deaf or hard of hearing. Many attend the National Technical Institute for the Deaf or receive support services—such as interpreting and notetaking—from NTID while enrolled in one of RIT’s other eight colleges.

RIT’s Project IMPRESS (Integrating Metacognitive Processes and Research to Ensure Student Success) seeks to teach students self-reflection and self-assessment skills—key components of metacognition, or thinking about how one thinks and learns.

“We know that all students—not just our target population—overestimate their understanding,” says Scott Franklin, professor in RIT’s School of Physics and Astronomy. “Helping students see reflection, assessment and metacognition as a fundamental part of how they learn can make a huge impact on their success.”
Metacognition: An Effective Tool to Promote Success in College Science Learning*

Ningfeng Zhao¹, Jeffrey Wadeska¹, Saundra McGuire², Elzbieta Cook²

¹Department of Chemistry, East Tennessee State University
²Department of Chemistry, Louisiana State University

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

Mindset Matters!


**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>
Fixed Mind-set
Intelligence is static

Growth Mind-set
Intelligence can be developed

CHALLENGES
...avoid challenges
...embrace challenges

OBSTACLES
...give up easily
...persist in the face of setbacks

EFFORT
...see effort as fruitless or worse
...see effort as the path to mastery

CRITICISM
...ignore useful negative feedback
...learn from criticism

SUCCESS OF OTHERS
...feel threatened by the success of others
...find lessons and inspiration in the success of others

As a result, they may plateau early and achieve less than their full potential.
All this confirms a deterministic view of the world.

As a result, they reach ever-higher levels of achievement.
All this gives them a greater sense of free will.

GRAPHIC BY NIGEL HOLMES
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
Sharing Strategies that Have Worked for Others Can Change Mindset and Motivate Students
Top 5 Reasons Students 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 memorize
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 Students 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 a 60 minute learning strategies presentation by the professor, students were given a survey to determine their self-assessment of whether they were using or not using the strategies. The average scores of the different groups on the first two exams are shown below.

<table>
<thead>
<tr>
<th>Self-Reported Use of Strategies</th>
<th>Exam 1</th>
<th>Exam 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not use the strategies</td>
<td>58</td>
<td>54</td>
</tr>
<tr>
<td>Used metacognitive strategies</td>
<td>95</td>
<td>80</td>
</tr>
</tbody>
</table>
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%!
(for students who took all three course exams)
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)*

• Increase the frequency of tests from three per semester to biweekly  *(Mathematics Professor at Miles 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)*
<table>
<thead>
<tr>
<th>Date</th>
<th>Result</th>
<th>Date</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/04</td>
<td>Failed</td>
<td>10/05</td>
<td>Passed</td>
</tr>
<tr>
<td>10/04</td>
<td>Failed</td>
<td>11/05</td>
<td>Failed</td>
</tr>
<tr>
<td>11/04</td>
<td>Failed</td>
<td>12/05</td>
<td>Passed best in group</td>
</tr>
<tr>
<td>12/04</td>
<td>Failed</td>
<td>1/06</td>
<td>Passed</td>
</tr>
<tr>
<td>1/05</td>
<td>Passed</td>
<td>2/06</td>
<td>Passed</td>
</tr>
<tr>
<td>2/05</td>
<td>Failed</td>
<td>3/06</td>
<td>Failed</td>
</tr>
<tr>
<td>3/05</td>
<td>Failed</td>
<td>4/06</td>
<td>Passed last one!</td>
</tr>
<tr>
<td>4/05</td>
<td>Failed</td>
<td>5/06</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Began work with CAS and the Writing Center in October 2005
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 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.
From a SUNY/Brockport Student to Dr. Kelley in Spring 2015

When you came to our biochem class to talk about improving study habits... I was very worried about my present ineffective study strategies for physics. I also was hoping to improve my biochem 2 grade... You gave me some of the best advice I have received in my three years of undergrad. You told me to start 1) working out homework problems without the internet on paper, 2) going to every class, 3) reviewing what would be taught in class 4) getting help from the professor as a last resort when I couldn't figure out a problem rather than turning to the internet, and finally 5) keeping my phone off as much as possible and not listening to music as I work. After hearing all this... I really didn't think it would work for me... However, after talking to you, I decided to try some of the strategies. I started working out 1-3 homework problems before class in a quiet room during my 1 hour break between classes. I also reviewed the chapter before going to class. I started keeping my phone off except for certain times like lunch or when I had to meet up with someone. The results were surprisingly drastic [sic]. The next exam after talking to you I got over 20 points higher than the class average... I was so excited and couldn't wait to tell you... I decided to also try to do as many odd-numbered end of chapter problems as possible to help prepare me for the next test... Again, I improved from the last test...
We can significantly increase student learning!

- We must teach students the **learning process**, provide **specific** strategies and **motivate students** to use the strategies.
- We must **not judge** student **potential on initial performance**.
- We must **encourage students to persist** in the face of initial failure.
- We must **encourage the use of metacognitive tools**.
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!
Special Note

Please visit the CAS website at www.cas.lsu.edu. We have on-line workshops that will introduce you and your students to effective metacognitive strategies. Please feel free to contact me at smcgui1@lsu.edu.

Have fun teaching your students powerful metacognitive strategies!

Saundra McGuire
Useful Websites

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


http://academic.pg.cc.md.us/~wpeirce/MCCCTR/metacognition.htm

*Excellent student reference*
QUESTIONS?