Evidence-Based Learning (EBL)

The Eight Key EBL Skills

Key EBL Skill 6
Metacognition

A
15-minute
Teacher Guide

1	This resource first outlines the benefits of developing metacognition in the classroom.
2	This resource then has research that supports using metacognition in the classroom.

Our review of over 200 educational research papers identified eight key thinking and learning skills that have been found in common across this research

Our two-year research review identified these eight key thinking and learning skills:

- Collaborative Skills
- Thinking Skills
- Peer Assessment
- Peer Teaching
- Self-Assessment
- Metacognition
- Self-Regulation
- Independent Learning

some of these eight skills are needed in different combinations

to develop 21st Century thinking and learning skills

Our two-year research review also identified three key 21st century thinking and learning skills:

- Creative Thinking
- Critical Thinking
- Problem Solving

these three skills need different combinations of the skills above

Cognitive thinking skills
are the thinking skills that
a learner needs to **do** a task

Metacognitive thinking skills are
the thinking skills that a learner
needs to think about:

how they are going
to do the task

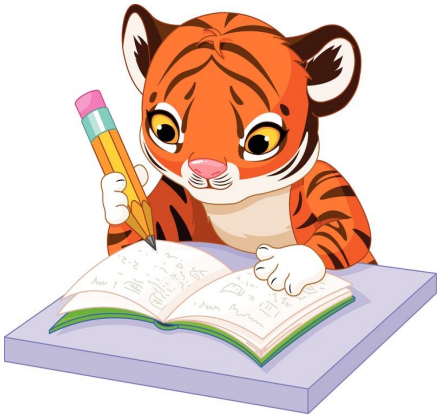
as well as:

the **monitoring** of their
thinking **as** they do that task

Cognitive thinking skills are the thinking skills that a learner needs to **do** a task

these cognitive thinking skills are:

lower-order thinking skills	and	higher-order thinking skills



I will need both lower order and higher order thinking skills to do this task.

But, I will need metacognitive thinking skills to monitor my thinking as I do the task.

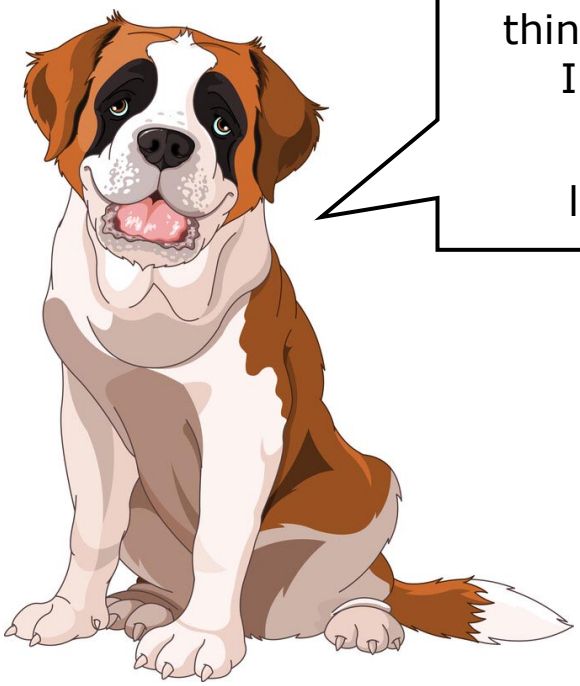
Metacognitive thinking is the thinking skills that the learner needs to think about:

how they are going to do a task

as well as:

the monitoring of their thinking *as* they do that task

Metacognitive thinking skills are the mental skills that a learner needs to **manage** their thinking as they do a task or an activity



I like to think about thinking about how quickly I can eat my dinner.

So, I am going to love metacognition.

In a 1976 research paper, John Flavell defined the term metacognition as "one's knowledge concerning one's own cognitive (thinking) processes".

Flavell said: For example, I am engaging in metacognition if I notice that I am having more trouble learning A than B, or if it strikes me that I should double check C before accepting it as fact."

(Flavell, 1976)

Metacognitive aspects of problem solving - The Nature of Intelligence Flavell 1976

Thinking About Metacognition - Vanderbilt University 2023 cft.vanderbilt.edu

I like to think about thinking about a walk in the park.

That's why I **love** metacognition!

What do you mean that thinking about a walk is not metacognition?

Who wants to SPOIL MY DAY!

Cognition is the lower and higher order **thinking skills** needed to do a task

Metacognition is the thinking skills needed to think about the **best** way to do that task

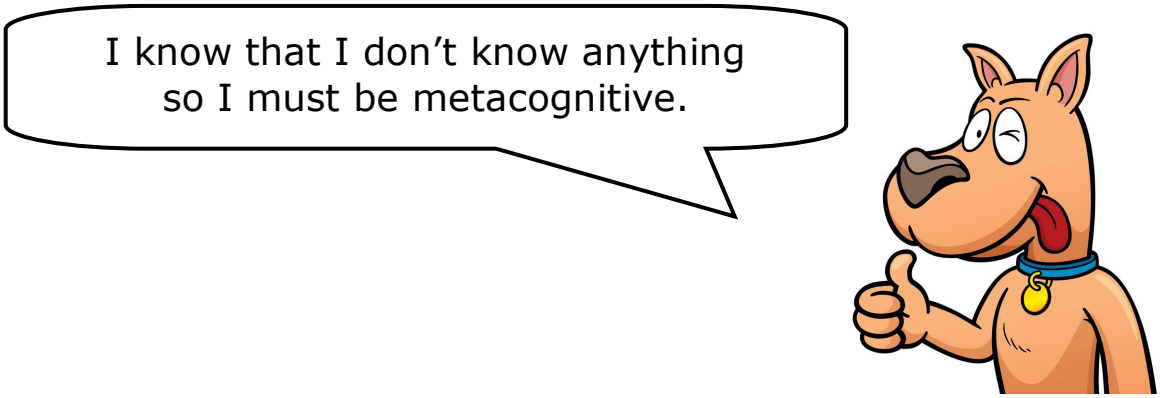
Metacognition is thinking about one's thinking. It refers to the processes used to plan, monitor, and assess one's understanding and performance.

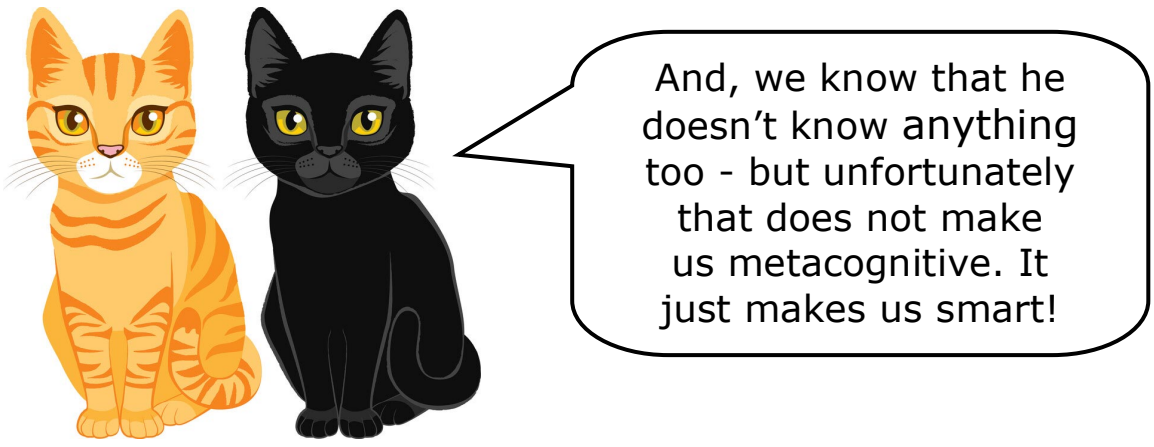
Metacognition includes a critical awareness of:

a) one's thinking and learning and

b) oneself as a thinker and learner.

Metacognition - Center for teaching
Vanderbilt University 2023 - cft.vanderbilt.edu





The general order that thinking and learning skills develop:		
First	Lower order thinking skills (e.g. remembering)	↓
Next	Higher order thinking skills (e.g. evaluating)	↓
Then	Self-assessment skills	↓
After that	Metacognitive thinking skills	↓
Finally	Self-regulation skills: Metacognitive thinking skills + Non-cognitive skills (the attitudes and the behaviours for learning, such as motivation, perseverance and self-belief)	↓

I am a metacognitive dog, but I am not quite self-regulated yet.

I like to think about my thinking and learning but I have not got the perseverance to think about them for long. I only really persevere in thinking about long walks and treats!

Metacognition needs cognitive thinking skills

To develop metacognitive thinking skills, cognitive thinking skills need to be in place

What are cognitive thinking skills?

In simple terms, cognition refers to the process of thinking. The skills that we use when we are thinking are called cognitive skills.

Cognitive skills are the core skills your brain uses to think, read, learn, remember, reason, and pay attention.

Cognitive skills are the brain-based skills that we need to carry out any task from the simplest to the most complex.

What are Cognitive Skills? Mind Matters - LearningRx 2019
www.learningrx.com

Cognition - wordpandit.com

What are cognitive abilities and skills, and can we boost them?
sharpbrains.com

Cognition is the thinking skills needed to do a task

Metacognition is the ability to think about *how* you are going to do the task and to then *monitor* your thinking *as* you doing that task

Imagine a pupil that is answering a difficult maths question. The pupil's cognition - their thinking skills - will be needed to do this task.

Metacognition would also be needed for the pupil to:

- be aware of possible strategies to do this task
- monitor their performance throughout the task
- correct errors during the task
- evaluate their performance at the end of the task

Adapted from: Difference Between Cognition and Metacognition Oct 2014 - www.differencebetween.com

The difference between Cognitive Thinking Skills and Metacognitive Thinking Skills

Cognitive Thinking Skills	Metacognitive Thinking Skills
are the thinking skills you need to do a task or activity these skills might be lower order thinking skills or higher order thinking skills	are the thinking skills needed to manage the cognitive thinking you are doing in a task or activity and the monitoring of that thinking as you do the task
the thinking skills you need to do a task	the thinking skills you need to manage and monitor your thinking during a task

Metacognition is thinking about your own thinking

Metacognition is thinking about my own thinking.

It is NOT thinking about how tasty this grass is - which I call a REAL shame!

A metacognitive thinker thinks about their thinking as they are working - so they will ask themselves questions such as:

- Am I on track?
- What strategy is best for me to use?
- Have I done anything like this before?
- How did I do this last time?

Metacognitive thinking is the most productive type of thinking.

Metacognitive thinking is the awareness of:	
☑	What you are doing.
☑	How you are doing it.
☑	The most effective way of doing it.
☑	If you did something similar before.
☑	What you could do to improve your work.

Metacognition involves the monitoring of your own thinking as you are working

Metacognitive thinking is

the *awareness* and the
regulation of your own thinking

metacognitive knowledge *awareness of your own thinking*	+	metacognitive regulation *regulating (monitoring) your own thinking*
thinking about your own thinking as you work on a task		monitoring this thinking as you work on the task

Metacognition thinking has two key components:

metacognitive knowledge *awareness of your own thinking*	+	metacognitive regulation *monitoring your own thinking*

Metacognitive knowledge refers to what individuals know about themselves as cognitive processors, about different approaches that can be used for learning and problem solving, and about the demands of a particular learning task.

Metacognitive regulation refers to how learners monitor and control their cognitive processes.

For example, learners with effective metacognitive-regulation skills can select appropriate learning strategies for a task and modify their approaches as they are working.

Adapted from: Cambridge Assessment: Getting Started with Metacognition - cambridge-community.org.uk

TEAL Center Fact Sheet No. 4: Metacognitive Processes Teal Center - U.S. Department of Education

A Definition of Metacognition

Metacognition is an awareness of one's thought processes and an understanding of the patterns behind them.

This higher-level cognition was given the label metacognition by American developmental psychologist John H. Flavell (1976).

The term metacognition literally means 'above cognition', and is used to indicate cognition about cognition, or more informally, thinking about your own thinking.

Metacognition - Wikipedia
Scholarly Community Encyclopedia 2023 - encyclopedia.pub

Metacognition is a transferable skill

Because cognitive strategies are task-specific, their transfer is limited. In contrast, metacognitive skills are task-general and transferable to a wide variety of learning tasks.

Transfer of metacognitive skills in self-regulated learning:
An experimental training study - Schuster - Metacognition and Learning
August 2020 - Research Gate - www.researchgate.net

I am engaging in metacognition if:

- ☑ I notice that I am having more trouble learning A than B.
- ☑ It strikes me that I should double-check C before accepting it as a fact.
- ☑ It occurs to me that I had better check each alternative in a multiple-choice task before deciding which will be the best alternative.
- ☑ I sense that I had better make a note of D because I may forget it.

Metacognitive Aspects of Problem Solving - Flavell 1976

What is Metacognition? - OECD 2014
read.oecd-ilibrary.org

When does metacognition take place?

Metacognitive processes are presumed to take place when we think about our own thinking, for example, when we reflect upon:

- ☑ Whether we know something
- ☑ Whether we are learning, or
- ☑ Whether we have made a mistake

Metacognition is needed for Self-Regulation (1)

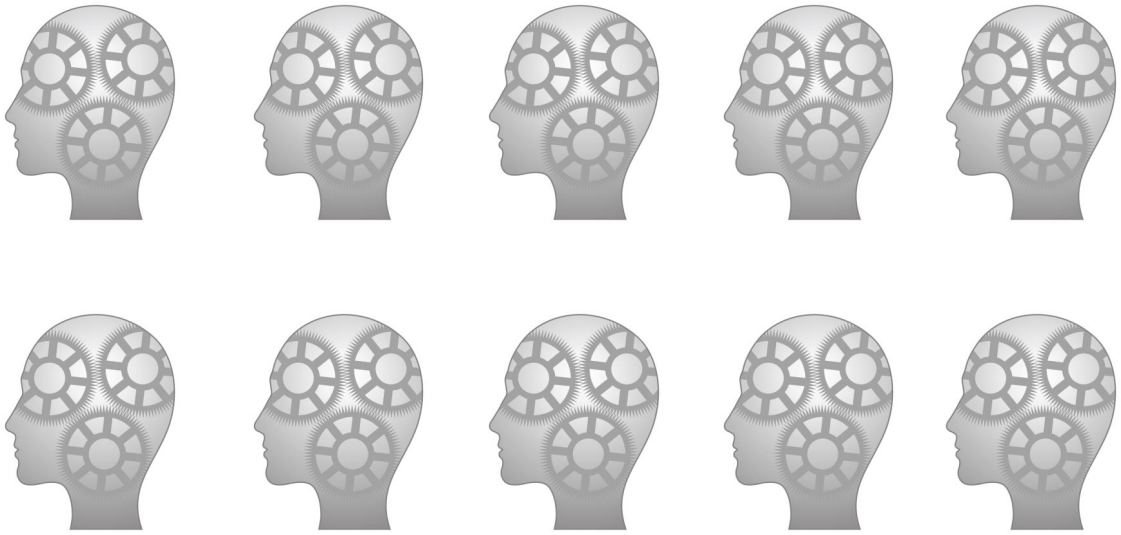
Metacognitive strategies empower students to think about their own thinking. This awareness of the learning process enhances their control over their own learning. It also enhances personal capacity for self-regulation and managing one's own motivation for learning.

Teachers can implement metacognitive strategies to assist students to become self-regulating learners and to develop a strong sense of agency (choice) in their learning.

Metacognitive activities can include planning how to approach learning tasks, identifying appropriate strategies to complete a task, evaluating progress, and monitoring comprehension.

Teacher tip: Use metacognitive strategies to empower your students
Aug 2021 - Department of Education - www.education.vic.gov.au

Metacognition is needed for Self-Regulation (2)

Cognition thinking skill	Cognition is the lower order and higher order thinking skills that pupils need to do a task.	↓
Metacognition thinking skill	Metacognition is the ability of pupils to think about how to do a task and then to monitor their performance as they do the task.	↓
		
Self-Regulation metacognition + the right behaviours for learning	Self-regulation needs metacognitive thinking about the task **plus** the right behaviours to get the task done. Self-regulation refers to the extent to which pupils exert control over themselves during a task to ensure that they get the task done.	↓

How to Identify a Self-Regulated Learner

Self-regulated learners are metacognitive:

They are aware if they know something or not.	✓
They know when they are having trouble understanding something or when something has not been explained fully to them.	✓

As well as being metacognitive, self-regulated learners also have the right behaviours for learning:

They take responsibility for their learning and for their success in a task and they put in more effort and persistence when needed.	✓
They plan their learning, set goals for their learning, monitor themselves as they are learning, and self-assess their learning.	✓

Definitions of Metacognition (1)

Metacognition is thinking about your own thinking

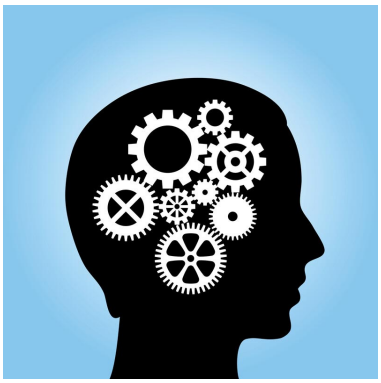
John Flavell first defined the term metacognition in a 1976 research paper as:

"One's knowledge concerning one's **own** cognitive processes".

Metacognition (Flavell) Learning Theories 2022
learning-theories.com

Flavell's definition evolved over time and metacognition was later defined as "thinking about your **own** thinking."

Metacognition - Queens University - Canada
www.queensu.ca



Metacognition is, put simply, thinking about **one's** thinking.

Vanderbilt University 2023
cft.vanderbilt.edu

Metacognition is, cognition about cognition', or 'thinking about **one's** thinking'.

Metacognition - Cambridge Assessment - Oct 2019
www.cambridgeinternational.org

Definitions of Metacognition (2)

John Flavell defined the term metacognition in a 1976 research paper as "one's knowledge concerning one's **own** cognitive processes".

(or thinking about your **own** thinking)

✓

Flavell's definition has become shortened over time to "thinking about thinking".

*This is not an accurate definition of metacognition since metacognition is actually "thinking about your **own** thinking".*

✗

Over time, the Flavell definition of metacognition:

thinking about your **own** thinking ✓

has been misinterpreted as:

thinking about thinking ✗

Metacognition has two key components (1)

metacognitive knowledge *awareness of your own thinking*	+	metacognitive regulation *controlling your own thinking*

Metacognition is considered to have two dimensions:

metacognitive knowledge

the awareness of one's own cognitive processes and one's strengths and weaknesses as a learner plus the understanding of how to regulate those processes to maximize learning (*Flavell 1982 + Pintrich 2002)* and

metacognitive regulation

is the managing, regulating and controlling of our thinking to make sure that a task gets done

What is Metacognitive Knowledge?
www.globalmetacognition.com

Metacognition has two key components (2)		
		
Metacognitive thinking has two key components:		
metacognitive knowledge *awareness of your own thinking*	+	**metacognitive regulation** *controlling your own thinking* ⬇ this will lead to self-regulation when the learner also controls, their feelings **and** their behaviours during learning as well as their thinking

Metacognition has two key components (3)

metacognitive knowledge *awareness of your own thinking*	+	metacognitive regulation *controlling your own thinking*

Metacognitive knowledge refers to what pupils know about their own cognition. It is their awareness of their own cognitive abilities (I find spelling tests difficult), their awareness of particular tasks (the spellings for the spelling test today look easier than last week) as well as the different approaches that they can use for learning and problem solving (If I test myself on the spellings just before the test, I will remember them more easily).

Metacognitive regulation is how we control our thinking in order to get the task done. For example, students with effective metacognitive-regulation skills can select appropriate learning strategies for a task and modify their approaches to their work *as* they are working - such as changing strategies if the strategy they are using is not working.

Adapted from: Cambridge Assessment - Metacognition 2019
www.cambridgeinternational.org

Getting Started with Metacognition - cambridge-community.org.uk

What is Metacognition? - Inner Drive - 2022 blog.innerdrive.co.uk

Where metacognition stands in the development of thinking and learning skills

Bloom's Taxonomy of thinking skills has been used as a framework for teaching and learning skills since 1956	● Remembering
	● Understanding
	● Applying
	● Analysing
	● Evaluating
	● Creating
Flavell's theory of metacognition was introduced in 1976	● Metacognition
Bandura 1986 and Zimmerman and Schunk 2001	● Self-Regulation
The key 21st Century thinking skills Although these three skills are key for modern thinking, they are some of the oldest thinking skills.	● Problem Solving
	● Critical Thinking
	● Creative Thinking

Examples of Metacognitive Questions	
Metacognition is the process of thinking about one's own thinking	
In a learning task, metacognitive questions might include:	
Before the task	What do I already know about this?
	What do I need to do first?
	What is the best way for me to start this task?
During the task	What do I need to do next?
	Who will help me if I get stuck?
	Is my strategy working?
After the task	How could I have done this differently?
	What did I do well?
	What do I need to remember about this task?

The following pages have evidence-based quotes on metacognition.

This research could be used for teacher CPD on the benefits of metacognition.

Research on Metacognition 1	1998

"Metacognition is essential to successful learning"

Metacognition is essential to successful learning because it enables individuals to better manage their cognitive skills, and to identify weaknesses that they can improve upon.

Promoting metacognition begins with building an awareness among learners that metacognition exists, that it differs from cognition, and that metacognition increases academic success.

Promoting General Metacognitive Awareness - Schraw 1998
Instructional Science Vol 26 - Department of Educational Psychology
The University of Nebraska-Lincoln

Research on Metacognition 2	1998

Metacognition is more important than ability

A research study by *Swanson (1990)* showed that metacognitive ability compensated for intelligence in a comparison between pupils' problem-solving ability.

Those with higher metacognitive ability were better able to solve problems than those with lower metacognitive ability regardless of their academic ability level.

This study reported two important findings. One was that metacognitive knowledge is not strongly correlated with ability.

Second, metacognitive knowledge contributes to successful problem solving over and above the contribution of ability and task-relevant strategies.

Promoting General Metacognitive Awareness - Schraw 1998
Instructional Science Vol 26 - Department of Educational Psychology
The University of Nebraska-Lincoln

Research on Metacognition 3	2007

"Metacognition is at the heart of all learning"

Metacognition is at the heart of all learning.

It involves learners in tracing back to how the task was tackled to understand their own thinking and learning processes.

To do this, learners need to "unpack their thinking" in order to appreciate the strategies they have used to learn, to assimilate the learning that has taken place and to link the learning to a new context.

Why Develop Thinking and Assessment for Learning in the Classroom 2007
www.wales.gov.uk

Research on Metacognition 4	2008

"Metacognitive skills rather than intellectual ability is the main determinant of learning outcomes"

When tasks are more complex for pupils, the quality of their metacognitive skills rather than their intellectual ability is the main determent of learning outcomes.

A metacognitive pupil is more likely to use a range of strategies that might work. A pupil without metacognition will have to rely on trial and error.

Adapted from: Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement - Hattie 2008

Research on Metacognition 5	2010

Metacognition is necessary for the transfer of learning

One prerequisite for the successful transfer of learning appears to be the extent to which pupils have developed the tendency to metacognitively monitor their own thinking.

Have your pupils develop an inner voice where they ask themselves questions as they work on a task, for example:

What's this about? How shall I do this? What have I done before that might help? Is this working?
Is there another way – a better way? What went well?
What would I do differently next time?
What have I learned? Where could I use this again?

Anne de A'Echevarria - Learning for Transfer:
Activities for Developing an 'Inner Voice' to Monitor Thinking
March 2010 - www.teachingexpertise.com

Research on Metacognition 6	2012

"Metacognition allows pupils to be more expert-like in their thinking"

Pupils with well-developed metacognition can identify concepts they do not understand and select appropriate strategies for learning those concepts.

Metacognition allows pupils to be more expert-like in their thinking and more effective and efficient in their learning. While collaborating in small groups, pupils can also stimulate metacognition in one another, leading to improved outcomes.

Fostering Metacognition to Support Student Learning and Performance
Stanton et al - Life Sciences Education - Vol 2 Issue 2 - Jun 2012

Research on Metacognition 7	2019

Metacognition can be developed before, during and after a lesson

Metacognition is an individual's ability to identify their current thought process and select helpful strategies to tackle challenges more effectively. It can be developed throughout a lesson.

Teachers can encourage the development of metacognition in the classroom by giving pupils the opportunity to use metacognitive strategies at key stages of a task. This ensures that they improve both their self-awareness and ability to choose effective thought processes in the future.

One way to do this is to break down the strategies into the three stages: before a task, during a task and after a task.

Conclusion

Metacognition improves performance

Teaching pupils about metacognition - or thinking about their thought processes - often provides the tools necessary to turn mediocre or failing academic performance into excellent performance.

When pupils are taught how to learn, their performance usually takes an immediate and dramatic turn for the better.

Emphasizing Two Underutilized Dimensions of Learning: Metacognition and Motivation - McGuire 2004
Center for Academic Success - www.researchgate.net