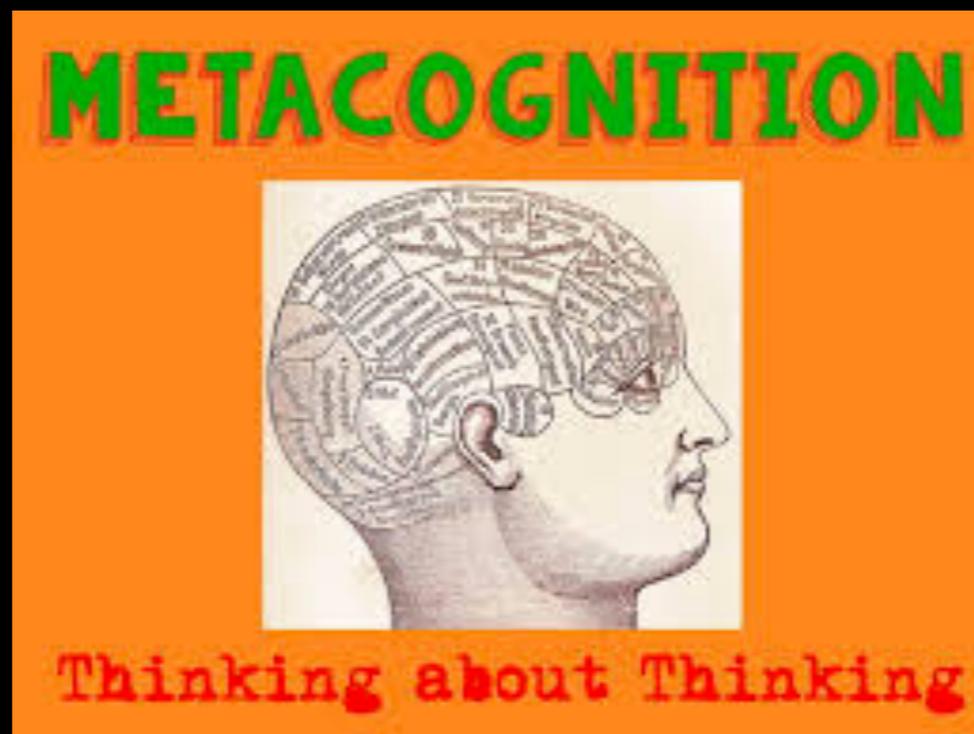


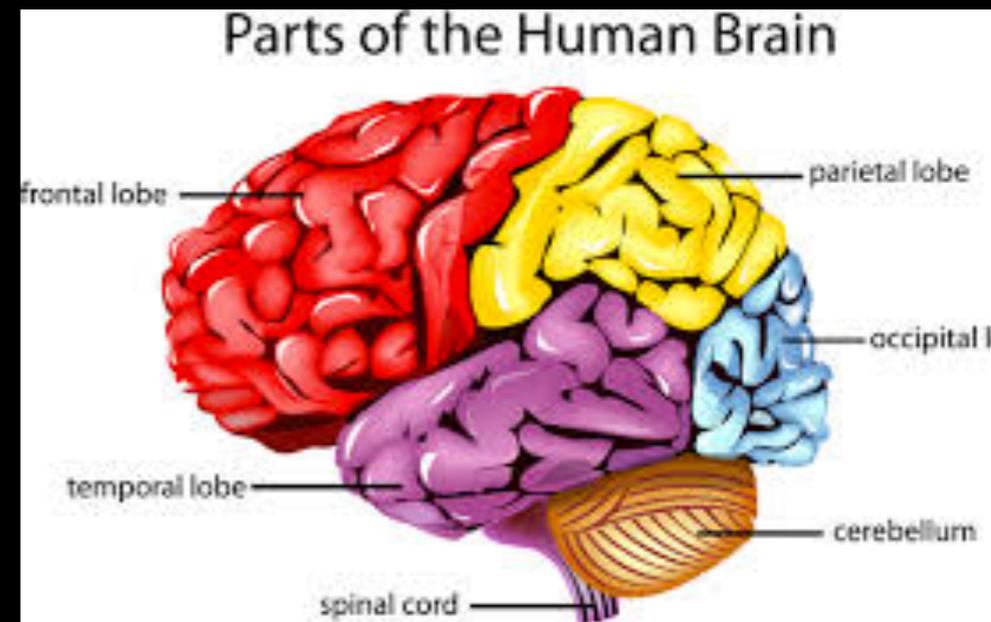
# Metacognitive Processes

SLS 1101 Professor Caroline S. Brooks



# What is Metacognition?

- Metacognition refers to awareness of one's own knowledge - what one does and doesn't know - and one's ability to understand, control and manipulate one's cognitive processes.
- It includes knowing when and where to use particular strategies for learning and problem solving.
- Metacognition is the ability to use prior knowledge to plan a strategy.



# Metacognition

- Cognitive Strategies are the basic mental abilities we use to think, study and learn.
- Metacognitive strategies are used to ensure that an overarching learning goal is being or has been reached.
- Metacognitive knowledge refers to what individuals know about themselves as cognitive processors.



# Metacognition

- Metacognitive Regulation refers to adjustments individuals make to their processes to help control their learning. Metacognitive knowledge is divided into three categories:



- **Person Variables** - what one recognizes about his or her strengths and weaknesses in learning and processing information
- **Task Variables** - what one knows about the nature of a task and the processing demands required to complete the task.
- **Strategy Variables** - The strategies a person has to successfully accomplish a task; knowing how to activate prior knowledge before reading a technical article.

# Why teach Metacognitive Skills?

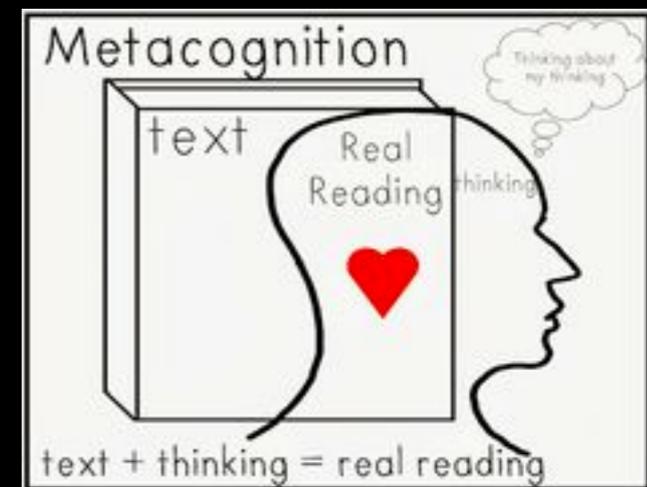
- Metacognitive skills can be taught to students to improve their learning. Metacognitive strategies guide, regulate and evaluate learning.
- Individuals who demonstrate a wide variety of metacognitive skills perform better on exams and complete work more efficiently.
- Metacognitive skills identify blocks to learning and changing tools and strategies. These strategies are associated with successful learning.



# Metacognition

- **Rote memorization** - is the usual and often only learning strategy employed by students. Learners need explicit instruction in both cognitive and metacognitive strategies.
- Recommended **Instructional Strategies** - Students must do the following:

- Develop a plan
- Monitor their understanding
- Evaluate their thinking after completing the task.



# Metacognition

- During the **planning phase**, learners can ask: What am I supposed to learn? What prior knowledge will help me with this task? What should I do first? What should I look for in this reading? How much time do I have to complete this?
- During the **monitoring phase**, learners can ask: How am I doing? Am I on the right track? How should I proceed? What information is important to remember? Should I move in a different direction?
- During the **evaluation phase**, learners can ask: How well did i do? What did I learn? Did I get the results expected? What could I have done differently? Can I apply this way of thinking to other problems or situations?



# Metacognition



- There are plenty of opportunities for learners to reflect on their learning processes. Examples follow for each content area below:
  - **Reading** - Teach learners how to ask questions during reading and model “think-alouds.” Teach students to take notes or highlight important details.
  - **Writing** - Teach learners brainstorming ideas using a word web or a graphic organizer.
  - **Social Studies and Science** - Teach learners the importance of using organizers such as KWL charts, Venn diagrams, concept maps, etc.
  - **Math** - Teach learners to use mnemonics to recall steps in a process. Model your thought processes in solving problems.

# Metacognition

- The goal of teaching metacognitive strategies is to help learners become comfortable with these strategies so they employ them automatically to learning tasks, focusing their attention, and derive meaning.



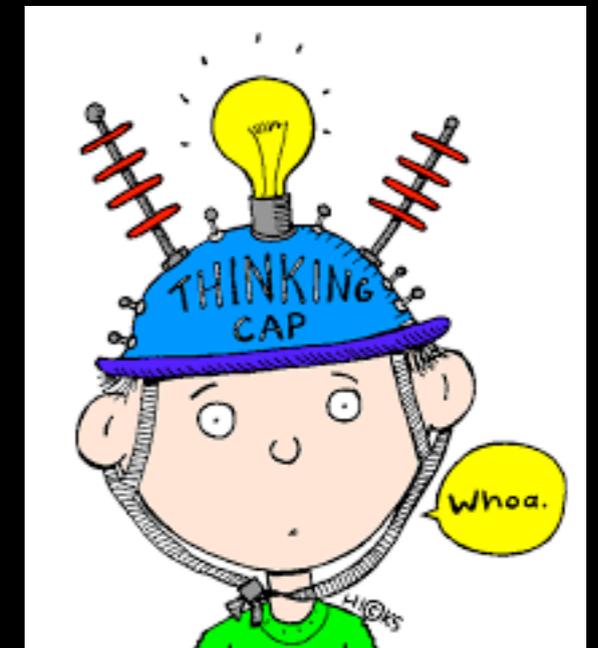
# Why Teach Metacognitive Skills?

- **Metacognitive skills** can be taught to students to improve their learning. Learners “construct knowledge” using cognitive strategies and they guide, regulate and evaluate their learning using metacognitive strategies.
- Questions to ask to activate **metacognitive skills**:
  - What did we learn today?
  - How will you use what we are learning outside of class?
  - Why are we practicing “x”? How will it help you?
  - When you are about to try something new, how do you feel?
  - When you are doing something and you get stuck, what do you do?



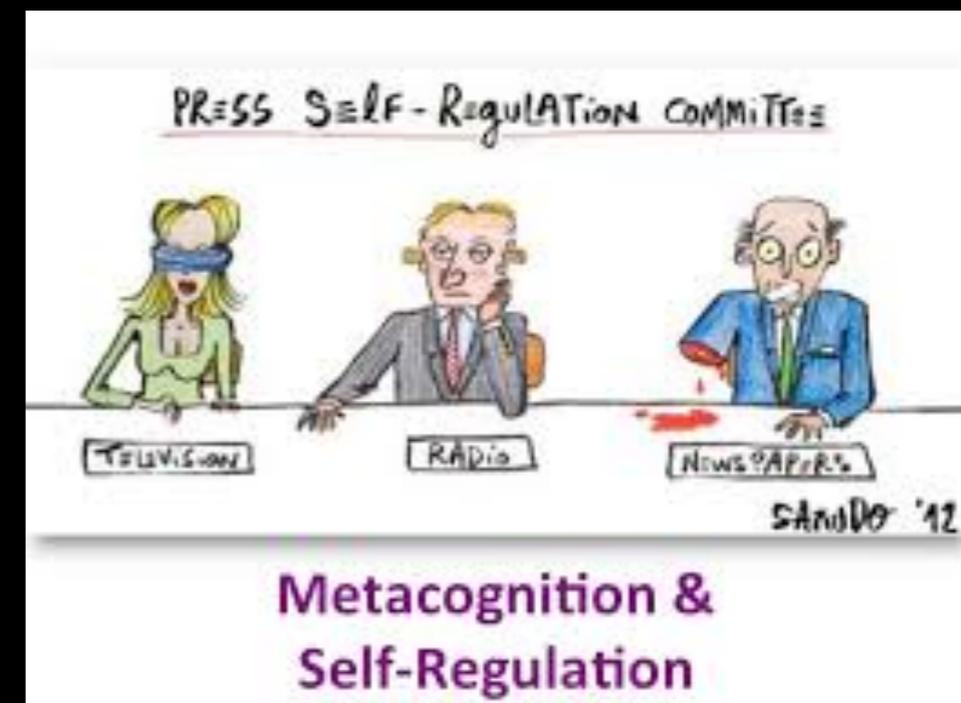
# Adult Learning Theories

- There is no single theory of learning that can be applied to all adults. There are three major theories we are going to review:
  - Andragogy
  - Self-Directed Learning
  - Transformational Learning



# What is Andragogy?

- **Andragogy** is the art and science of helping adults learn versus **pedagogy** which is the art and science of teaching children. It draws on the accumulated reservoir of life experiences to aid learning and is problem-centered. New learning is applied immediately and one is motivated to learn by internal versus external factors.
- Learning objectives are developed based on the learner's needs, interests and skill levels.
- Sequential activities are designed to achieve the above objectives.
- Work is done collaboratively with the learner to select methods, materials and resources for instruction.



# What is Self-Directed Learning?

- Approximately 70% of adult learning is self-directed. **Self-Directed Learning (SDL)** is a process in which individuals take the initiative, without the help of others' in planning, carrying out and evaluating their own learning experiences.
- **SDL** is an informal process that takes place outside the classroom.
- The benefit of **SDL** is that learning can easily be incorporated into daily routines and occurs at the learner's convenience.
- **SDL** can be difficult for adults with low-level literacy skills who may lack independence, confidence, internal motivation or resources.

# Strategies for Facilitating SDL

- Identify the starting point for a learning project
- Match appropriate resources and methods to the learning goal
- Negotiate a learning contract that sets learning goals, strategies and evaluation criteria.
- Acquire strategies for decision-making and self-evaluation of work
- Develop positive attitudes and independence relative to self-directed learning
- Reflect on what he / she is learning



# What is Transformational Learning?



- **Transformative Learning (TL)** is learning that changes the way individuals think about themselves and their world and that involves a shift of consciousness. **TL** is emancipating.
- **TL** is a rational process, a shift in a person's frame of reference or world view.
- Reflective discourse need to challenge each others' assumptions and encourage group members to consider various perspectives.
- It is essential that participants have complete and accurate information about the topic of discussion, be free from bias and meet in an environment of acceptance, empathy, and trust.

# To foster transformative learning consider the following:



- Create a climate that supports transformative learning. Promote student autonomy, participation and collaboration.
- Know your students and the types of learning activities that most appeal to them. Case studies, debates, critical questioning and analyses of theoretical perspectives are enjoyed by “thinking types.”
- Develop and use learning activities that explore different points of view. Engage in journal writing to engage in self-reflection.

# Bringing Theory into Practice

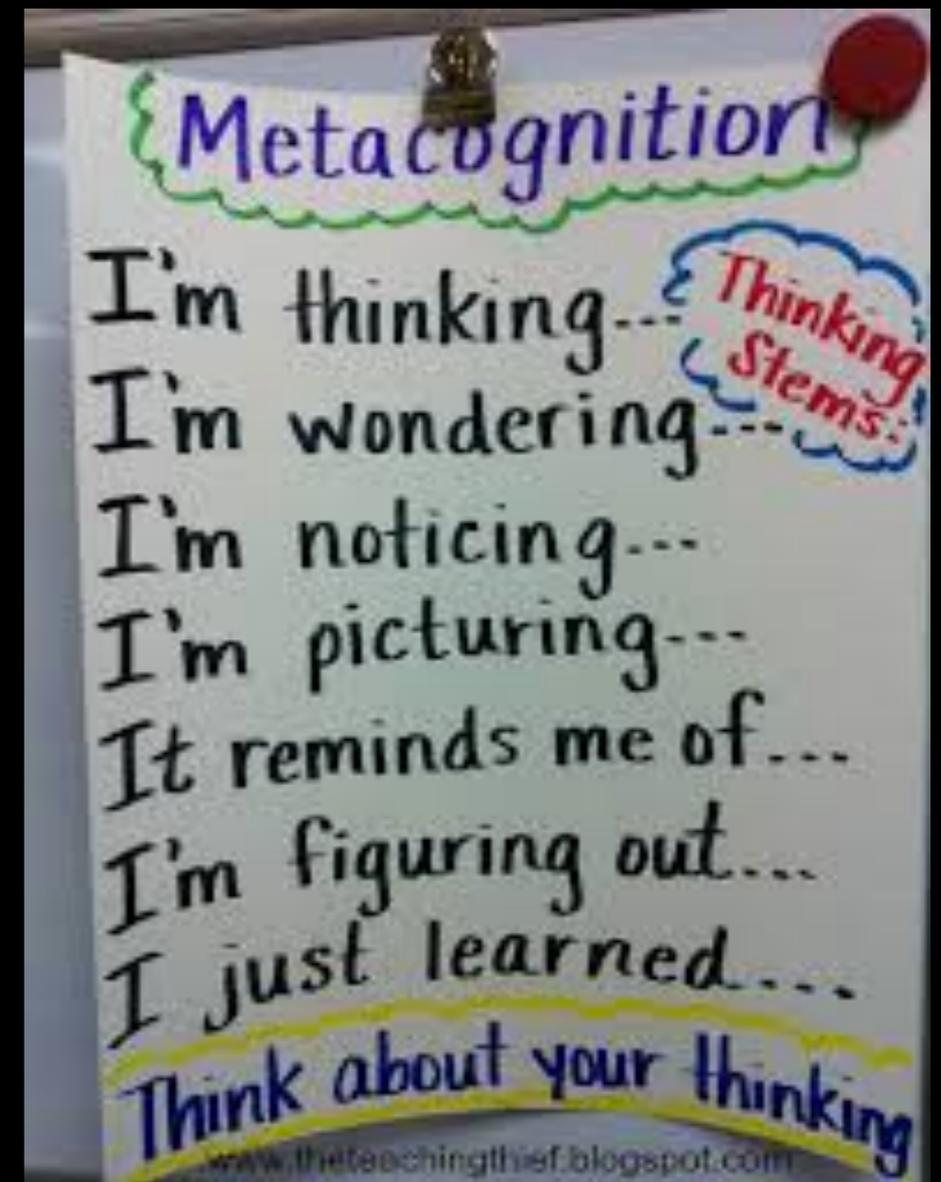
The art of teaching adults requires an understanding of various principles and theories of how adults learn. Suggestions for applying these theories to writing instruction include the following:



- Incorporate more writing to promote self-reflection and articulation of learning.
- use ungraded, short and timed prompts such as quick writes, etc. Writing is a natural means of self-reflection
- engage new adult writers with online communities of writers, as contributors, readers and peers to foster their SDL self-study and persistence.

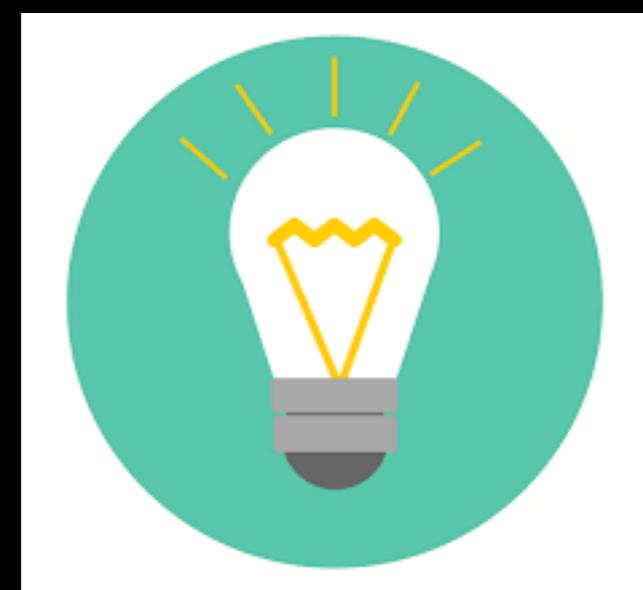
# Metacognitive Skills

- Learners will set **Learning Goals**:
  - Understand “goals” and illustrate and / or describe their own personal goals for participation in English classes.
  - Set goals related to working, parenting and / or participating in their community.
  - Differentiate between long and short-term goals.
  - Outline activities that will help them achieve their goals.
- Learners will understand their own **Learning Styles**:
  - Identify their previous learning experiences.
  - Express likes and dislikes about learning activities.
  - Understand “strengths” and “weaknesses”
  - Recognize learning modalities / preferences in simple terms
- Learners will **Evaluate their own Learning**:
  - Express feelings about class in simple terms. I like...
  - Illustrate / describe progress toward their goals.
  - Monitor and assess their progress





# Brain Research



- **Serotonin** is produced in the brain from the amino acid tryptophan. It is the everyday “feeling just fine” regulator. It serves as an agent that supports the production of new brain cells. We lose cognitive and behavioral flexibility when serotonin is low. Higher serotonin is associated with stability, greater popularity, being liked and even religiosity.
- **Dopamine** is the neurotransmitter of pleasure. When our brain predicts pleasure our dopamine rises. Once the pleasure has been experienced, dopamine goes down. It supports cognitive function, especially decision-making, impulsivity, and working memory.

# Brain Research

- **Cortisol** is released from the adrenal glands. We usually associate it with stress but like dopamine, it's the prediction of discomfort or any negative outcome that can raise our cortisol levels. The prediction of adversity bumps up our cortisol. It's the body's way of prepping for surviving. Cortisol enhances the body's supply of energy so you can handle adversity. When you don't take the action to use the newly created energy to deal with the stressor, the extra energy gets stored as fat.
- Chronic levels of stress elevate levels of cortisol and are very bad for the mind and body. Chronically high levels of cortisol reduce memory, reading skills, working memory, creativity, social skills and production of brain cells. Cortisol increases impulsivity.

# Brain Research

- **Norepinephrine** is also known as noradrenaline. This chemical acts as a hormone within the body and acts as a neurotransmitter within the brain. It affects many areas of the brain, such as the amygdala, which can influence where we direct attention. Norepinephrine underlies the fight, flight, or freeze response by directly increasing heart rate triggering the release of glucose from energy stores, increasing blood flow and boosting the brain's oxygen supply. It is triggered by urgency risk and excitement.

# Practical Applications

- **Serotonin** can be raised by friendships, while dopamine goes up for very special people, like a loved one. Familiar music, teams and classroom rituals promote serotonin. It can be stabilized by physical activity.
- **Dopamine** can be enhanced by positive predictions and can be bumped up by successes such as problem solving, task completions, resource acquisition. Success, gaining on a goal, or winning boosts dopamine. Voluntary gross motor movement can boost it too.
- **Cortisol** can be raised by creating uncertainty, by raising accountability, and by creating a negative prediction. You can also raise cortisol with mild failures, confusion or uncertain changes.
- **Noradrenaline** can be ramped up by strong time deadlines, competition for resources or game competition. Rapid, energetic physical activities will also raise this chemical. Music with high beats per minute will also raise these levels. Urgency, excitement and risk-taking increase noradrenaline.

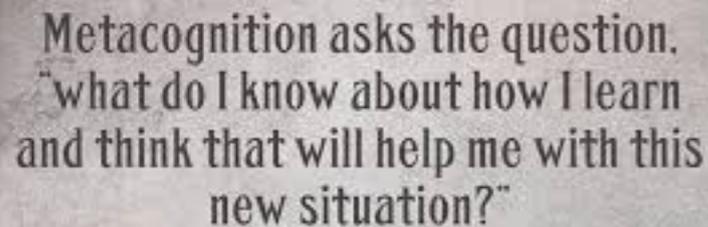
# Fixed Mindset vs. Growth Mindset: Which One Are You?

- **Fixed Mindset** - people who hold these beliefs think that “they are the way they are”. They will often avoid challenges and stick to what they know. Obstacles are external factors that get in your way. They avoid working hard and making efforts. Useful negative feedback is ignored and taken as an insult the rest of the time. Any criticism of your capabilities is criticism of you. The success of others is seen as a benchmark against which the person looks bad. Deterministic world view.
- **Growth Mindset** - people who hold these beliefs know that intelligence can be developed, that the brain is like a muscle that can be trained. They have a desire to improve and embrace challenges. External setbacks do not discourage them. Failure is an opportunity to learn. Effort is necessary for growth, not seen as useless. Criticism and negative feedback are sources of information to help change current abilities. The success of others is seen as a source of inspiration. They create positive feedback loops that encourages them to keep learning and improving.

# The Science of Mindsets

**Mindsets** originate from many different sources including the following:

- Our intense life experiences may evoke strong emotional events that can often alter our course in life.
- A pervasive culture consistently and purposefully shapes actions.
- Conscious growth and learning via reflection, self-talk, discovery, reading, writing, learning
- When humans are constantly hearing and repeating stories about the way things are, the narrative gets daily reinforcement.
- Specific social groups that include or exclude, you based on how to respond to challenges, obstacles, others successes, and criticism.



Metacognition asks the question,  
"what do I know about how I learn  
and think that will help me with this  
new situation?"

- Howard Pitler in Education Week Teacher

# Making Sense of Life Experiences

- If students reflect on how they learn, they become better learners.
- Students learn to regulate their behavior to optimize learning. They begin to see how their strengths and weaknesses affect how they perform. As students' metacognitive abilities increase, research suggests they also achieve at higher levels.
- This higher-order thinking strategy actually changes the structure of the brain, making it more flexible and open to even greater learning.
- **Self-awareness** plays a critical role in how students make sense of life experiences, including empathy, curiosity, and sociability.



# Making Sense of Life Experiences



- Self-awareness plays a critical role in improved learning because it helps students become more efficient at focusing on what they still need to learn.
- When teachers cultivate students' abilities to reflect on, monitor and evaluate their learning strategies, young people become more self-reliant, flexible and productive

# 7 Strategies that Improve Metacognition

1. Teach students how their brains are wired for growth.
2. Give students practice recognizing what they don't understand.
3. Provide opportunities to reflect on coursework.
4. Have students keep learning journals.
5. Use a “wrapper” to increase students' monitoring skills (a wrapper is a short intervention that surrounds an existing activity and integrates a metacognitive practice).
6. Consider essay versus multiple-choice exams.
7. Facilitate reflexive thinking - becoming aware of our biases, encouraging dialogue that challenges human and societal biases. Learn to think about your own thinking.



# Cognitive Versus Metacognitive Strategies

Cognitive Strategies	Metacognitive Strategies
used to help achieve a particular goal	used to ensure that the goal has been reached
actively utilizing information	precede or follow a cognitive activity
emphasize development of thinking skills & processes as a means to enhance learning	often occur when cognition fails
* the distinction between the two lies in how information is used	

# The Two Processes of Metacognition



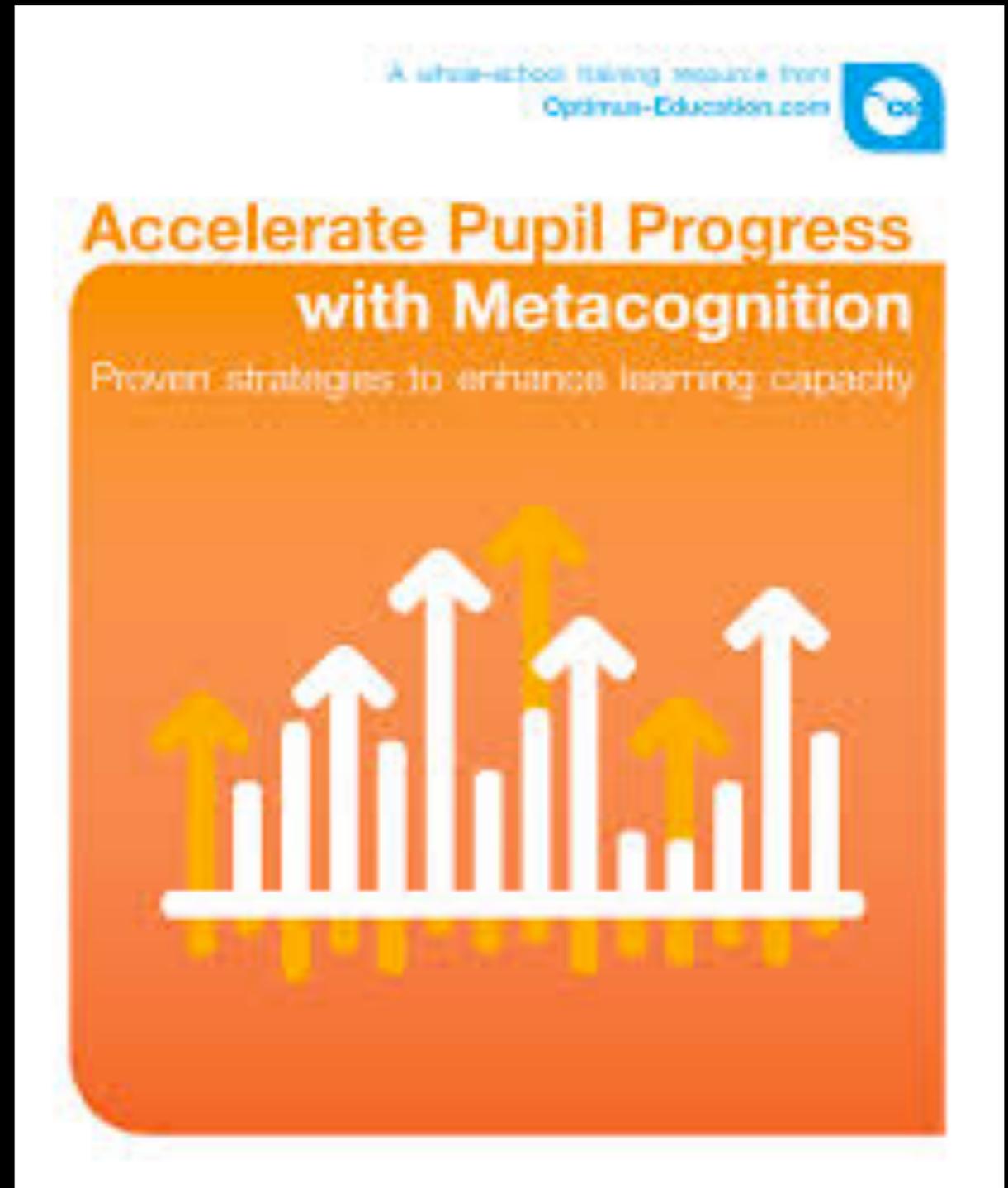
Metacognition consists of two complementary processes:

1. **The knowledge of cognition** - has three components: knowledge of the factors that influence one's own performance: knowing different types of strategies to use for learning: knowing what strategy to use for a specific learning situation.

2. **Regulation of cognition** - involves setting goals and planning: monitoring and controlling learning: and evaluating one's own regulation (assessing results and strategies used)

# 10 Metacognitive Strategies

1. Ask questions.
2. Foster Self-reflection.
3. Encourage Self-questioning.
4. Teach strategies directly.
5. Promote Autonomous Learning.
6. Provide access to mentors.
7. Solve problems with a team.
8. Think aloud.
9. Self-explanation.
10. Provide opportunities for making errors.



# You Can Grow Your Intelligence

- New research shows the brain can be developed like a muscle
- The brain gets stronger when you use it. The context of the brain has tiny nerve cells called **neurons**. The neurons have branches connecting them to other cells, creating a complicated network which allows us to think and solve problems.
- When you learn new things, these tiny connections in the brain actually multiply and get stronger. The more that you challenge your mind to learn, the more your brain cells grow.
- Learning causes permanent changes in the brain. The cells get larger and grow new connections between them. The more a person learns, the easier it gets to learn new things.

