THE OHIO STATE UNIVERSITY

Successful Learning:
Mindset and Metacognition

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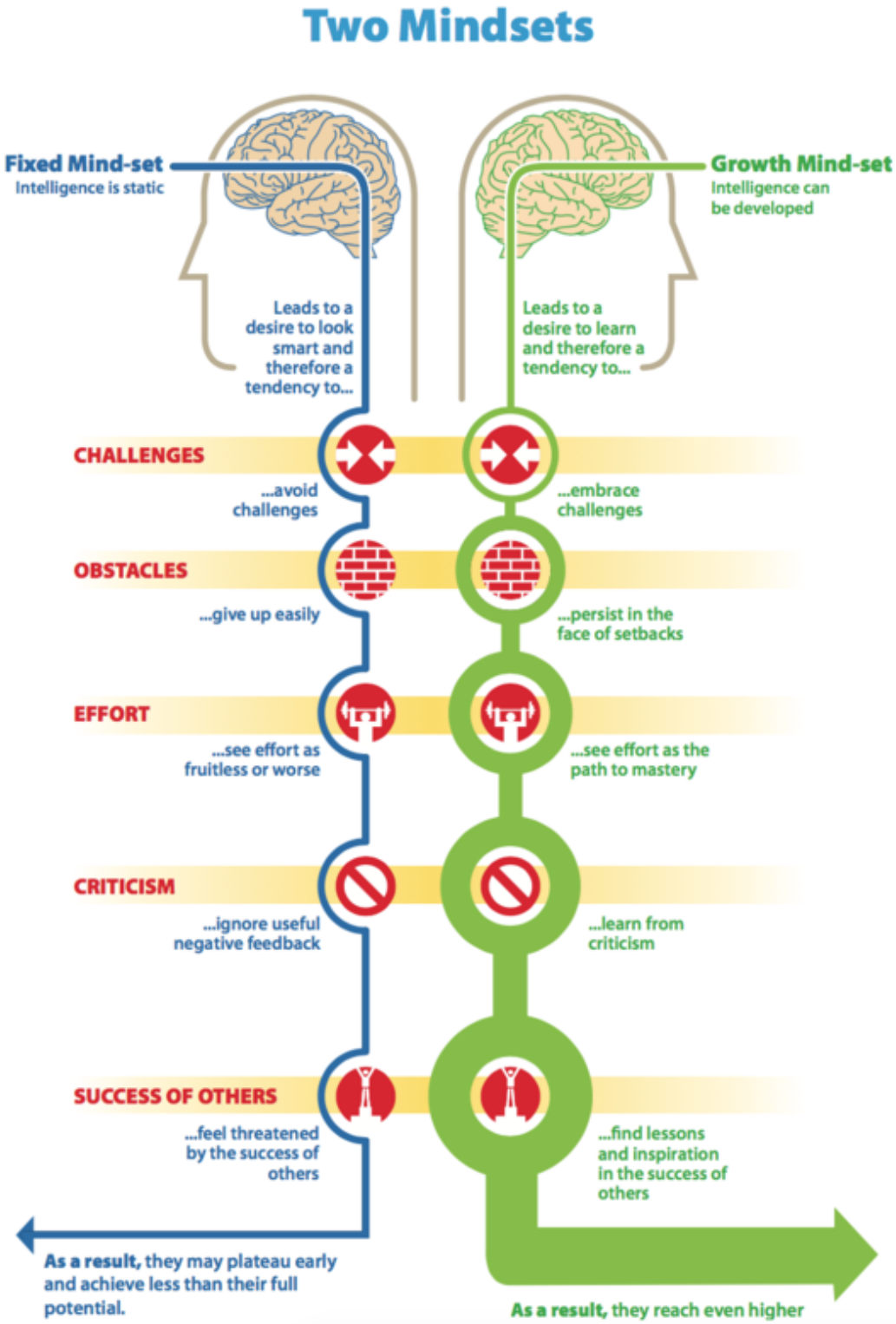
Outline:

1. Mindsets
2. Metacognition
3. Learning strategies
4. Examples

Mindset [1]:

1. You can grow your own intelligence!
2. You can learn how to learn effectively!
3. Everyone has a mix of two mindsets…

Growth vs. fixed mindsets in learning [1]



Adopt the growth mindset

Love the process of learning!

Changing Mindsets [1]

Repairing fixed mindset:

1. Acknowledge your fixed mindset (pieces)
2. Know fixed mindset triggers (challenges, dead ends, failures)
3. Assign a name to the fixed mindset ("Joe")
4. Educate Joe with growth mindset ideas
5. Choose path, iterate

Nurturing a growth mindset:

1. Opportunities for learning and growth today? Me? Others?
2. Make a plan
3. What, where, and how can I act on my plan?
4. How to maintain and continue growth?
5. Repeat

Metacognition Definition [2,3]

Metacognition =

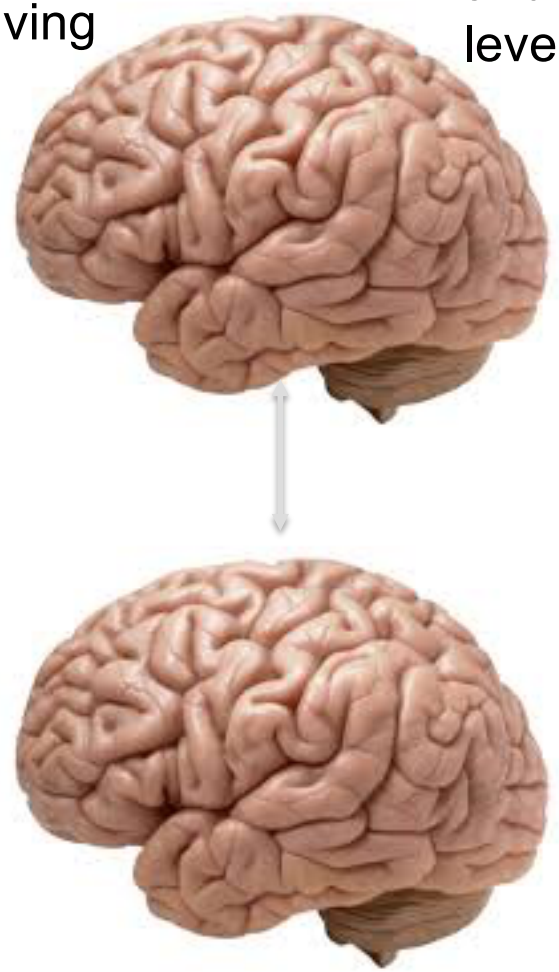
"thinking about your own thinking" [Flavell]

Metacognition and learning =

"thinking about your own learning"

Awareness you are problem-solving

Judge your approach and learning level, adjust



As if you have a brain inside your brain! 😀

Metacognition Success

Academic success stories (many others + evidence per scientific studies) [3]:

Travis: LSU student, test scores:

47, 52, **82, 86**

Before/after

Dana: LSU student, test scores:

80, 54, **91, 97, 90**

Learn "metacognitive learning" in the university, use it for life!

Careers and Learning

Career success requires life-long learning:

- Industry: Automotive, aerospace,..
- Government: Labs, think tanks,…
- Academia:
  - BS, MS, PhD, Professor
  - Law, Medicine, Business,…

Your ability to learn will greatly impact your life-long career success—*use your second brain!*

Desired Outcomes [3]:

1. Analyze your current learning strategies
2. What changes needed to get an A?
3. Concrete strategies for this semester
4. Use these strategies, as needed, in your whole career + learn more strategies

Learning Mindset: Effort, Goals [3,1]

Approach from a growth mindset

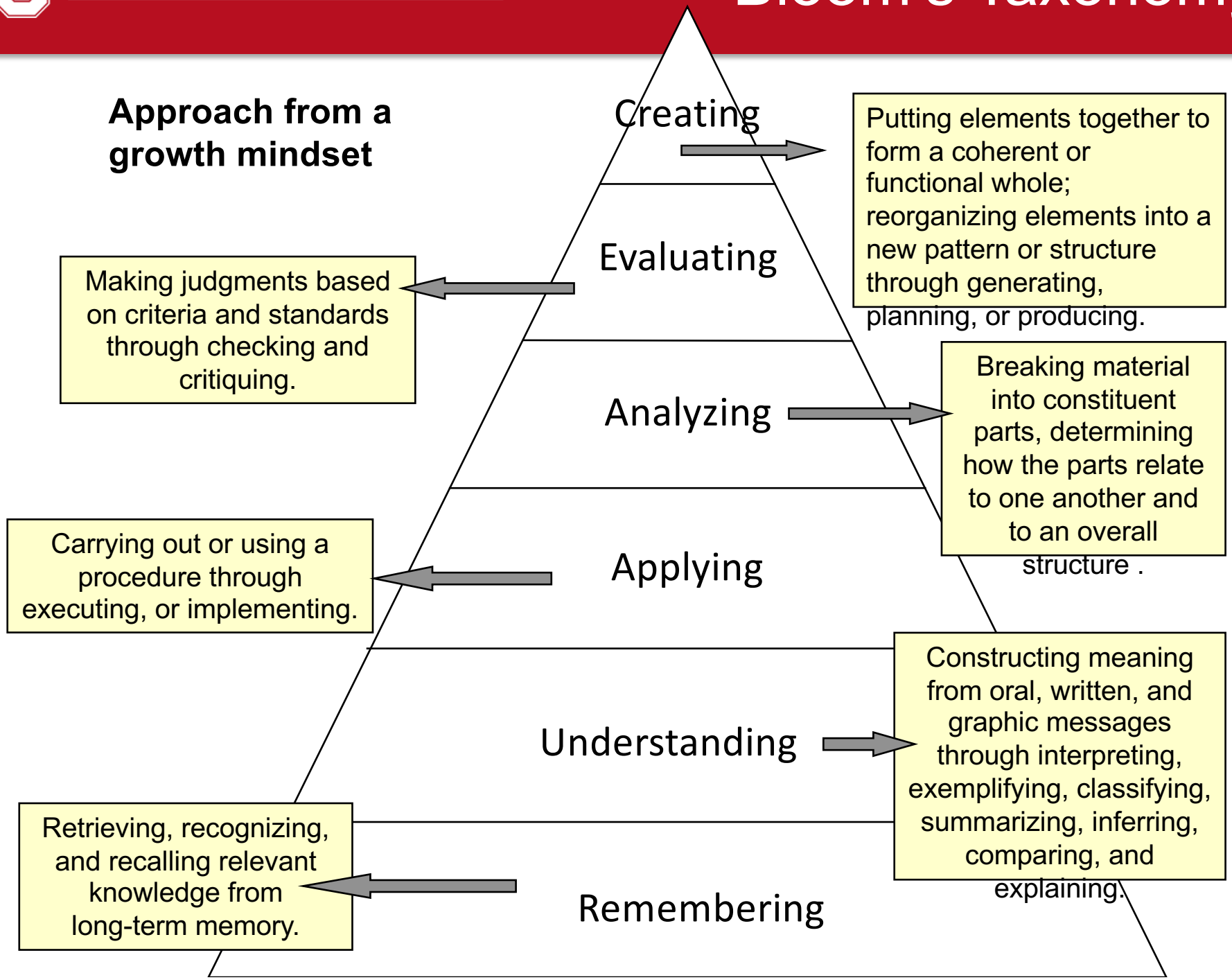
- What is the difference between studying and learning?
- Which task would you work harder
  1. Get an A on an exam.
  2. Teach the material to the class.

What is your mode of operation:
(i) study mode, or (ii) learning mode?

Stay in learning mode, study as if you had to teach it!

Bloom's Taxonomy [3]

Approach from a growth mindset



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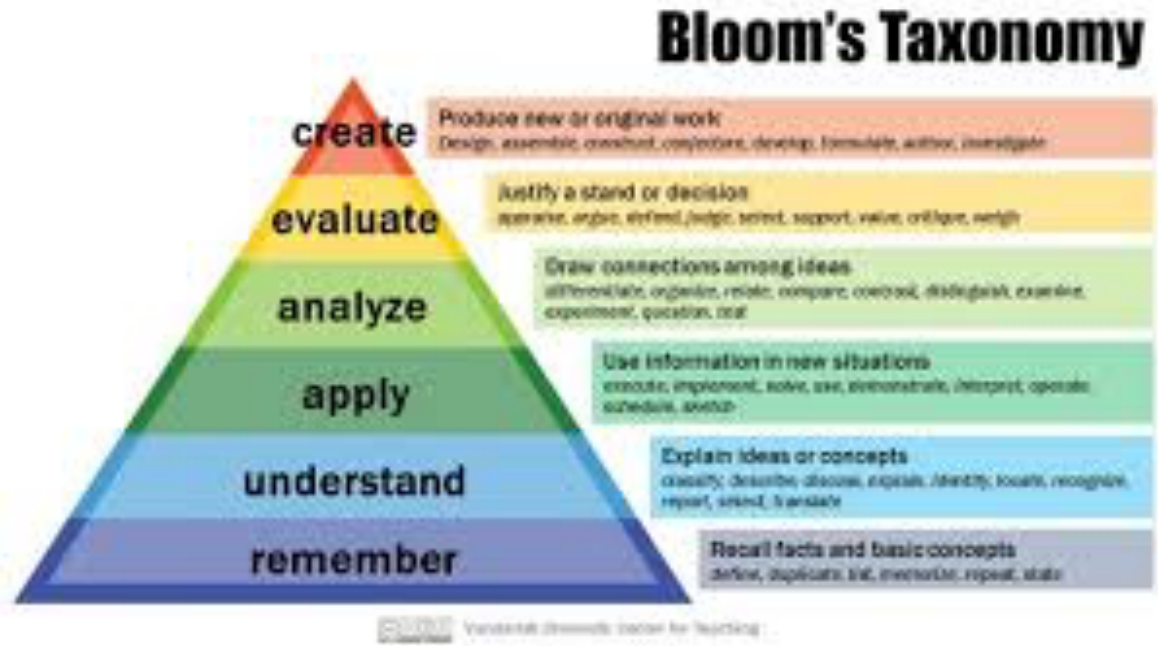


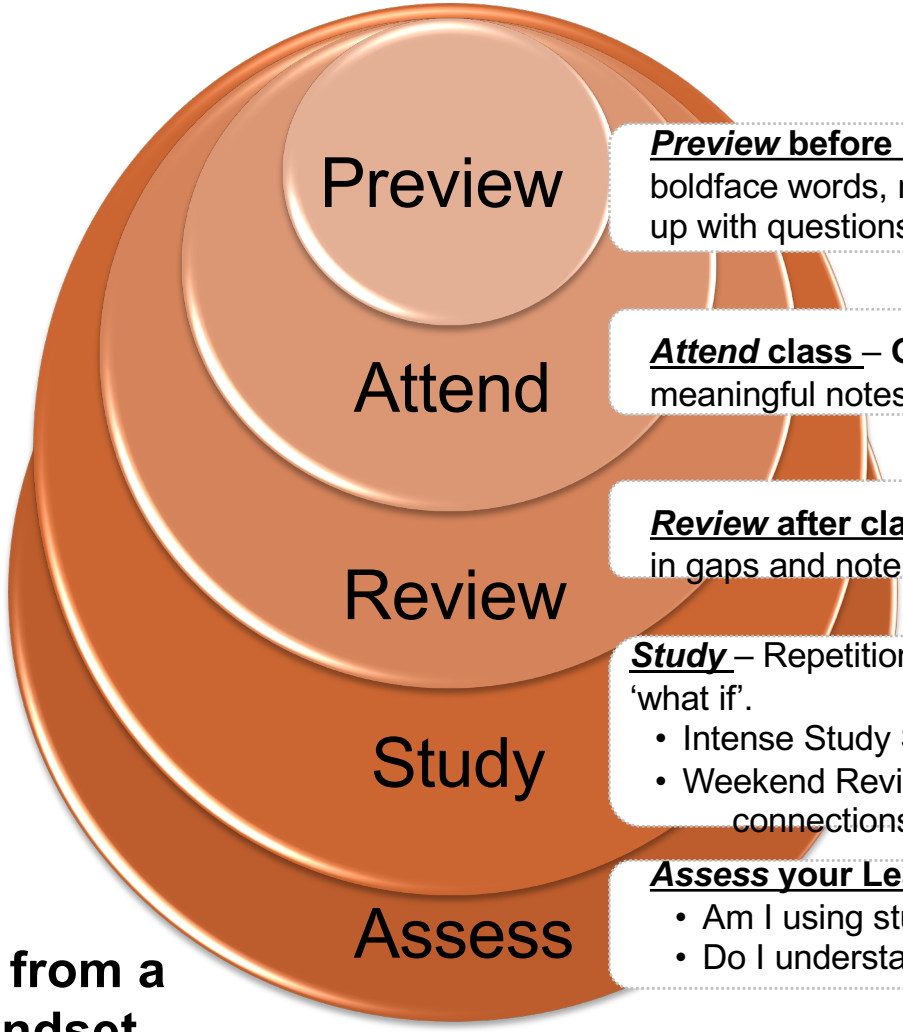
Characteristics [3]:

- Levels of thinking while learning.
- Levels build on each other.
- Must learn lower levels to get to higher ones.

How to move up the hierarchy?
Use the "study cycle"…

The Study Cycle [3]

Actively and continuously engage in learning the material!



***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?

Approach from a growth mindset

Maintain a calendar: study sessions, assignments, tests

*Intense Study Sessions [3]

Start assignments the day they are assigned.

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, solve, reflect,…
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**

Actively engage!

Metacognitive Strategies [2,3]

Approach from a growth mindset

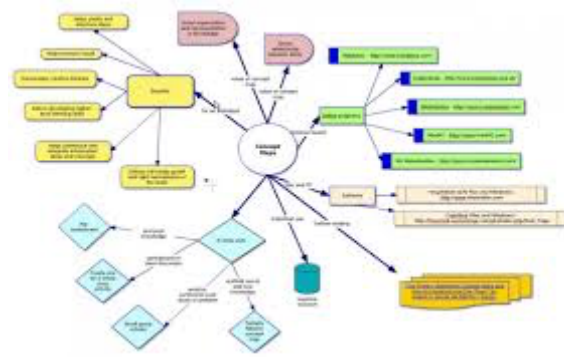
1. Assess prior knowledge, fill in gaps
2. Always ask “why,” “how,” and “what if” questions.
3. Organize knowledge (e.g., textbook + lecture).
4. Learn component skills + integration
5. Use study cycle/intense study sessions.
6. Seek higher levels of the Bloom Taxonomy.
7. Test understanding by giving mini-lectures on concepts (fake audience?). Work in study groups?
8. Solve problems without looking at an example or solution. Put together a mock exam?
9. Spend time every day on the class, use textbook
10. Goal: 100% mastery

Metacognitive Strategy: "Active reading" [3]

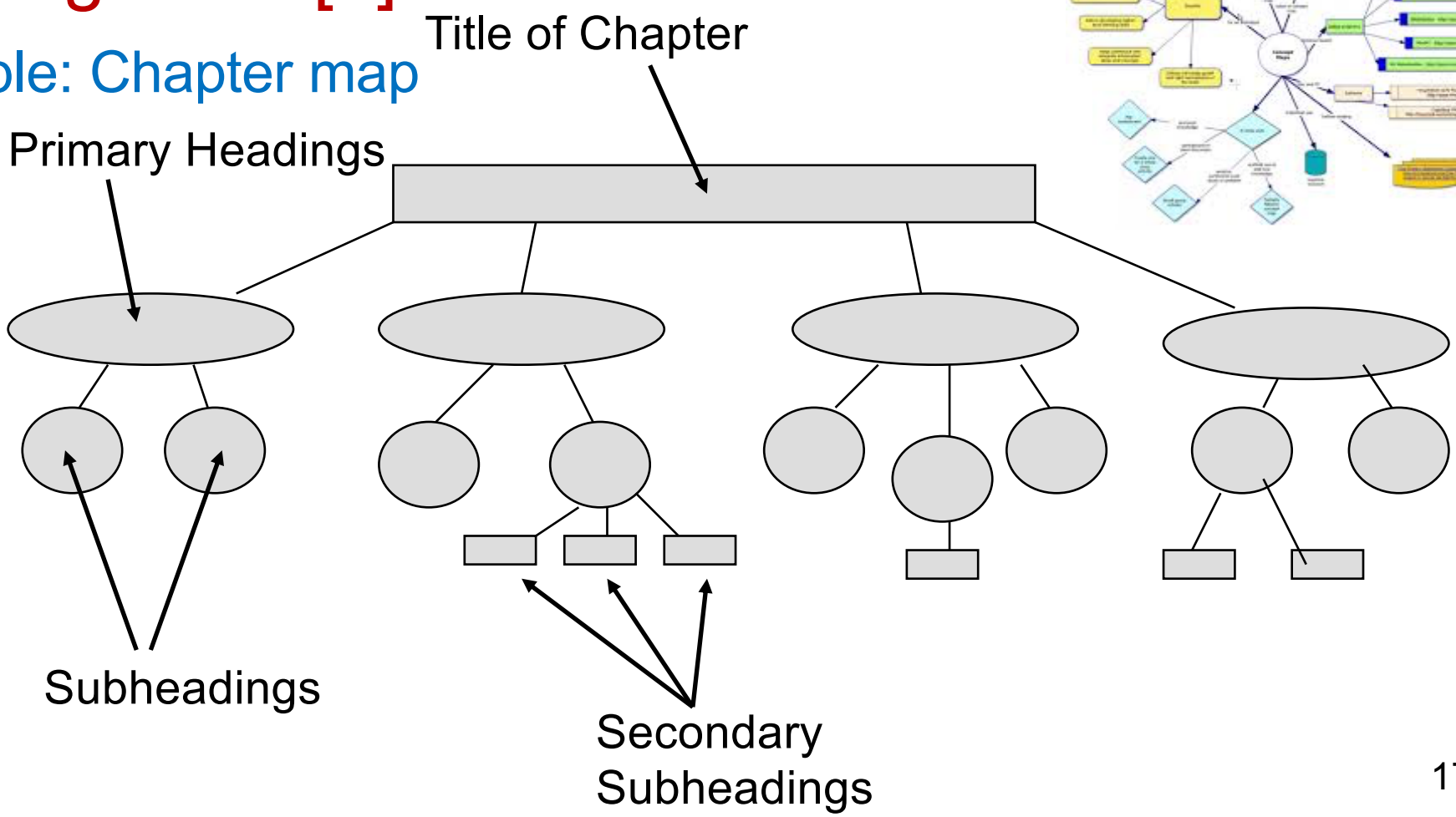
1. Preview: Read title, section headings
2. Re-preview: Read abstract, conclusions
3. Activate: Write down questions the reading can answer
4. Activate: Paraphrase as you read (write!)
5. Activate: Equations, figures, diagrams: Slow down! Requires analysis/Matlab?

Metacognitive strategy: Concept maps [2]

Facilitate the development of higher order thinking skills [3]:



Example: Chapter map



Metacognitive strategy: [2,3]

Compare and Contrast: Find deep knowledge

Concept #1

Concept #2

How are they similar?

How are they different?

Other learning strategies are in [1,2].

General Metacognition for Learning [2]

Approach from a growth mindset

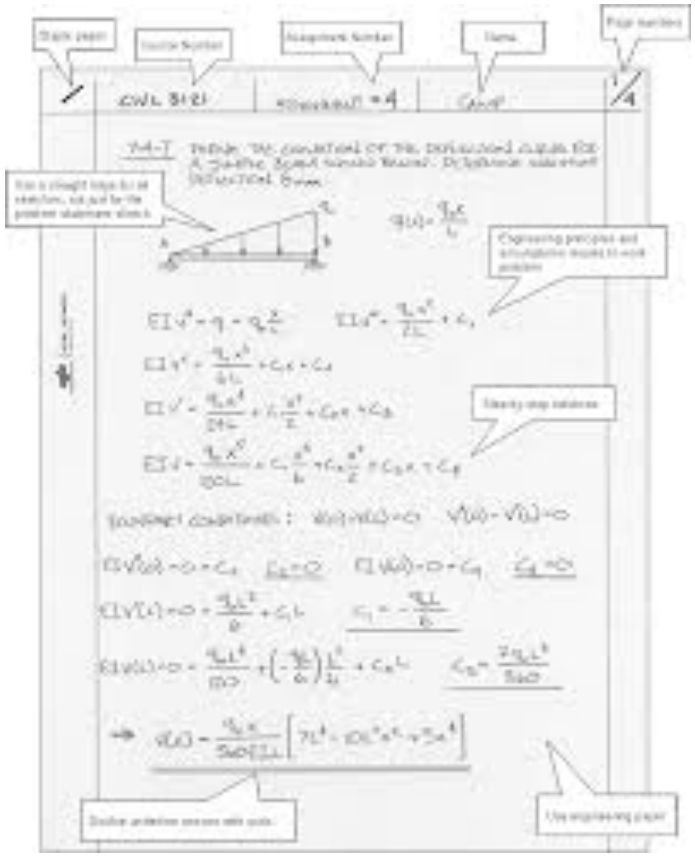
- Assess the task at hand, taking into consideration the task's goals and constraints.
- Evaluate their own knowledge and skills, identifying strengths and weaknesses.

- Plan their approach in a way that accounts for the current situation.
- Apply various strategies to enact their plan, monitoring their progress along the way.
- Reflect on the degree to which their current approach is working so that they can adjust and restart the cycle as needed.

Can apply this approach to *any* learning task!

Example Task: Solution to an Engineering Assignment

Approach from a growth mindset

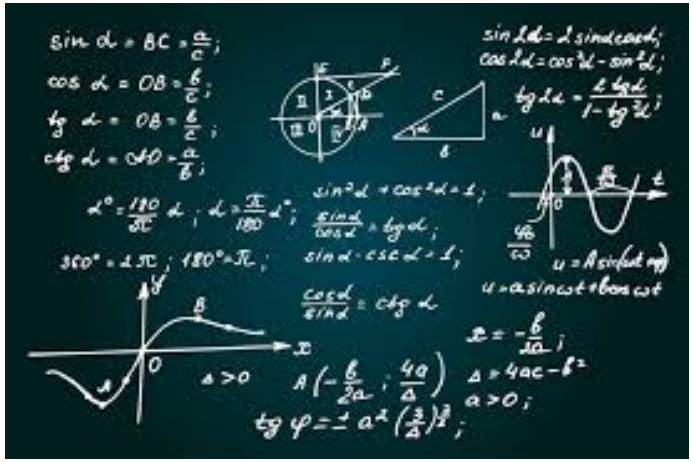


- Task details, constraints, goals
- Prior knowledge? Required time/effort?
- Approach: Math, Matlab, graphics, words, use of other literature.
- Learning goal: Be able to teach it to the class.

Example Task: Mathematical Paper

1. Use the active reading strategy.
2. Read slow and careful, re-read.
3. Do simple examples, sketches, math of your own, Matlab simulation.
4. Explore other literature (references).
5. Learning goal: Be able to teach it to a group of graduate students.

Approach from a growth mindset



Approach from a growth mindset

Example Task: Humanitarian Engineering

1. Assess task, goals, constraints: Social, technical
2. Evaluate own knowledge, skills: Need help?
3. Plan an approach: But, be flexible
4. Apply various strategies, monitor
5. Reflect, adjust approach when needed

Final Remarks:

- Ideas are useful to improve your success?
- Want to change your mindset?
- New metacognitive strategy to use first?
- Start now, or you probably will not!

References:

[1] C. Dweck, “Mindset: The New Psychology of Success,” Balantine, NY, 2016.

[2] S.A. Ambrose, M.W. Bridges, M. DiPietro, M.C. Lovett, M.K. Norman, “How Learning Works: Seven Research-Based Principles for Smart Teaching,” Wiley, NY, 2010.

[3] S.Y. McGuire and S. McGuire, “Teach Students How to Learn: Strategies You Can Incorporate Into Any Course to Improve Student Metacognition, Study Skills, and Motivation,” Stylus Pub., VA, 2015.