The Learning Trajectory

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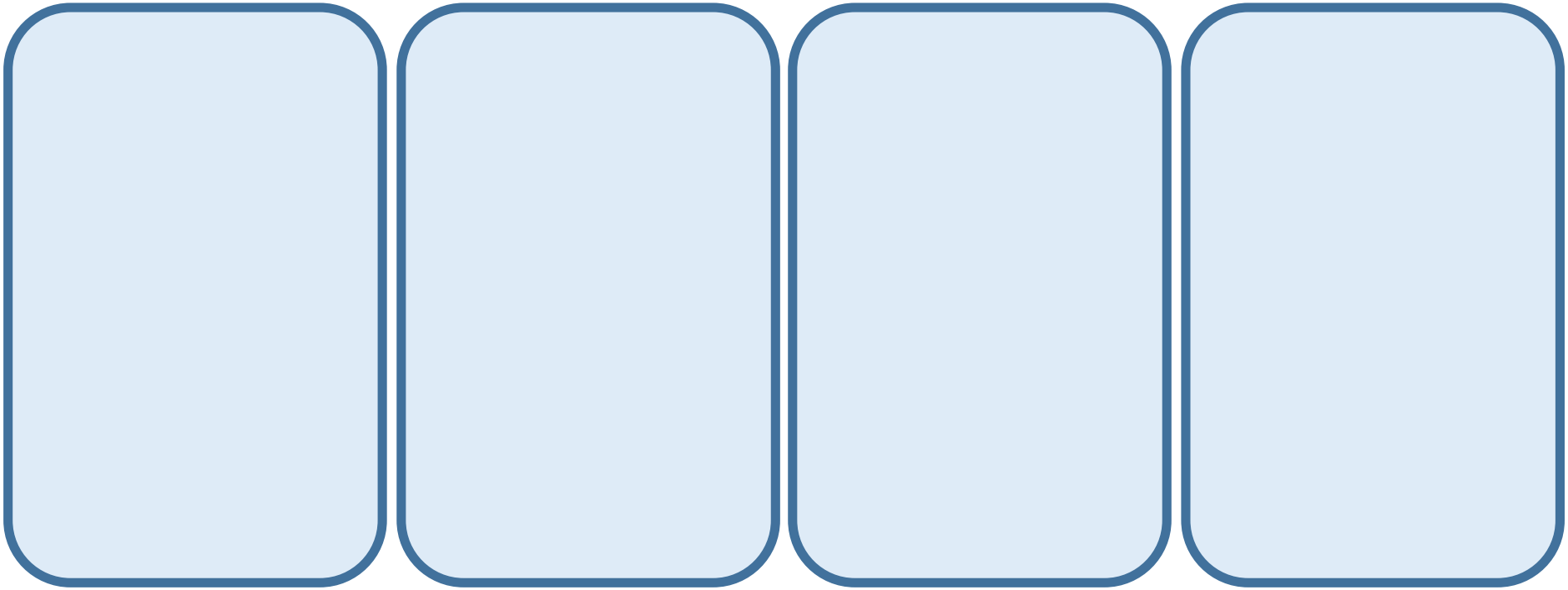
The Science of Learning Group

www.scienceoflearning.com.au

A GAME



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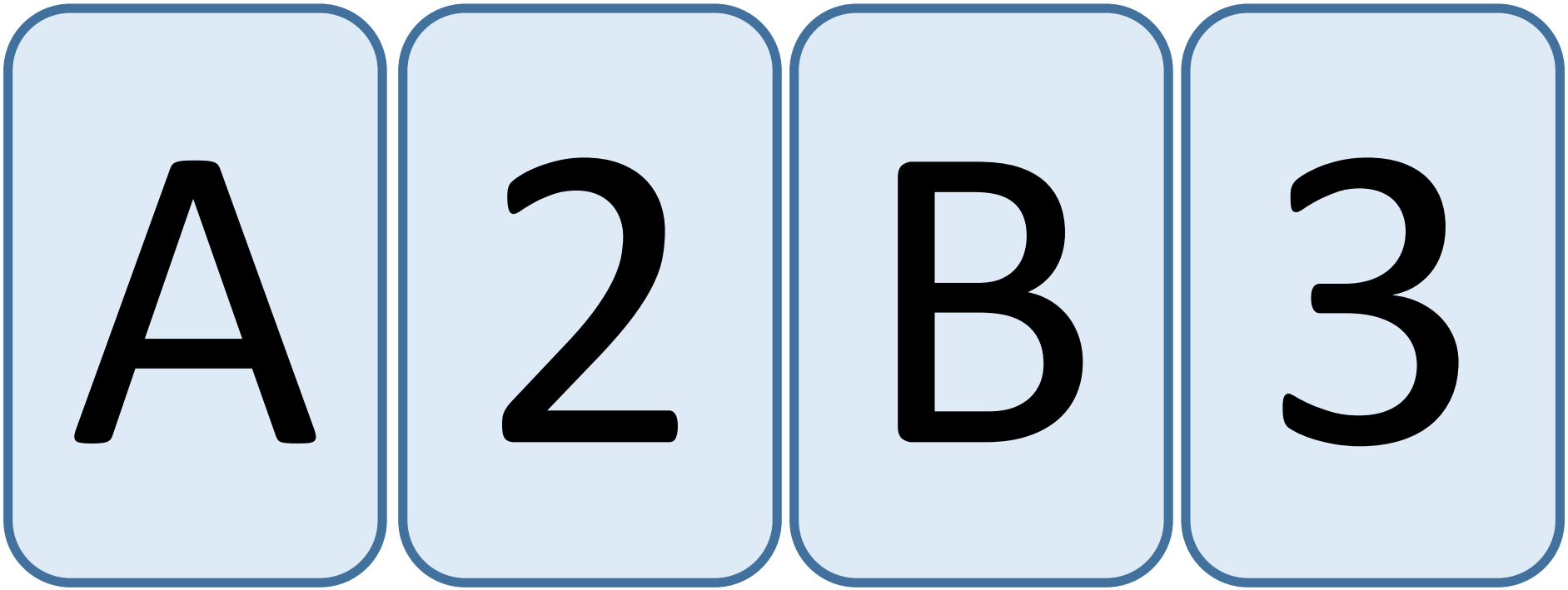
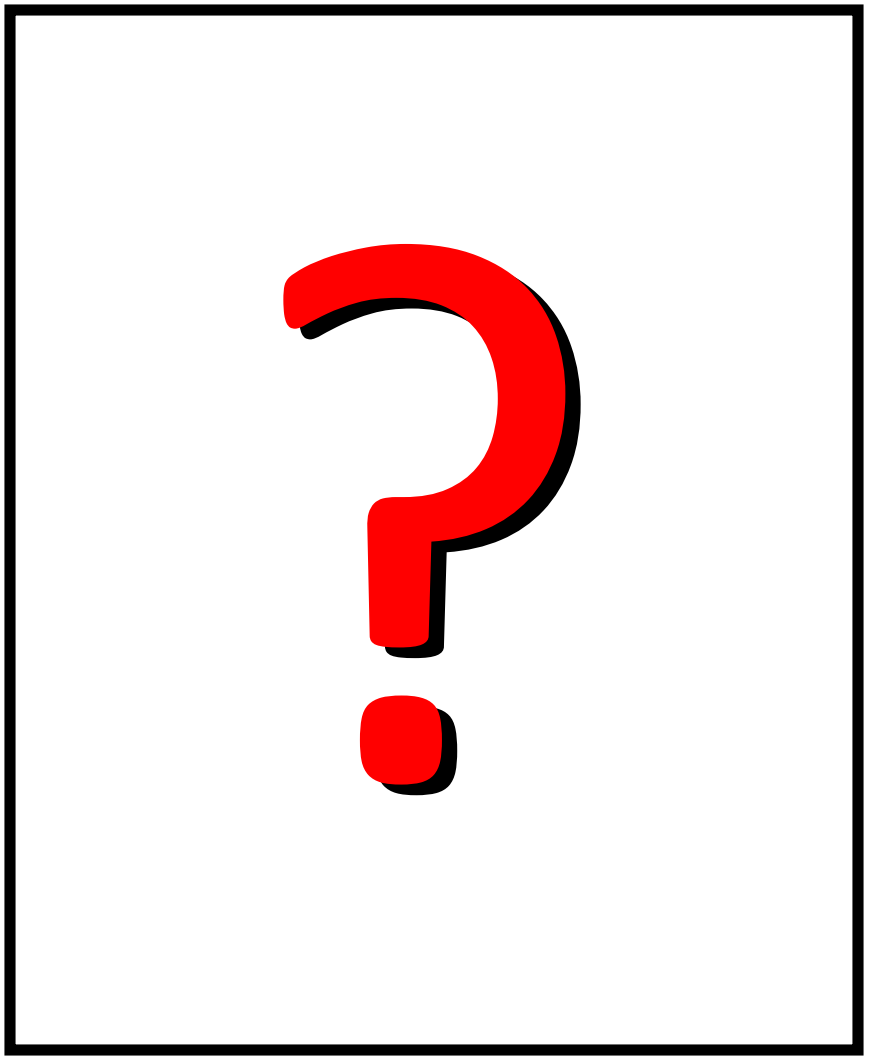


The Learning Trajectory

Question

What is Learning?



A neuroscientist:

“When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased.”

(Hebb 1961)

A cognitive psychologist:

“the process by which a relatively stable modification in stimulus-response relation is developed as a consequence of functional environmental interaction via the senses.”

(Sheldon 1996)

An educator:

“A process whereby knowledge is created through the transformation of experience.”

(Kolb 1984)

A Student:

“What I do for Homework.”

Architecture

Form First

Architecture

Form First

Architecture

Form First

Louis Sullivan

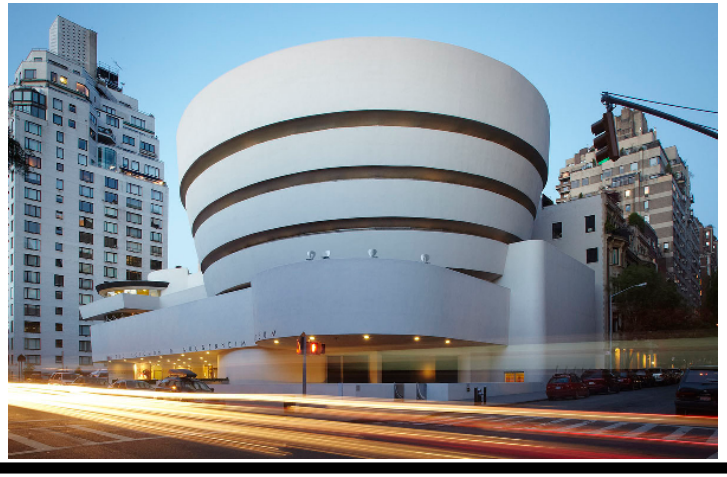
Form Follows Function

Louis Sullivan

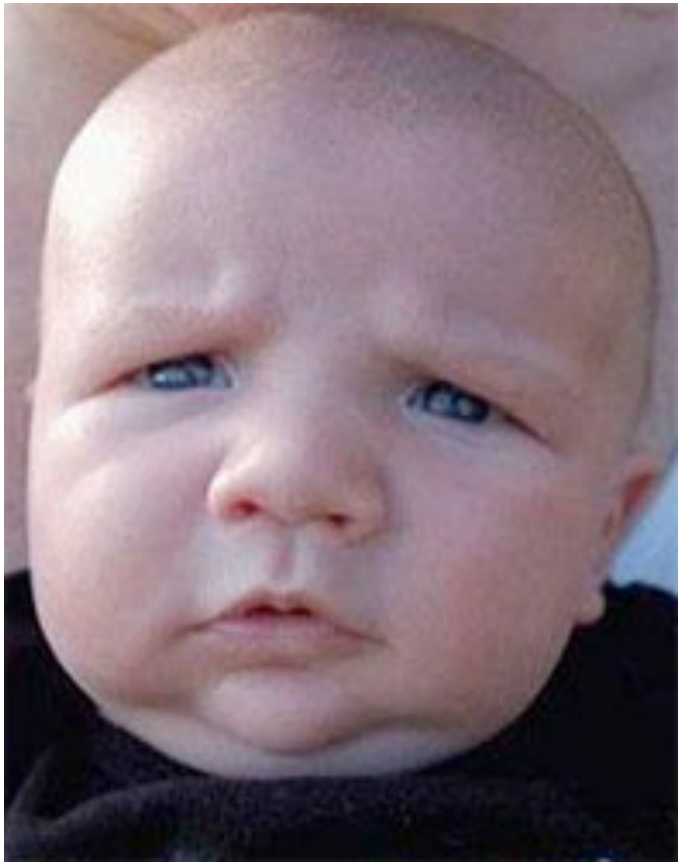
Form Follows Function

Form Follows Function

Form Follows Function



Why Does this Matter?



FORM

What do I do?

FORM FOLLOW FUNCTION

What do I want!?

Learning Objective

VERB

PURPOSE

Learning Objective

Orally describe the steps involved in the scientific method.

Learning Objective

*Orally **describe** the steps involved in the scientific method.*

Learning Objective

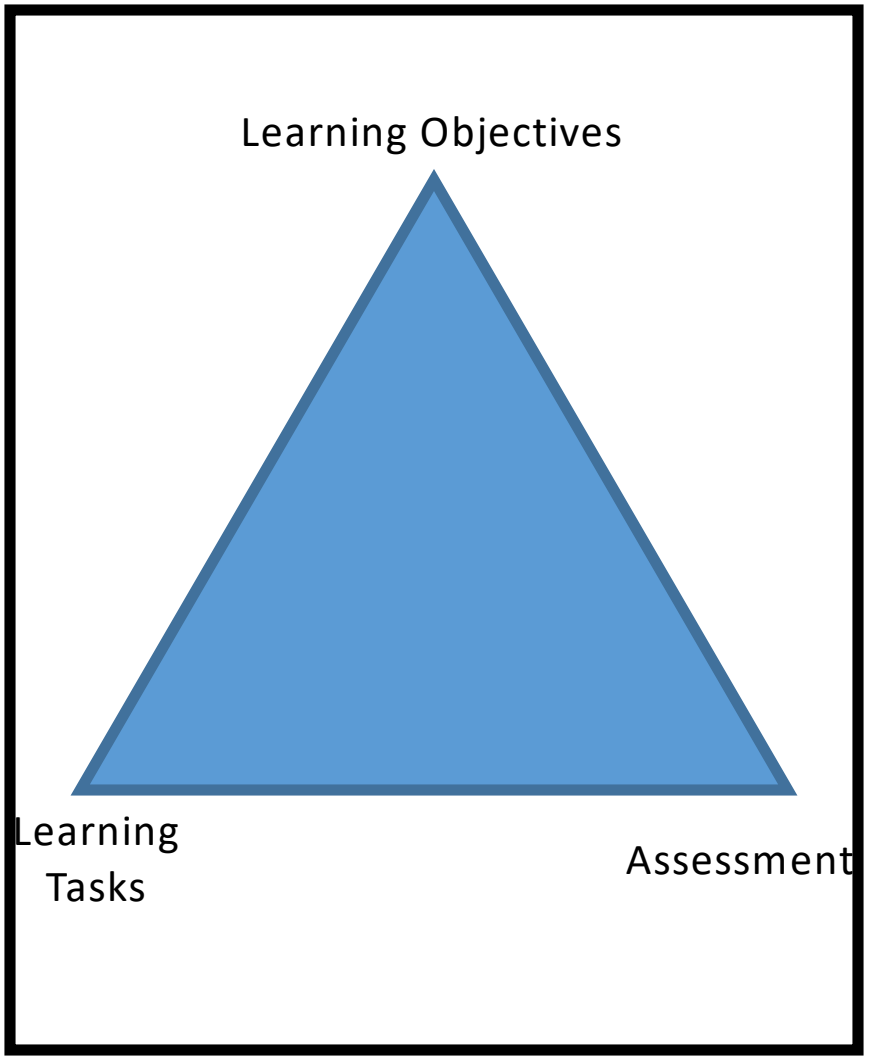
VERB MUST BE ACTIVE & EXTERNALLY OBSERVABLE OR MEASURABLE!

Task

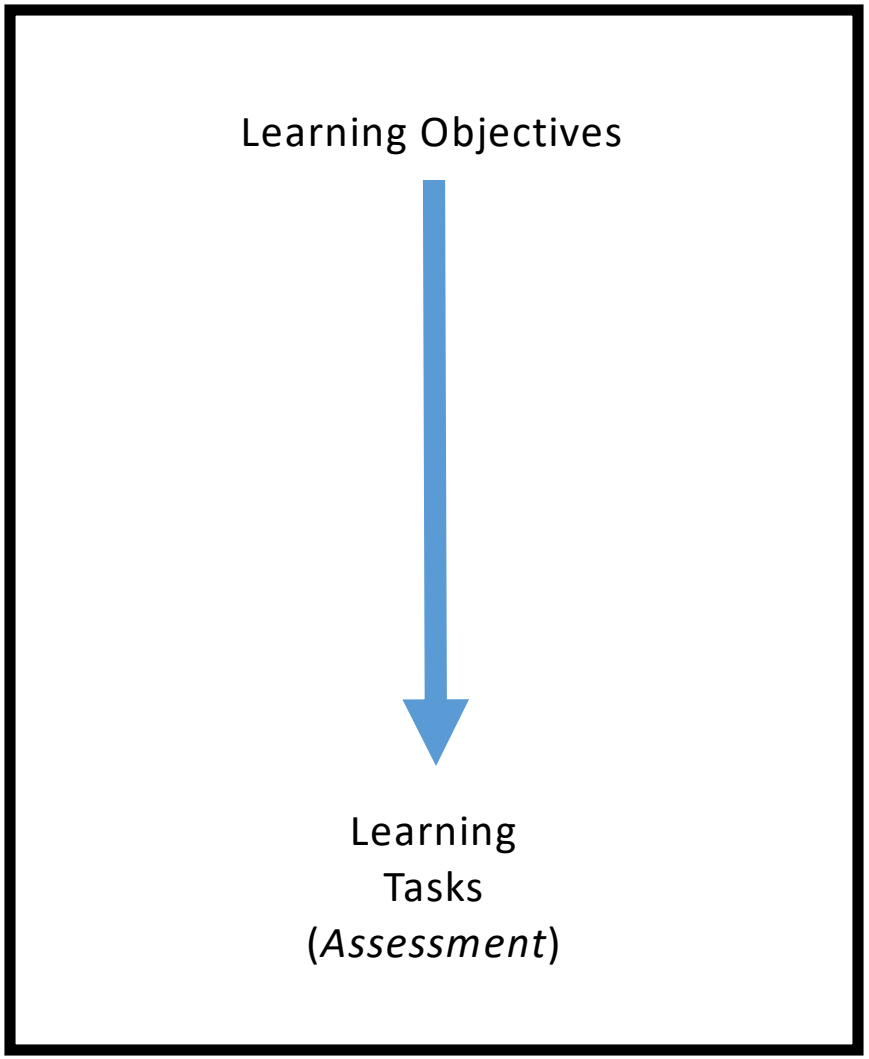
VERB MUST BE ACTIVE & EXTERNALLY OBSERVABLE OR MEASURABLE!

Remember…

Remember…

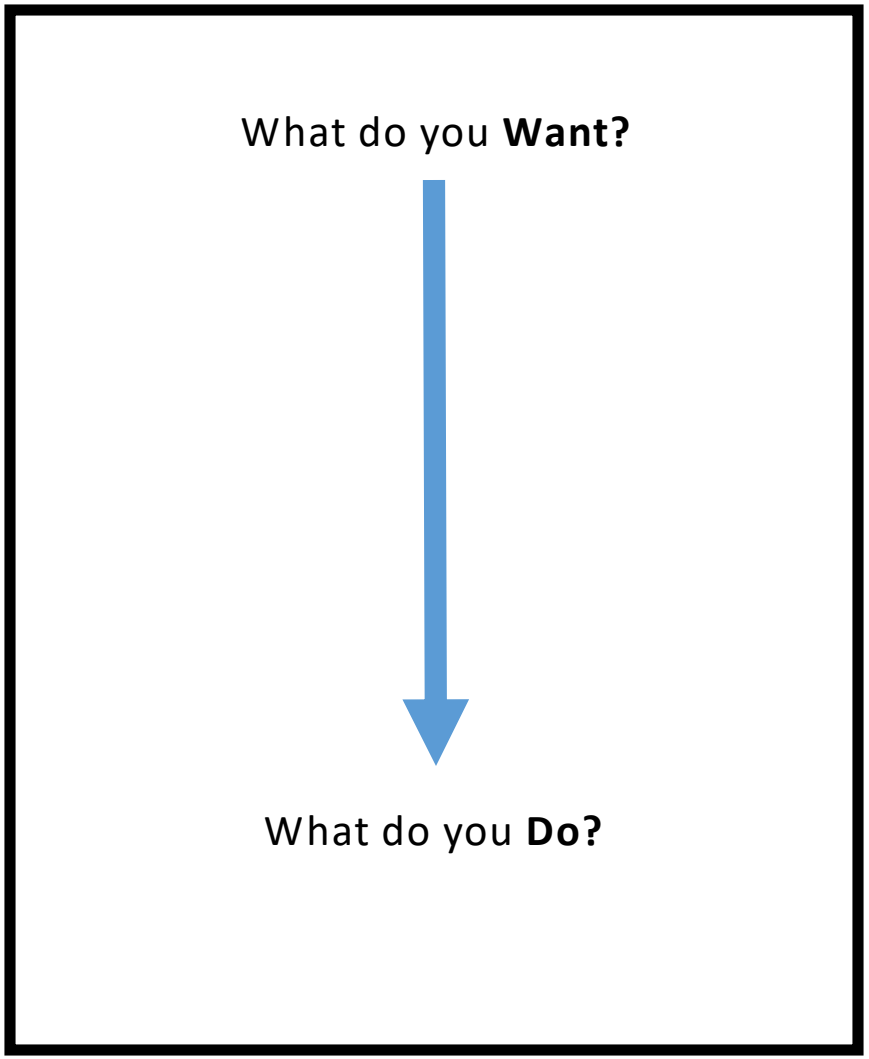


Remember…



Remember…

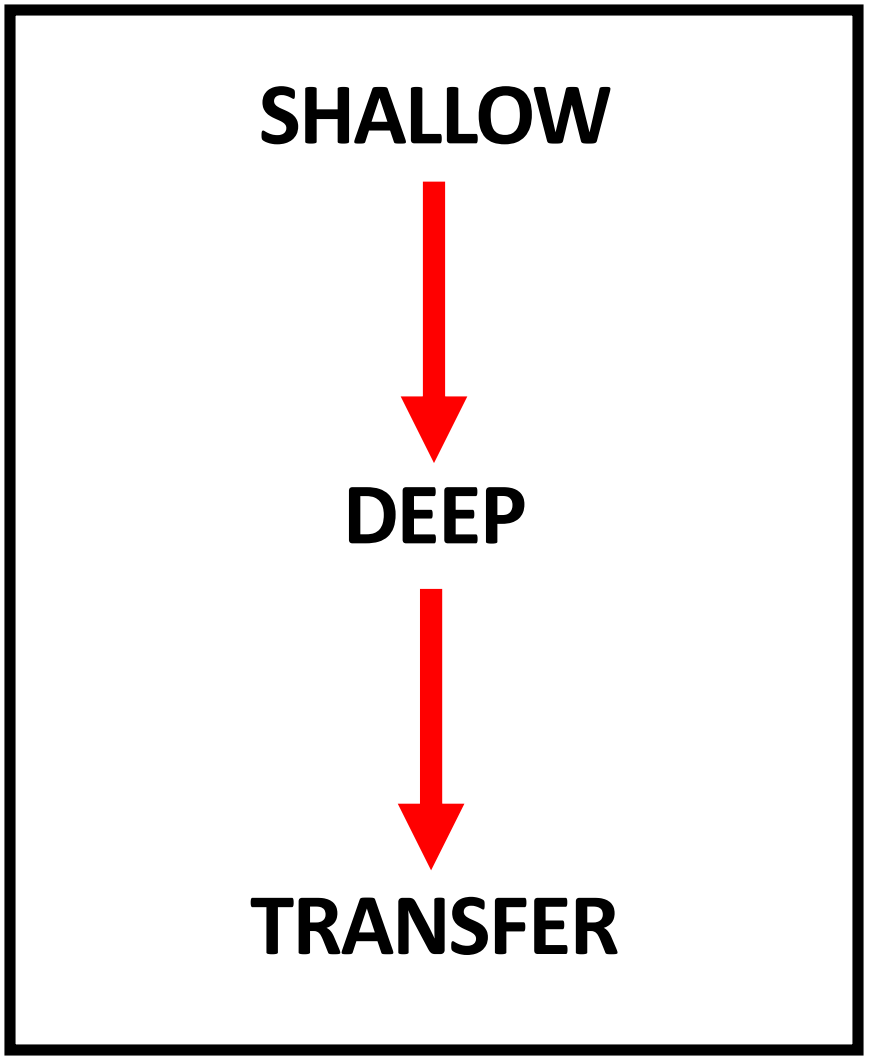
Alignment



Learning Objective

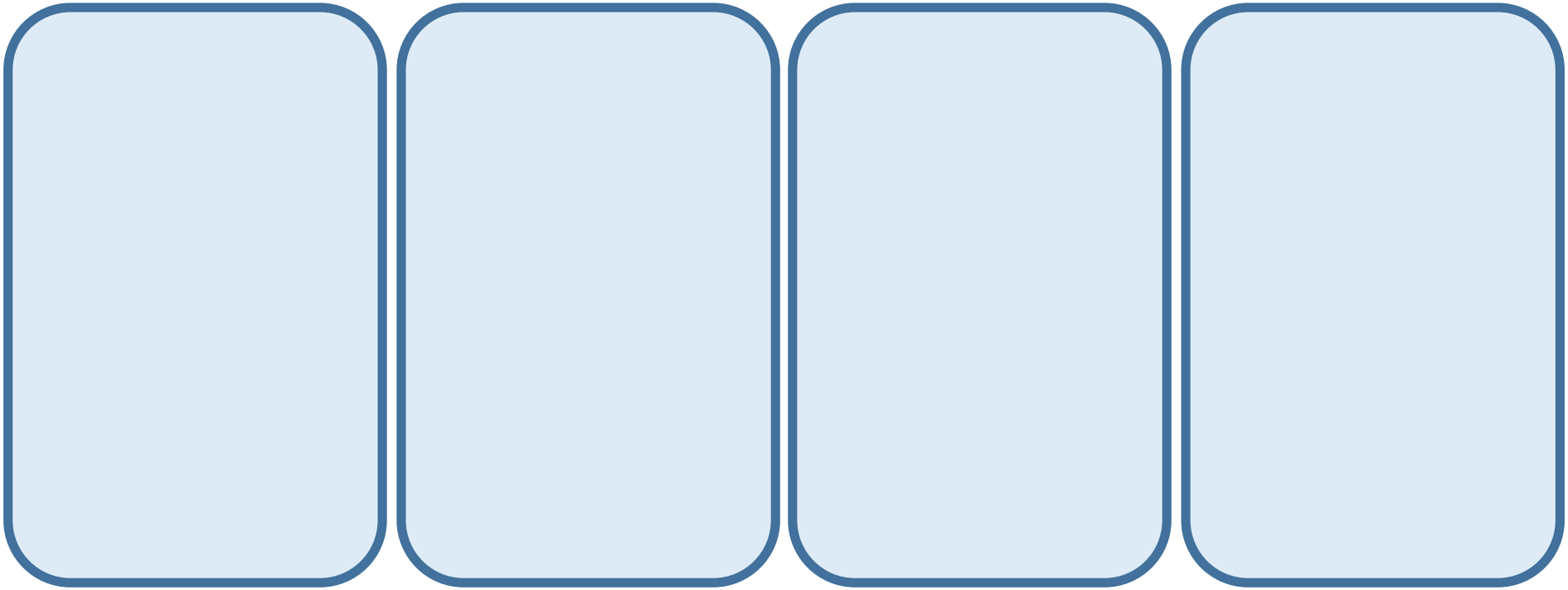
*Orally **describe** the steps involved in the scientific method.*

The Learning Trajectory



The Big Secret

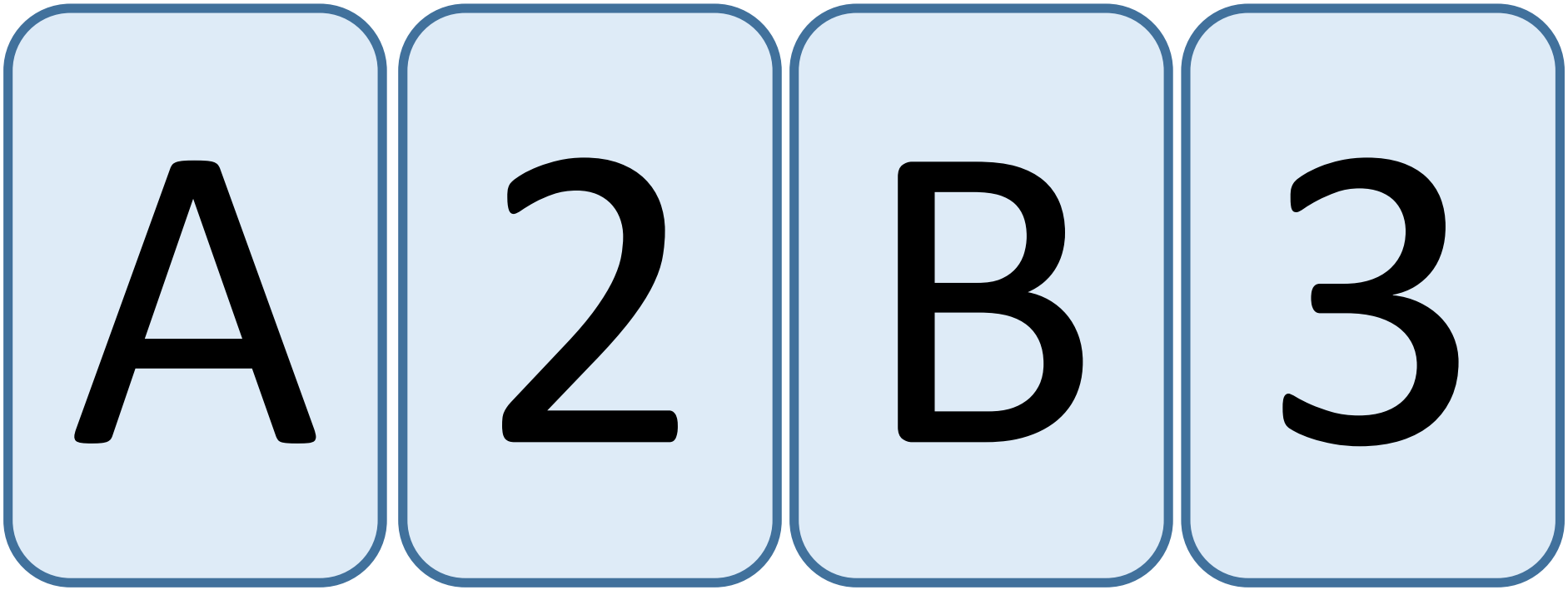
A GAME



A GAME

BEER	31	COKE	11

A GAME



The Big Secret

FACTS ALWAYS PRECEDE SKILLS

Basic Learning Process

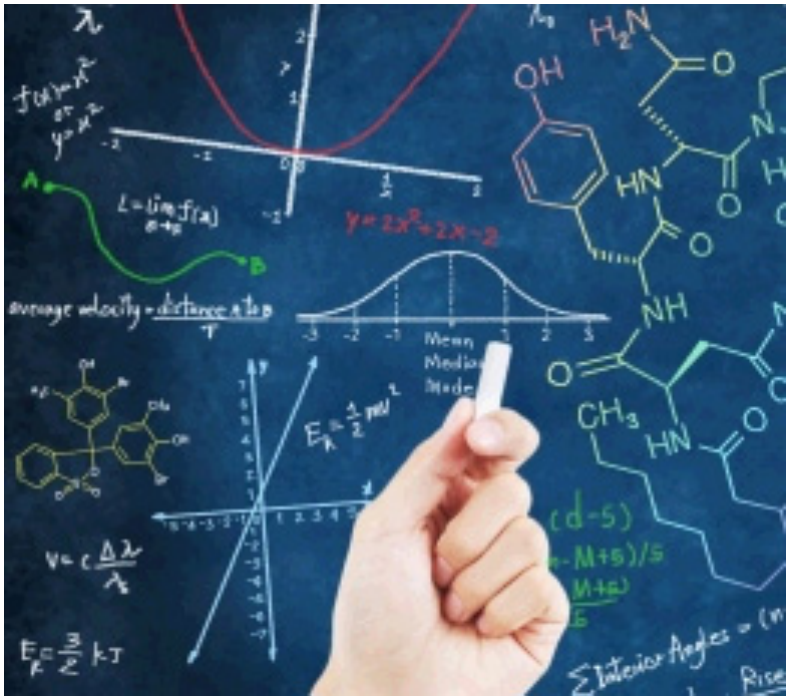
Retrieval (Surface)

Comprehension (Deep 1)

Analysis (Deep 2)

Utilization (Deep 3)

Transfer



Basic Learning Process

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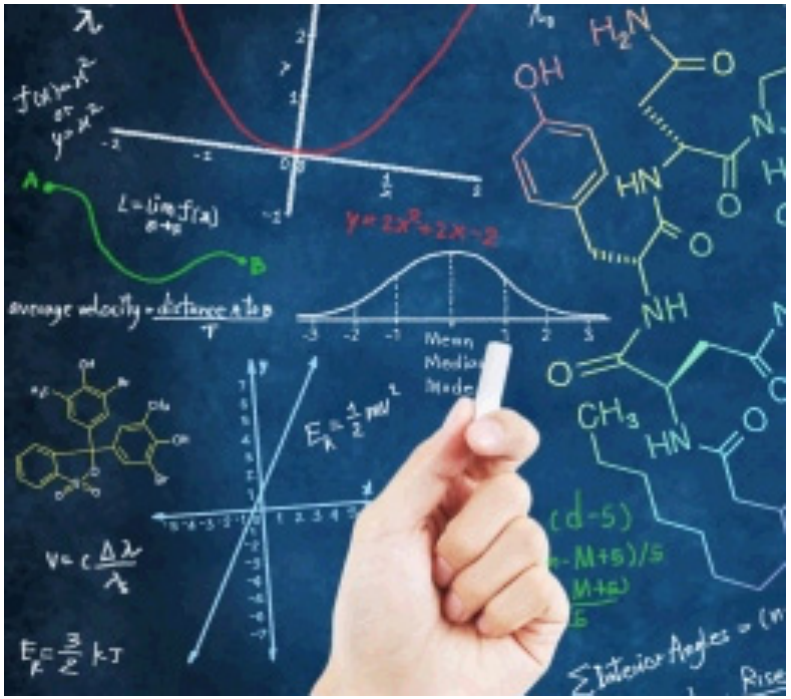

A Quick Passage...

Facts Always Precede Skills

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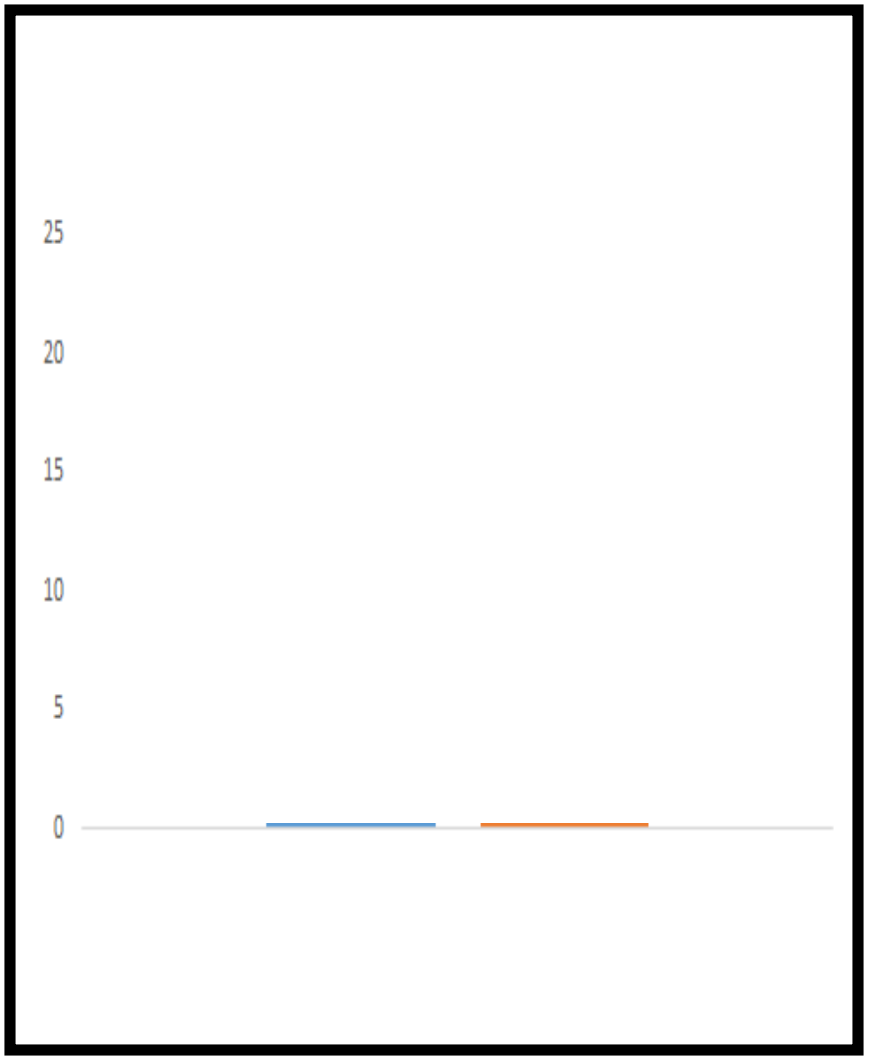

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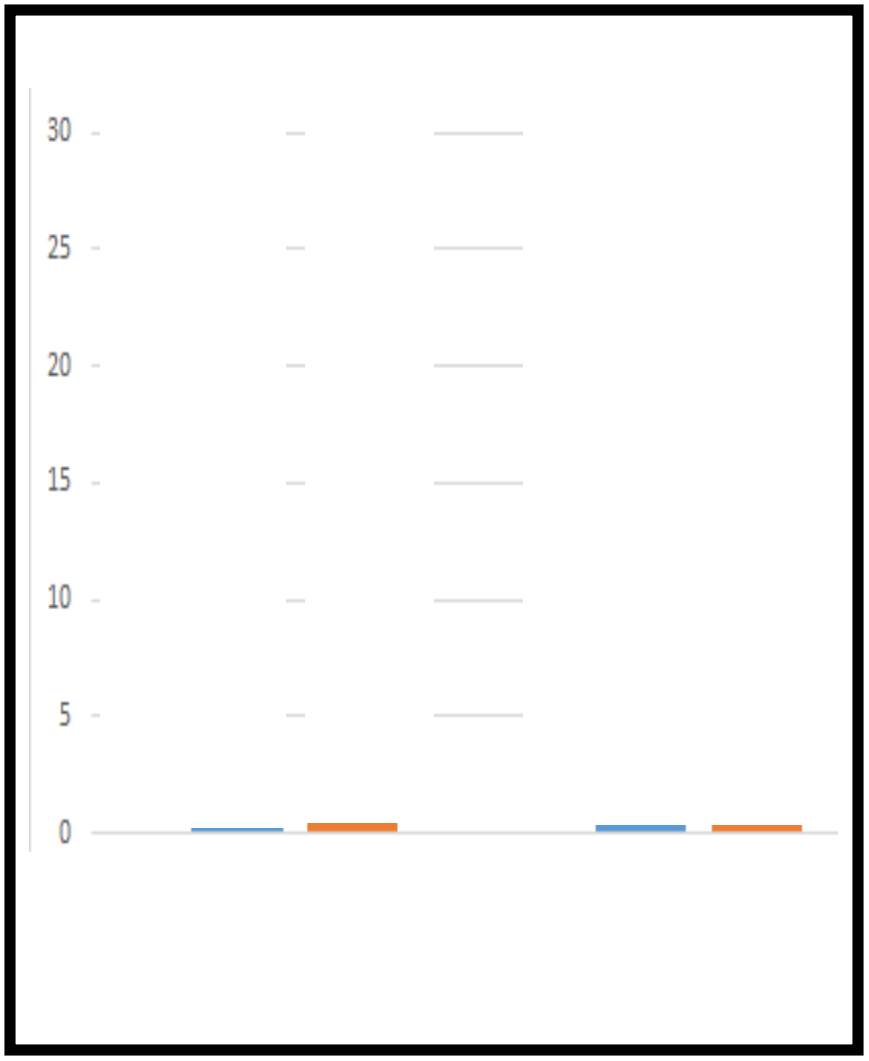
Facts Always Precede Skills



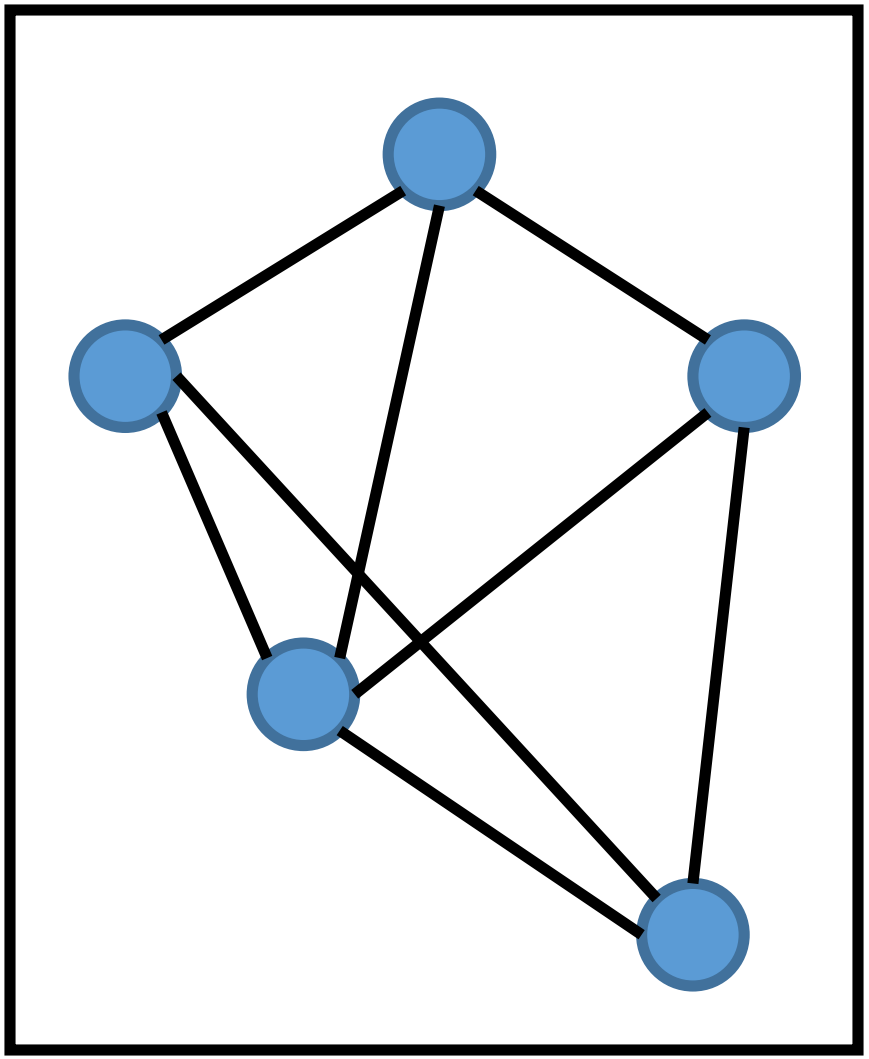
Declarative Memory

Episodic

Semantic

Memory

Exposure & Repetition



A GAME

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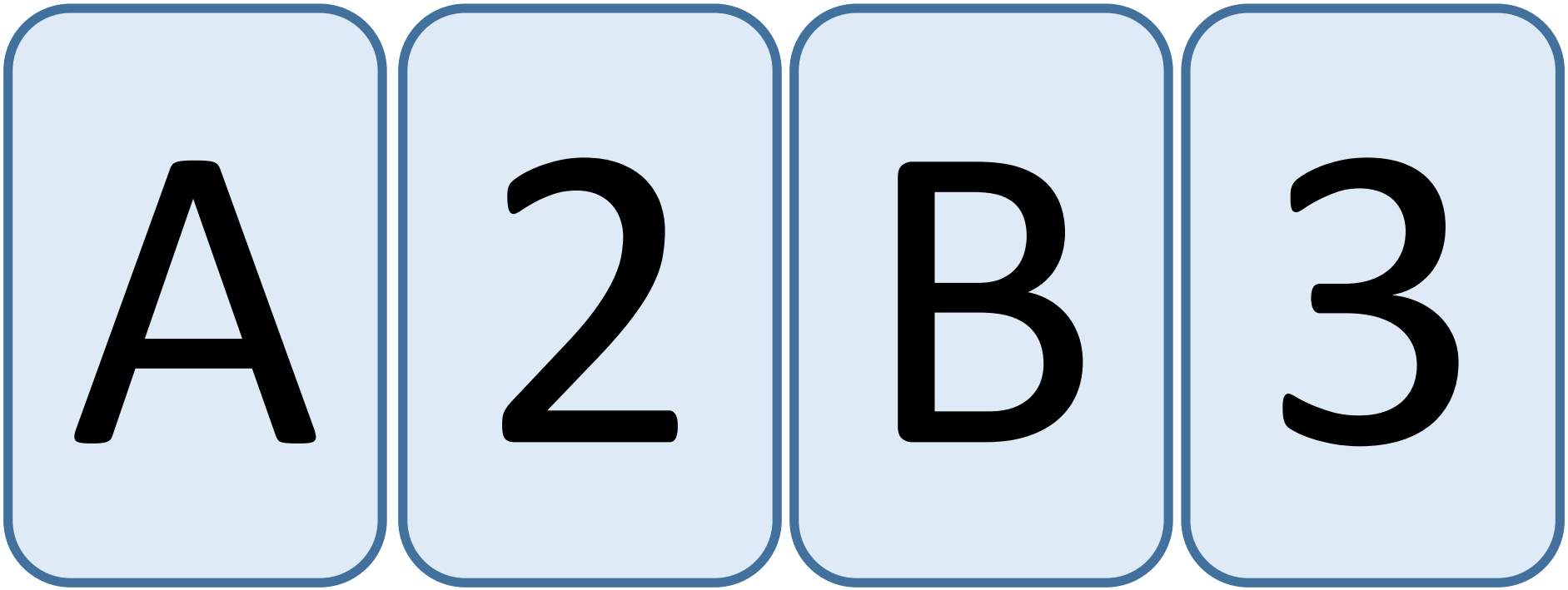

ELIZABETH II
AUSTRALIA 2014

ELIZABETH II
AUSTRALIA 2014

AUSTRALIA 2014
ELIZABETH II

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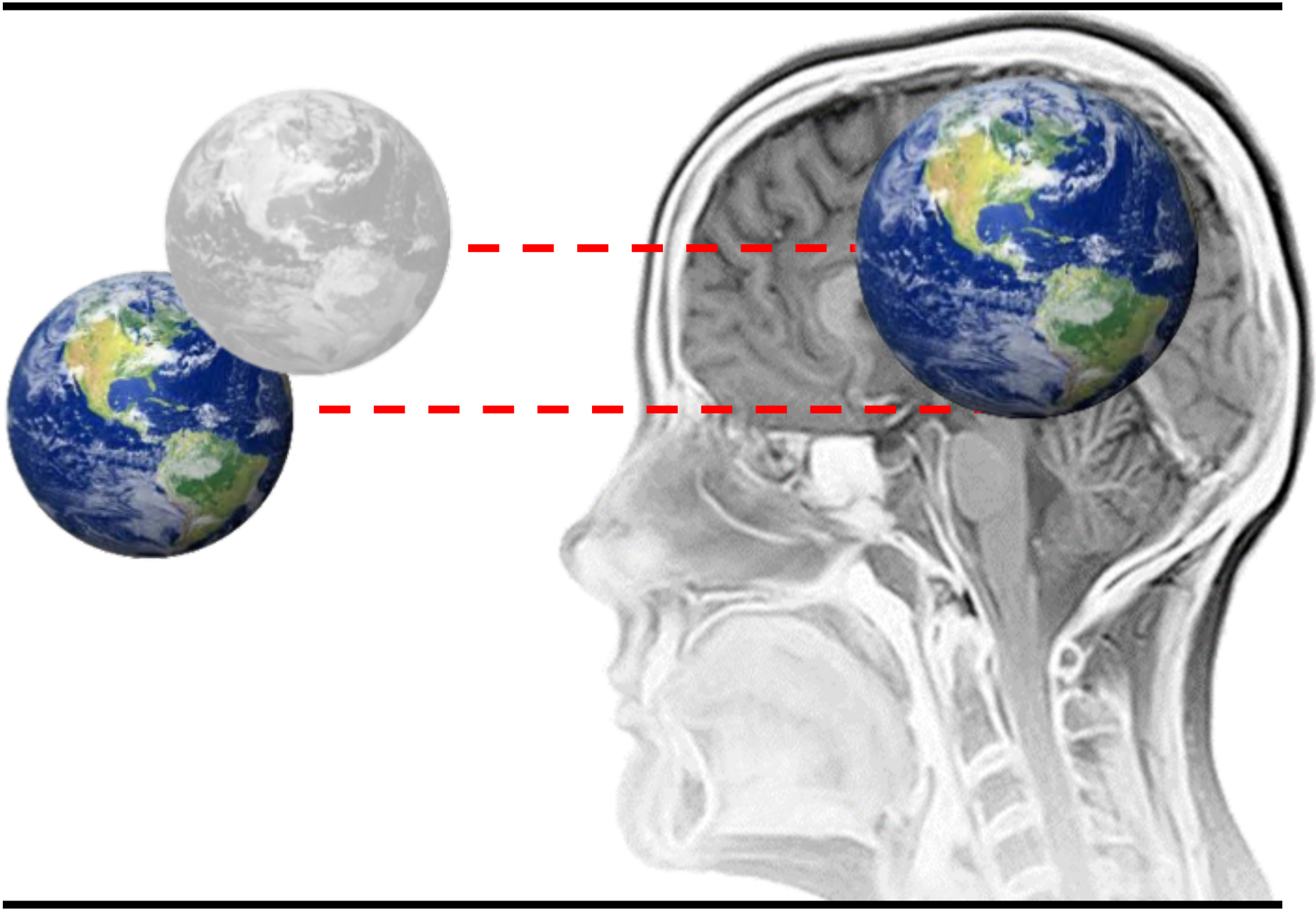
ELIZABETH II
AUSTRALIA
2014

Finish These…



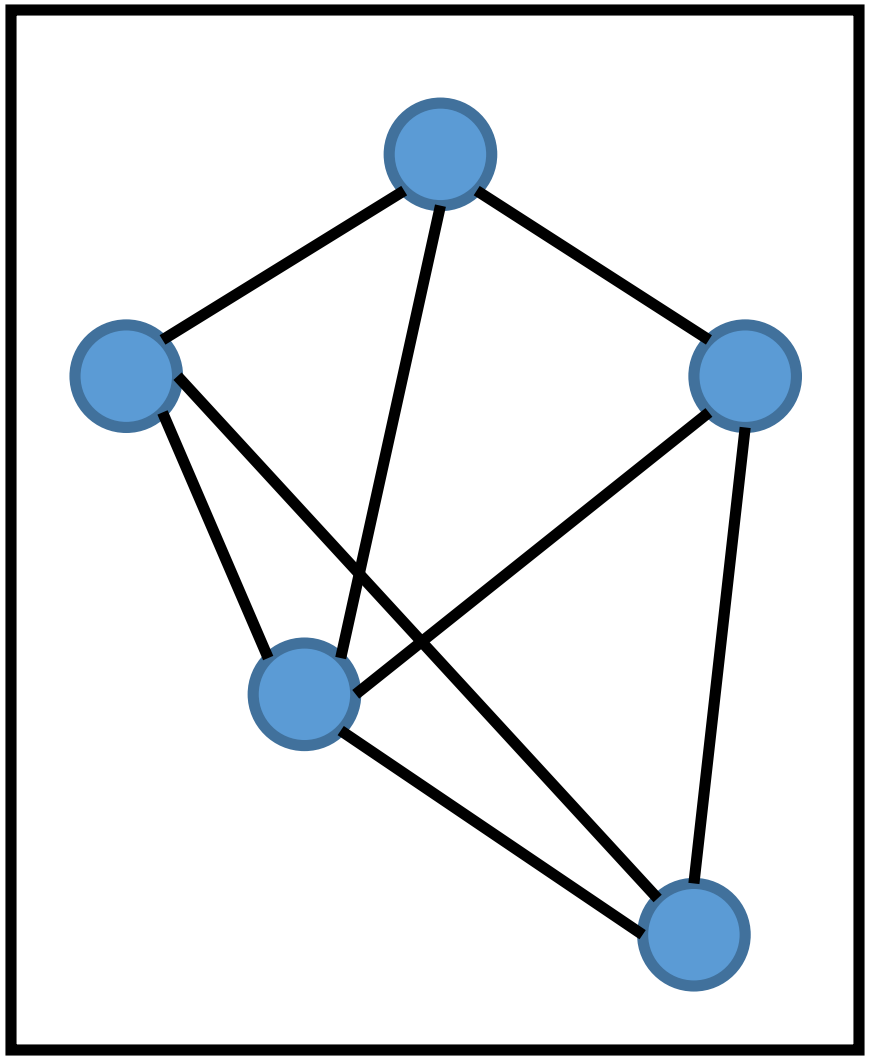
Memory

Exposure & Repetition

ACTIVE

RECALL

PARTICIPATION & THOUGHT



Retrieval (*surface*)

VERBS

Define	Point Out
Arrange	Find
List	Reproduce
Recall	Sort Out
Quote	Tell
Name	Order
Repeat	Memorize
Describe	Recognize

Shallow Learning (Facts)

STRATEGIES / TASKS

Multiple Choice

Free-Recall

Sacavenger Hunt

Illustrations

Analogies

DIRECT INSTRUCTION

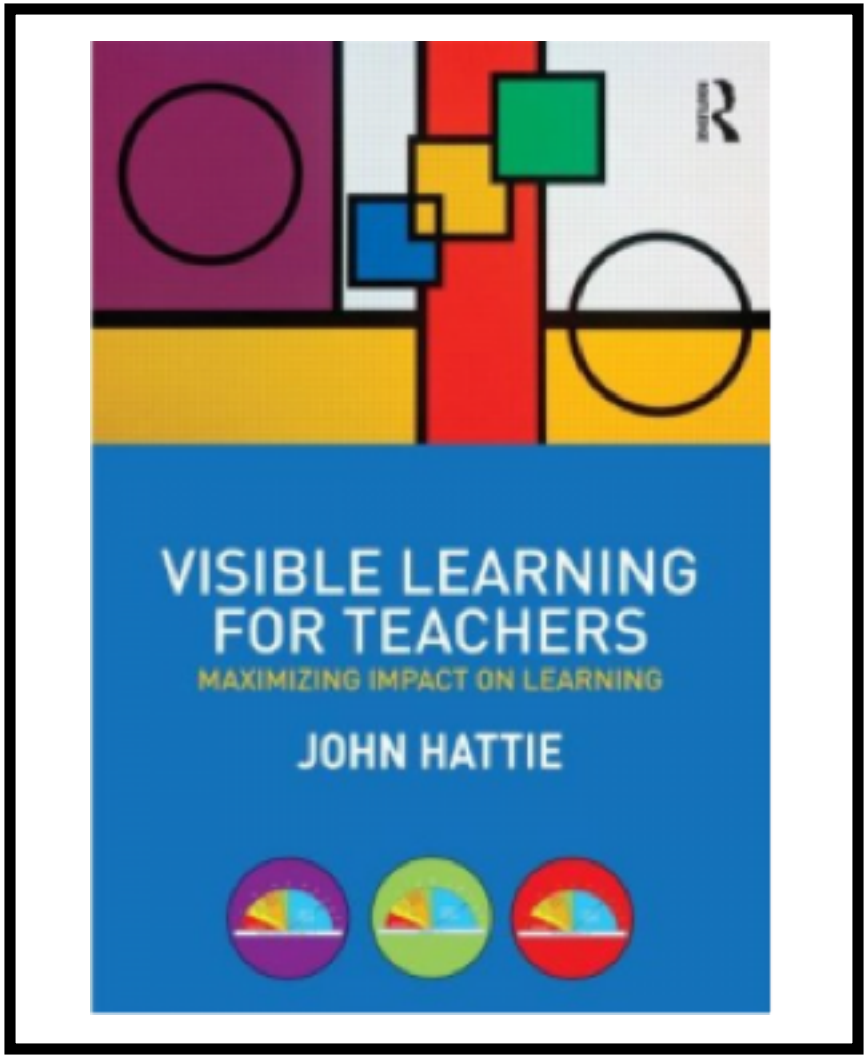
Evidence

Surface Learning = 93%

Direct Instruction

Class Size

Homework



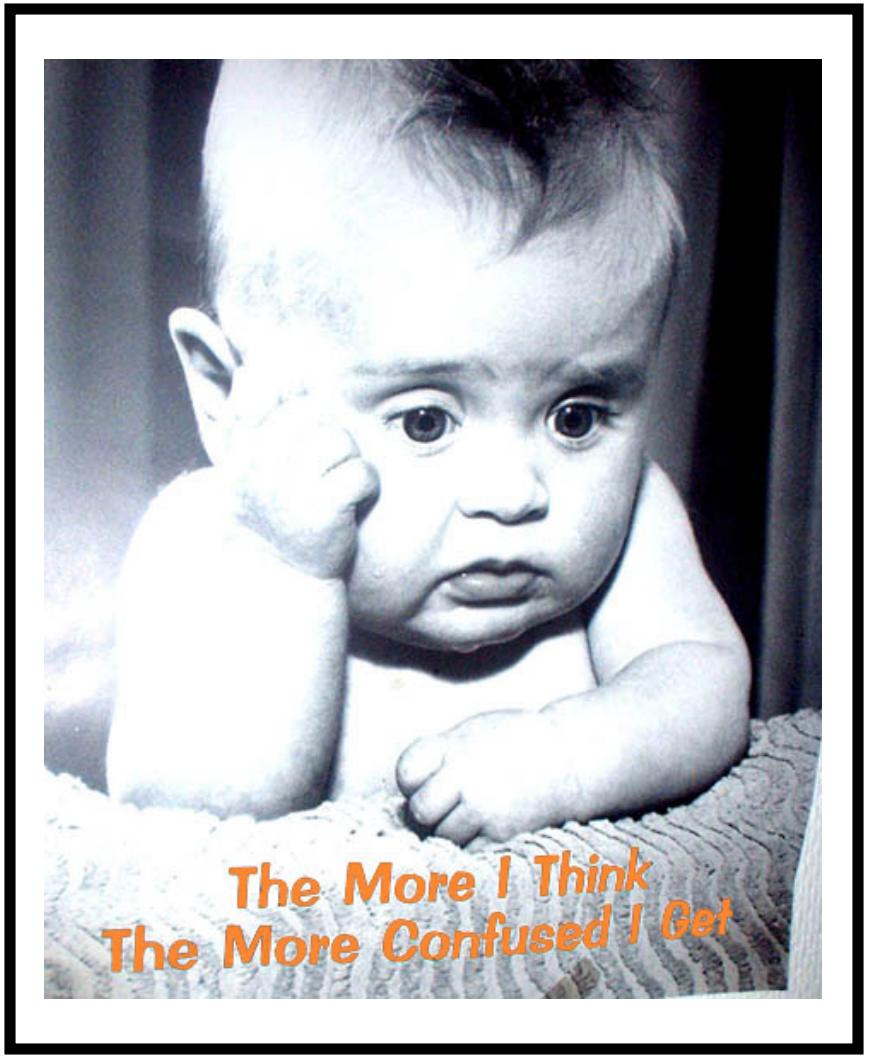
What About…

Problem Based Learning

Inquiry Learning

Immersion Learning

Exploratory Learning



Basic Learning Process

Retrieval (Surface)

Comprehension (Deep 1)

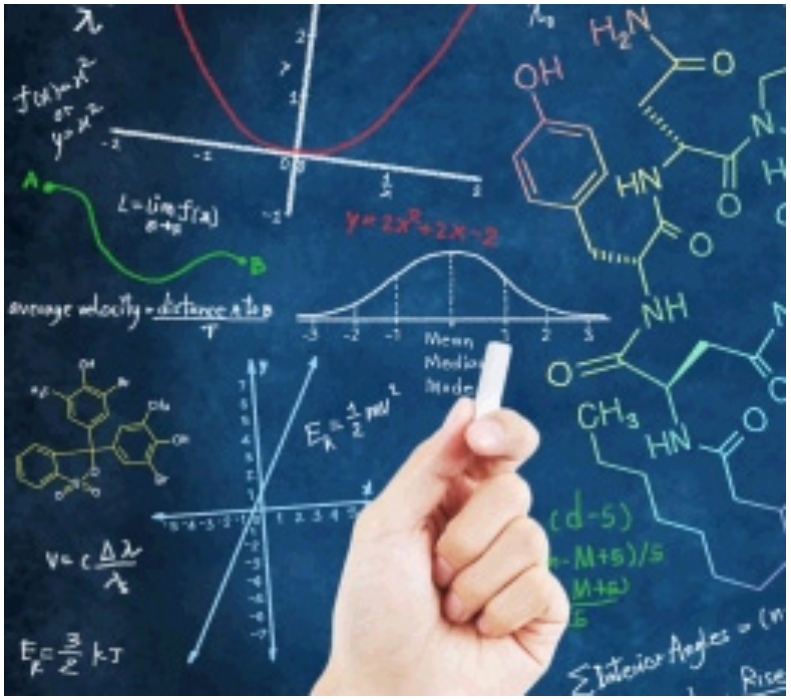
Analysis (Deep 2)

Utilization (Deep 3)

Transfer

THINKING

(hint: no additional facts needed)



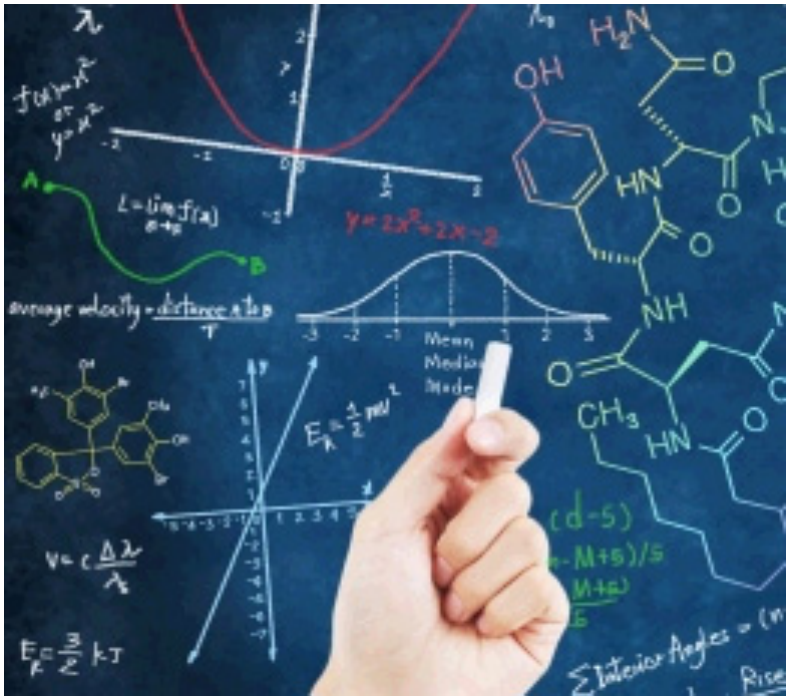
Basic Learning Process

*Surface = **WHAT** you Know*

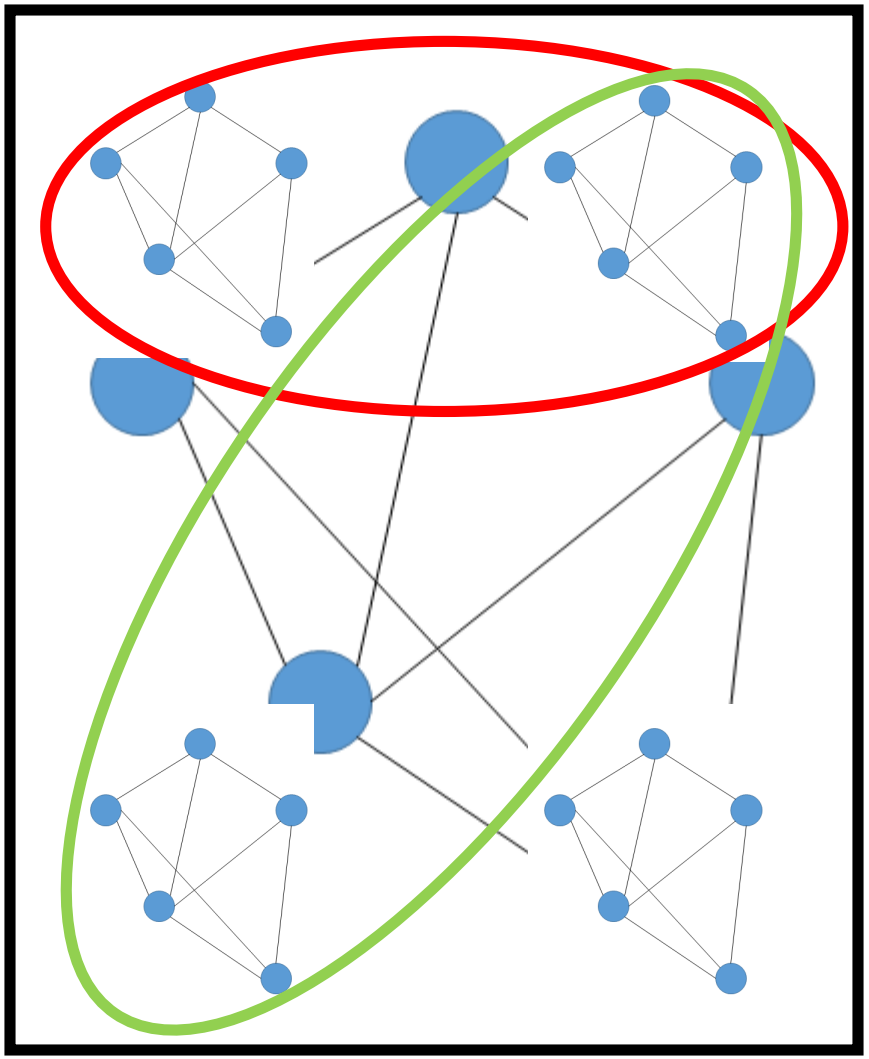
(Facts)

*Deep = **HOW** do you understand it and what are you going to **DO** with it?*

(Concepts)



Concepts



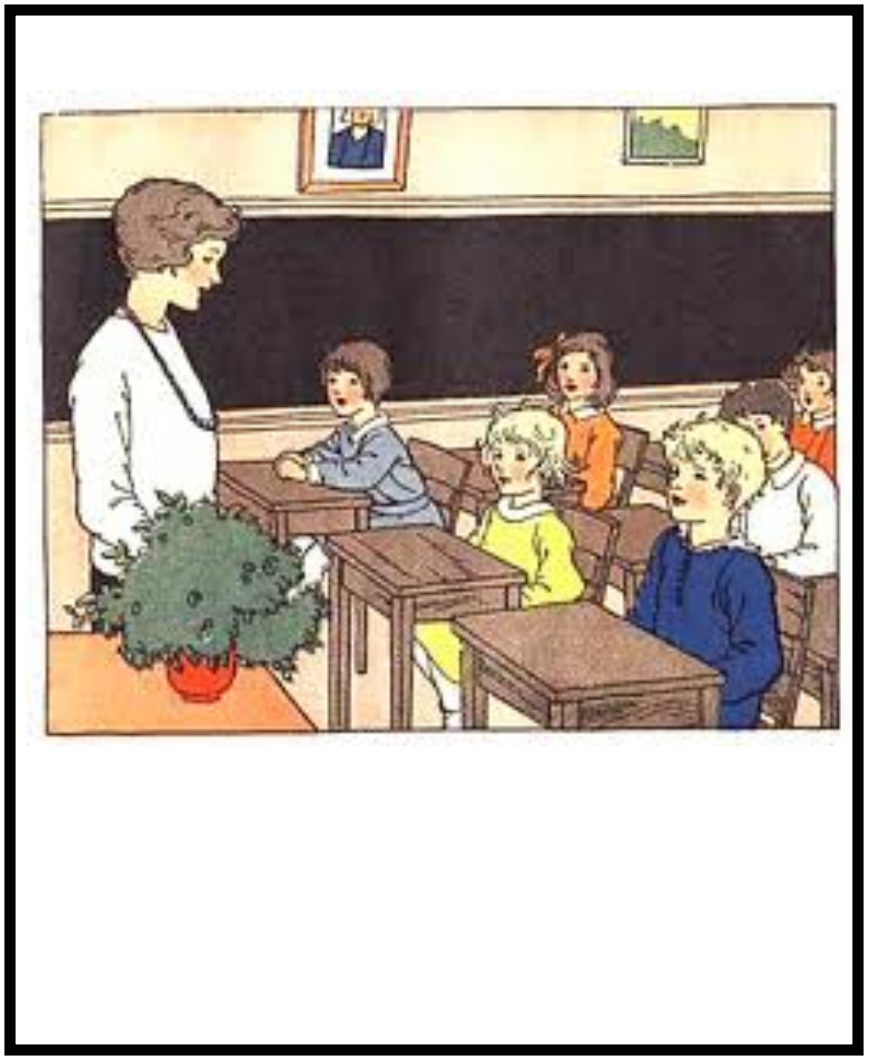
Concepts

Concepts

Concepts

Concepts

Chunking



Level 1

Activate & Associate Knowledge

(Comprehension)

Level 1

Activate & Associate Knowledge

(Comprehension)

Level 1

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(Comprehension)

Level 1

Activate & Associate Knowledge

(Comprehension)

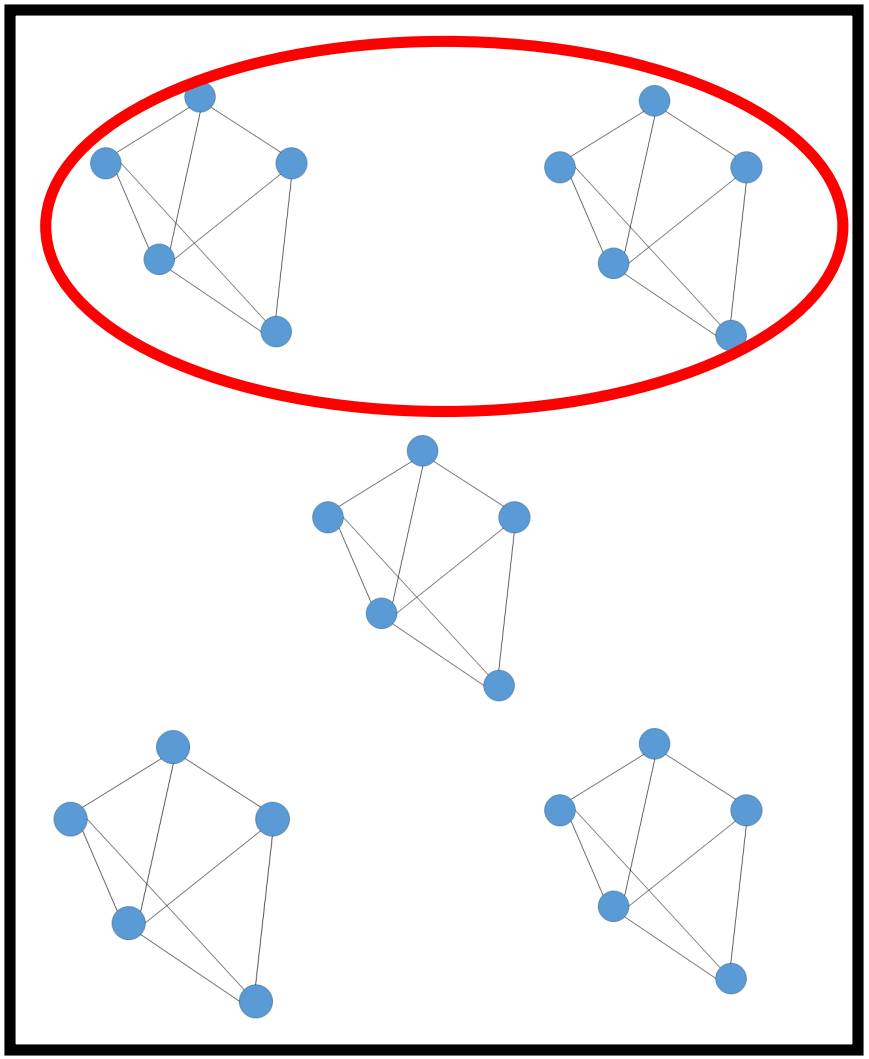
Level 1

Activate & Associate Knowledge

(Comprehension)

SOUP

Concepts



Level 1

Activate & Associate Knowledge

(Comprehension)

Comprehension (*Deep 1*)

VERBS

Paraphrase	Associate
Classify	Restate
Distinguish	Identify
Interpret	Estimate
Examine	Explain
Express	Discuss
Summarize	Indicate

Comprehension (*Deep 1*)

STRATEGIES / TASKS

See – Think – Wonder

Zoom In

Think – Puzzle – Explore

Chalk Talk

321 Bridge

Compass Points

Explanation Game

Map

Diagram

Oral Report

Discussion board

Pre-Quiz

Own Statement

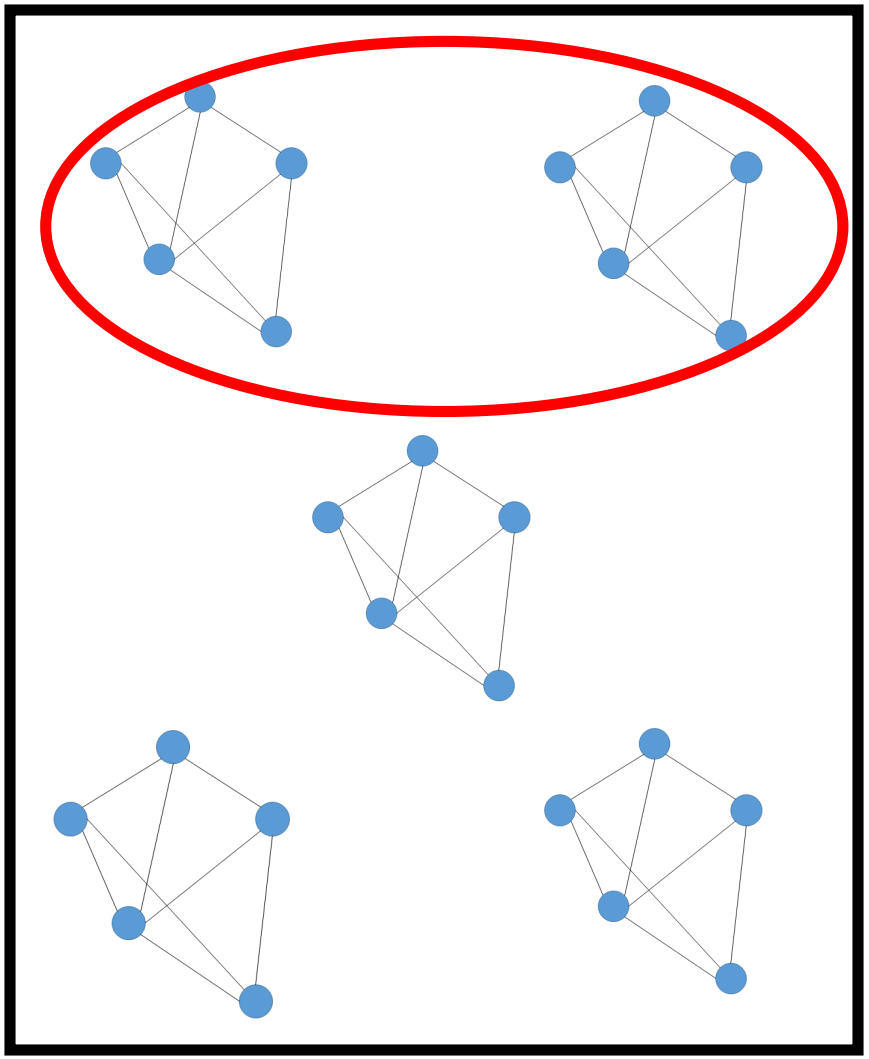
Match

Word Search

Level 2

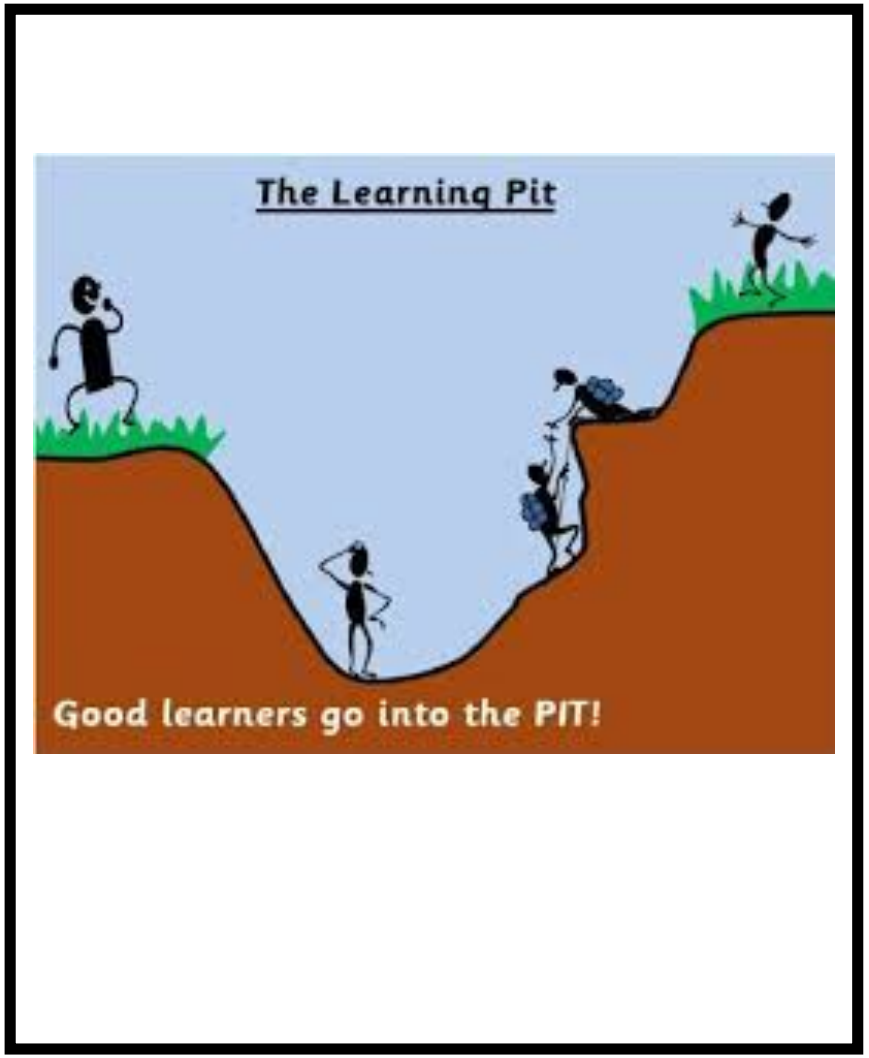
Elaboration & Connection (Analysis)

Concepts



The Learning Pit

Concepts – Not Facts!



Level 2

Elaboration & Connection (Analysis)

Analysis (Concepts 2)

VERBS

Combine

Contrast

Adapt

Modify

Separate

Question

Criticize

Interrogate

Deconstruct

Discriminate

Appraise

Arrange

Categorize

Re-Build

Anaysis (Concepts 2)

STRATEGIES / TASKS

Headlines

CSI

Concept Map

Connect – Extend - Challenge

The 4 C's

Micro-Lab

I Used to Think

Questioning

Problems

Case Studies

Stories

Critical incidents

Discussion

Counter Debate

Propaganda

Peer Teaching

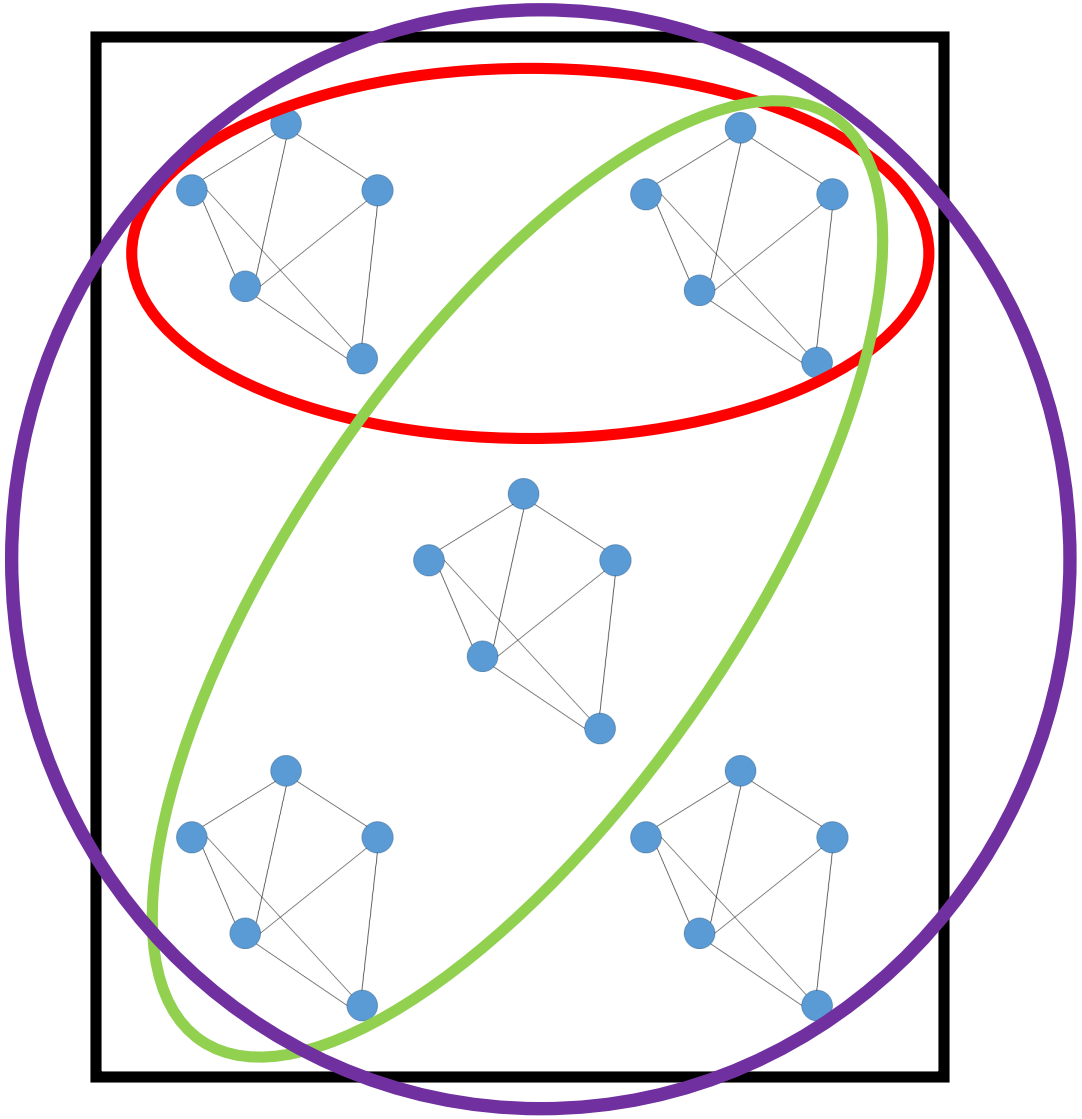
WHAT DID YOU DO AT SCHOOL TODAY?
NOTHING
TRY SHUTTING THEM UP IF THEY'VE HAD THAT EUREKA MOMENT
I WANT MORE CHALLENGE!
LEARNING

Level 3

Context & Personalization

(Utilizaton)

Concepts



Utilization (*Deep 3*)

VERBS

Design	Conclude
Explain	Convince
Hypothesize	Employ
Experiment	Justify
Test	Predict
Defend	Rank
Prove	Rate

Utilization (*Deep 3*)

STRATEGIES / TASKS

What Makes you Say That?

Step Inside

Red Light, Yellow Light

Claim, Support, Question

Tug of War

Word – Phrase - Sentence

Project

Problems

Experiments

Creative Expression

Intervention

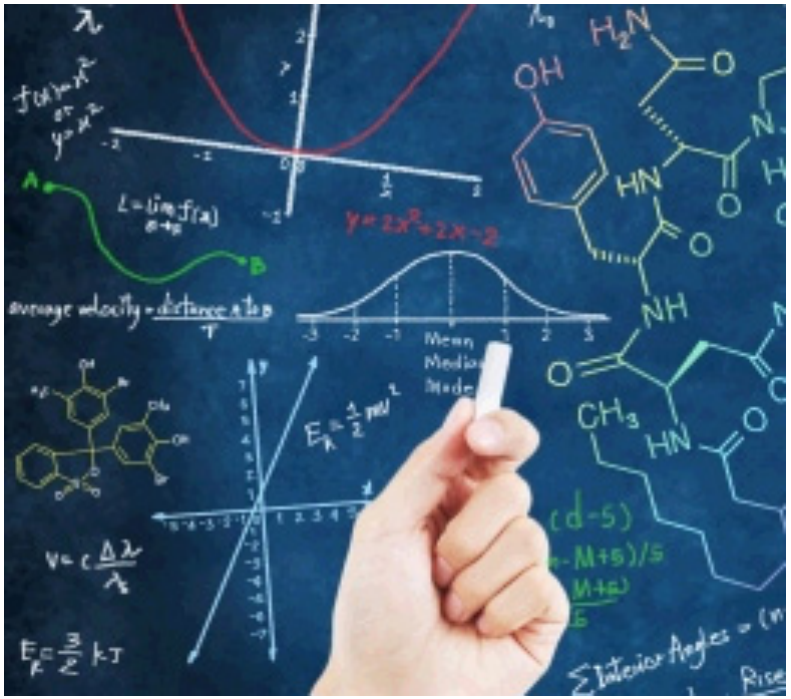
Articles

Invent

Basic Learning Process

Surface = Facts

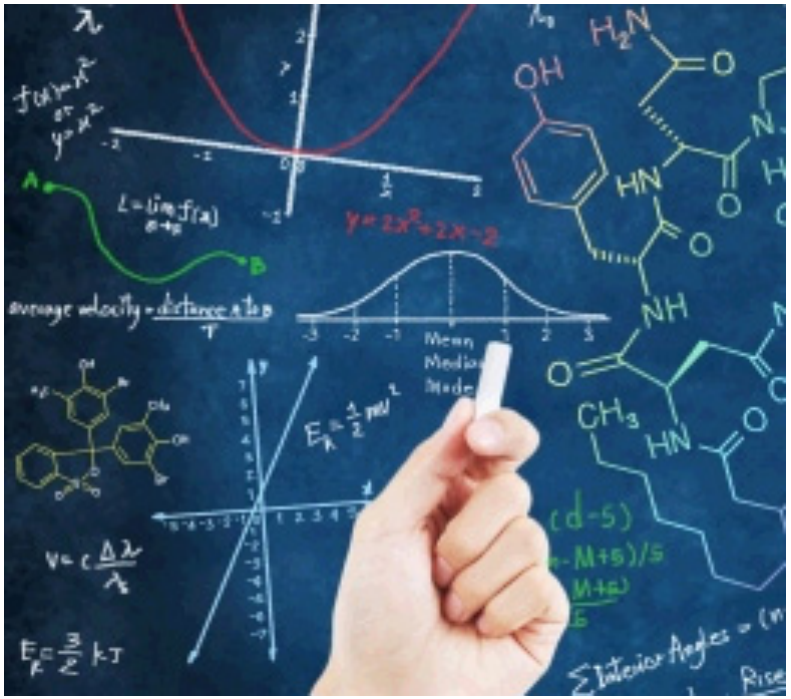
(Answers – Clear Y/N)



Basic Learning Process

Deep = Concepts

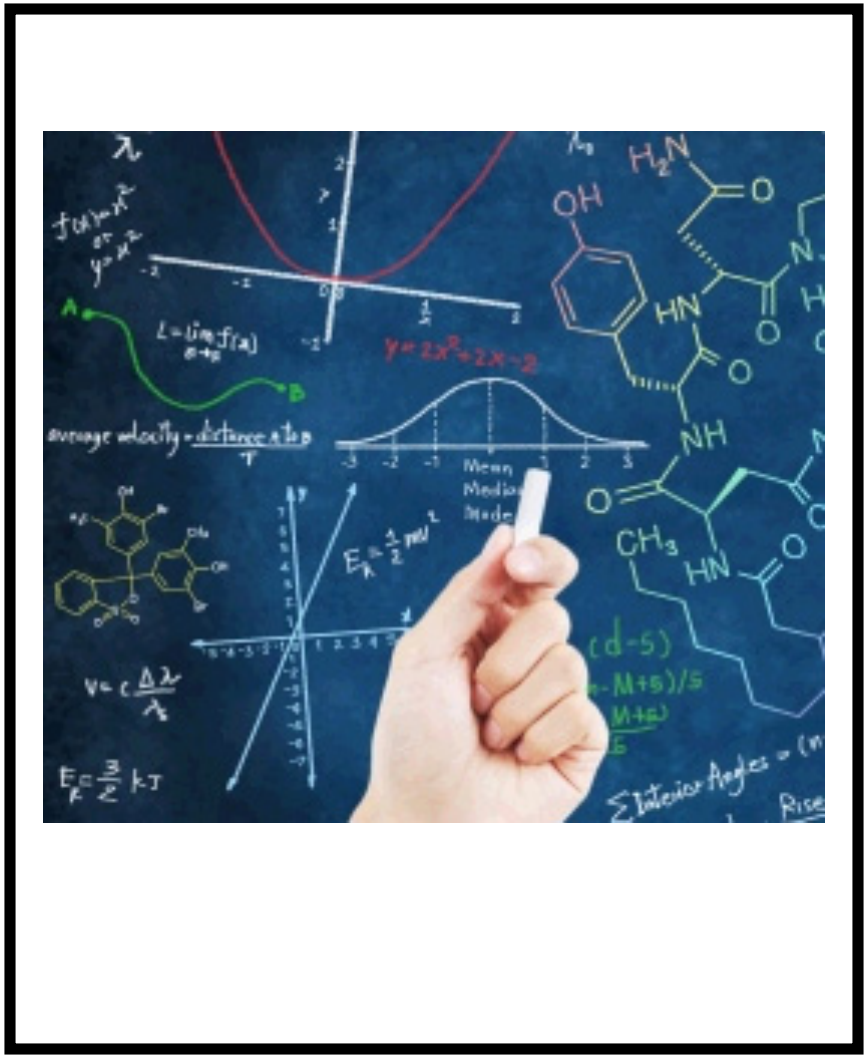
(Answer-less – Unclear Y/N)



Basic Learning Process

Deep = Concepts

(NO ADDITIONAL FACTS NEEDED)



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Retrieval (Surface)

Comprehension (Deep 1)

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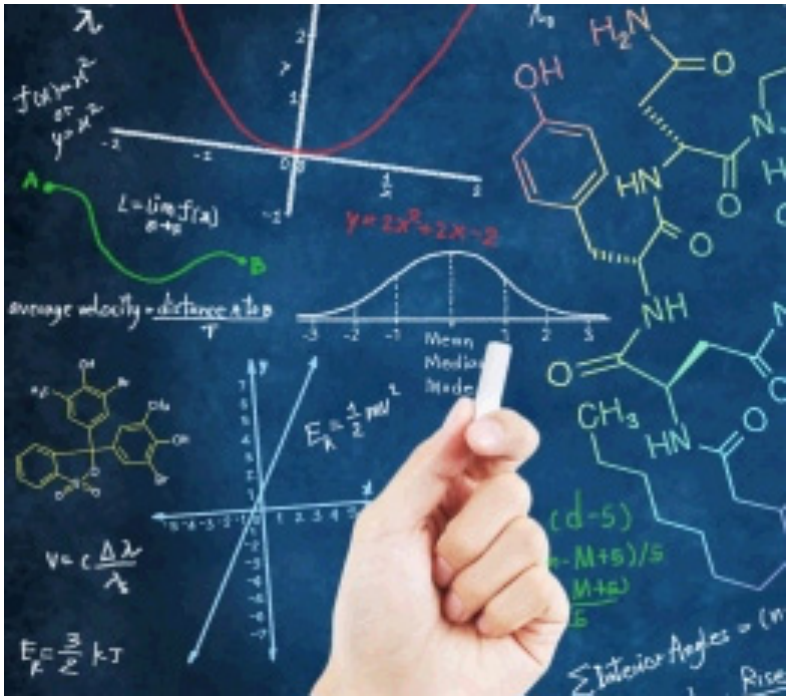
Utilization (Deep 3)

Transfer



Near Transfer

Far Transfer

Secret…

3 Transfer Lessons

Little Albert

Little Albert

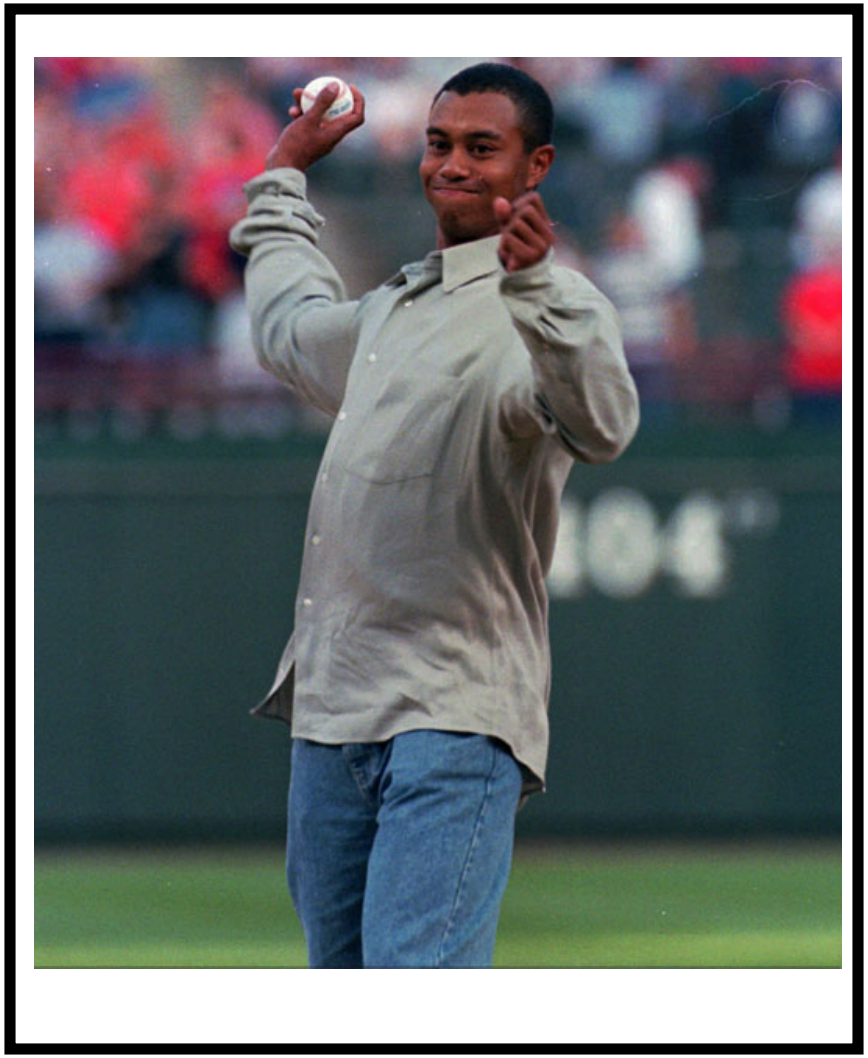
Little Albert

Little Albert

Bottom Up Practice

Bottom Up Practice

Near Transfer



Top Down Learning

Top Down Learning

Far Transfer

3 Transfer Lessons

1) *Transfer narrows with competence.*

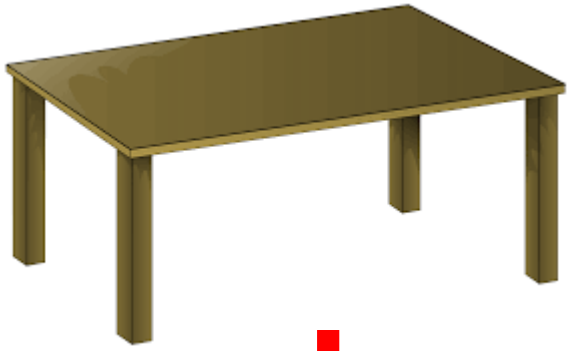
Two Questions

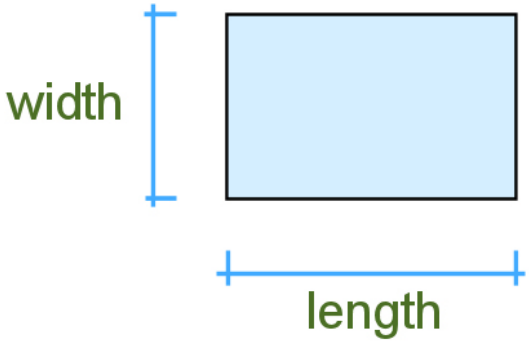
Two Questions

Surface Structure

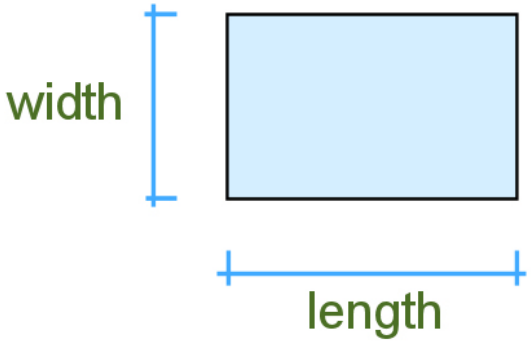
Vs

Deep Structure





Area = length x width



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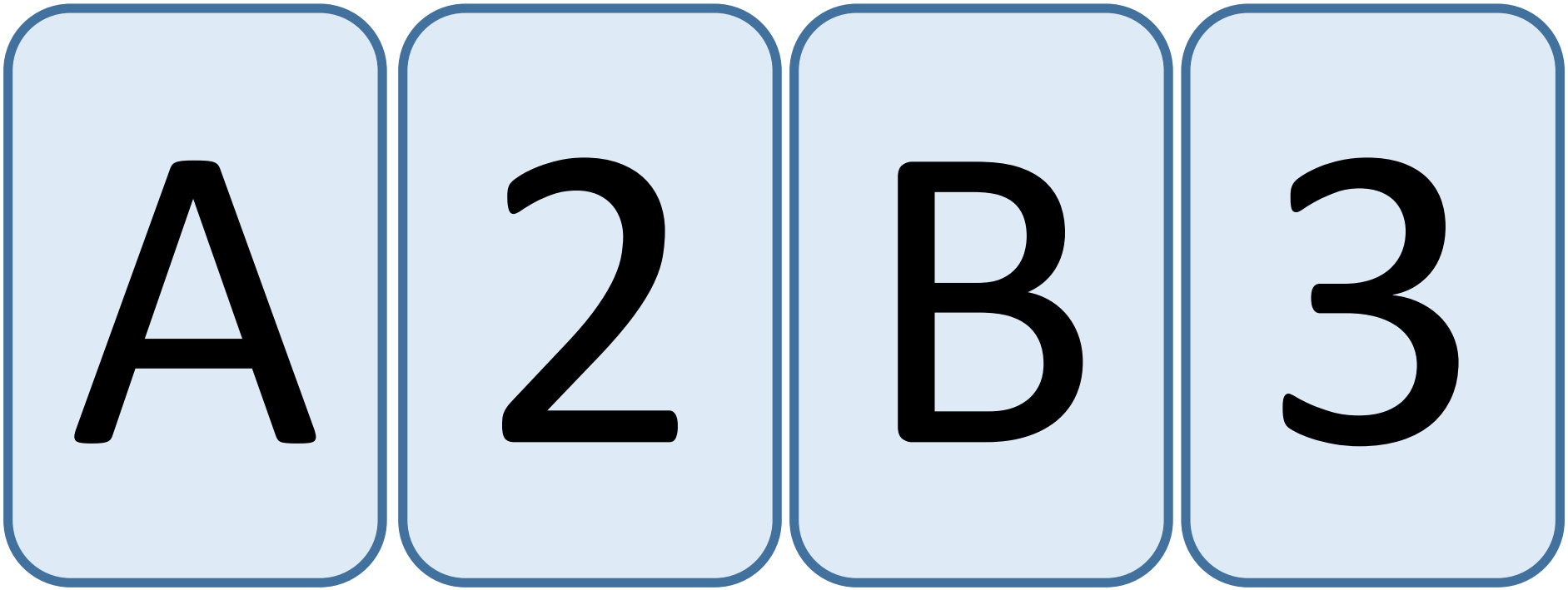
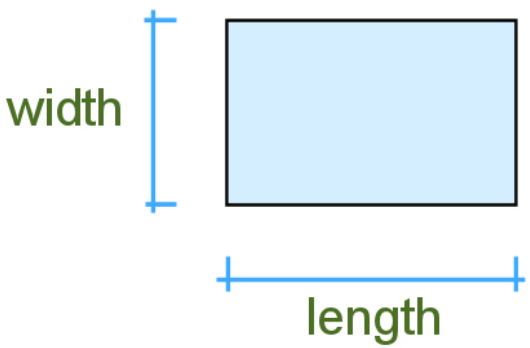
A GAME





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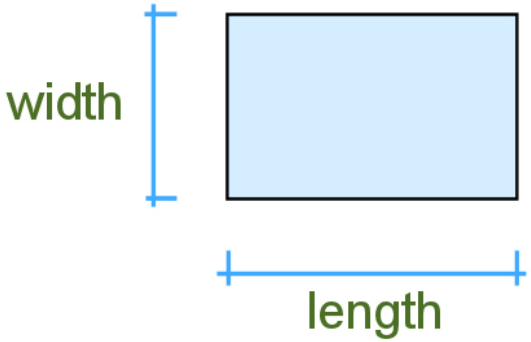

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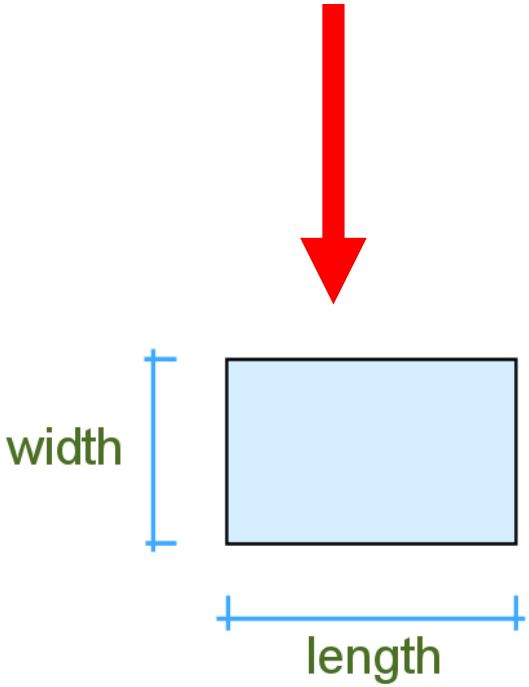
3 Transfer Lessons

1) *Transfer narrows with competence.*

2) *Deep structure transfer requires surface knowledge of BOTH domains.*



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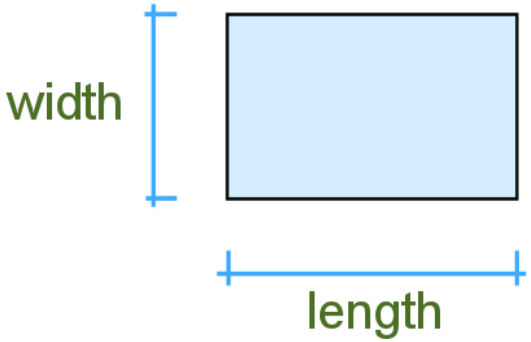


Area = length x width

3 Transfer Lessons

1) *Transfer narrows with competence.*

2) *Deep structure transfer requires deep knowledge of BOTH domains.*

3) *Shallow structures can confuse deep structures.*

2 Secrets

EXPLICIT

&

PRACTICED

Transfer

VERBS

Apply

Derive

Generalize

Utilize

Select

Extend

Predict

Evaluate

Create

Build

Predict

Discover

Implement

Operate

Transfer

STRATEGIES / TASKS

Explicit Comparison

Contrast

Embrace Error / Failure

Forecast

Project

Simulations

Outreach

But First…

VERB

PURPOSE

One Last Thing…

Retrieval (Shallow)

Comprehension (Deep 1)

Analysis (Deep 2)

Utilization (Deep 3)

Transfer

*Orally **describe** the steps involved in the scientific method…*

*to demonstrate recall of relevant facts (**shallow**)*

One Last Thing…

Retrieval (Shallow)

Comprehension (Deep 1)

Analysis (Deep 2)

Utilization (Deep 3)

Transfer

*Orally **describe** the steps involved in the scientific method…*

*to convince another of your understanding (**utilization**)*

One Last Thing…

Retrieval (Shallow)

Comprehension (Deep 1)

Analysis (Deep 2)

Utilization (Deep 3)

Transfer

*Orally **describe** the steps involved in the scientific method…*

*to recognize any commonalities or patterns (**comprehension**)*

But First…

What's the objective?

(VERB + LEVEL)

But First…

Retrieval (Shallow)

Comprehension (Deep 1)

Analysis (Deep 2)

Utilization (Deep 3)

Remember…

Task

Using the same objective,
develop a totally different task!

Meta…

Analyze MY Task!

(What was my learning objective: verb + level?)

IDENTIFY (facts)

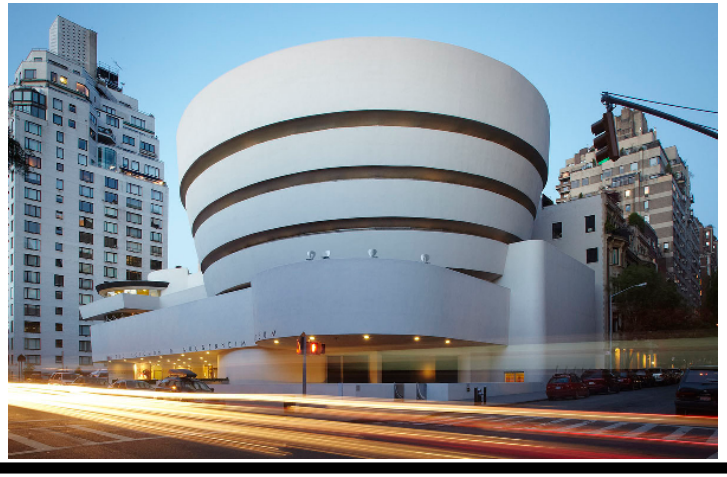
ANALOGY (deep 1)

Meta…

Did anyone notice…

So Now Then

Form Follows Function

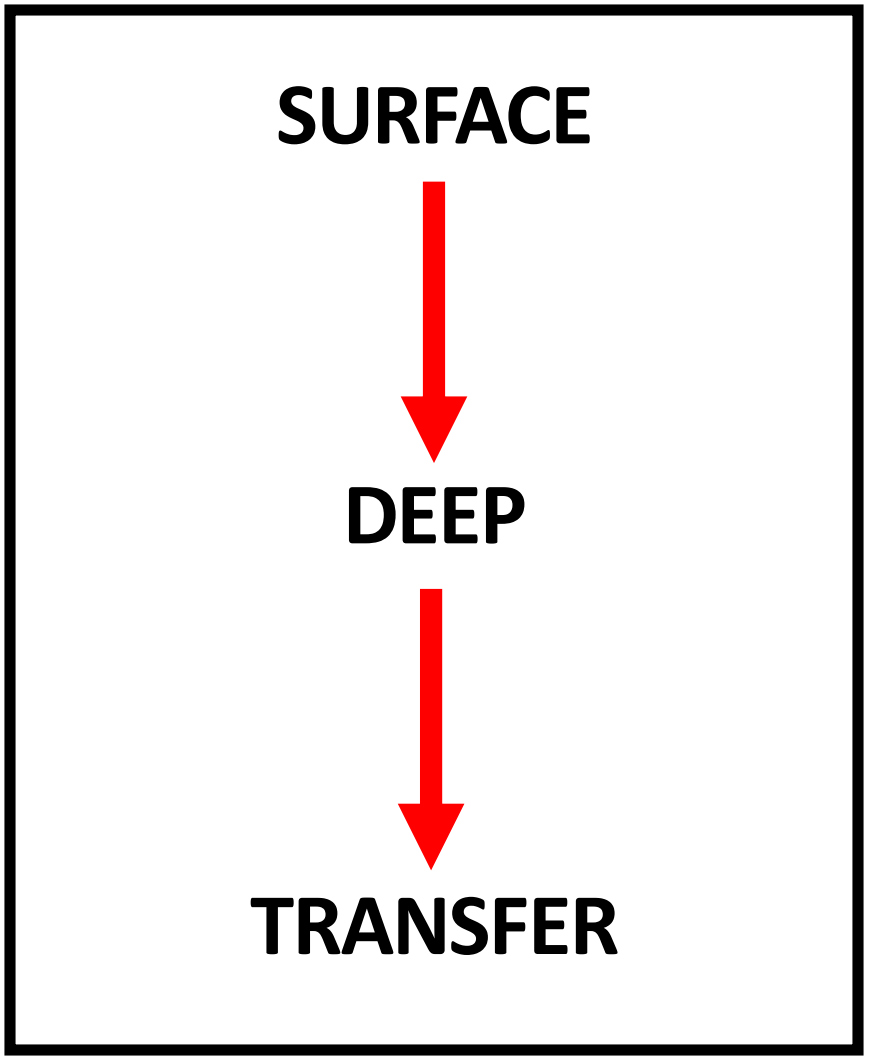


Learning Objectives

VERB

PURPOSE

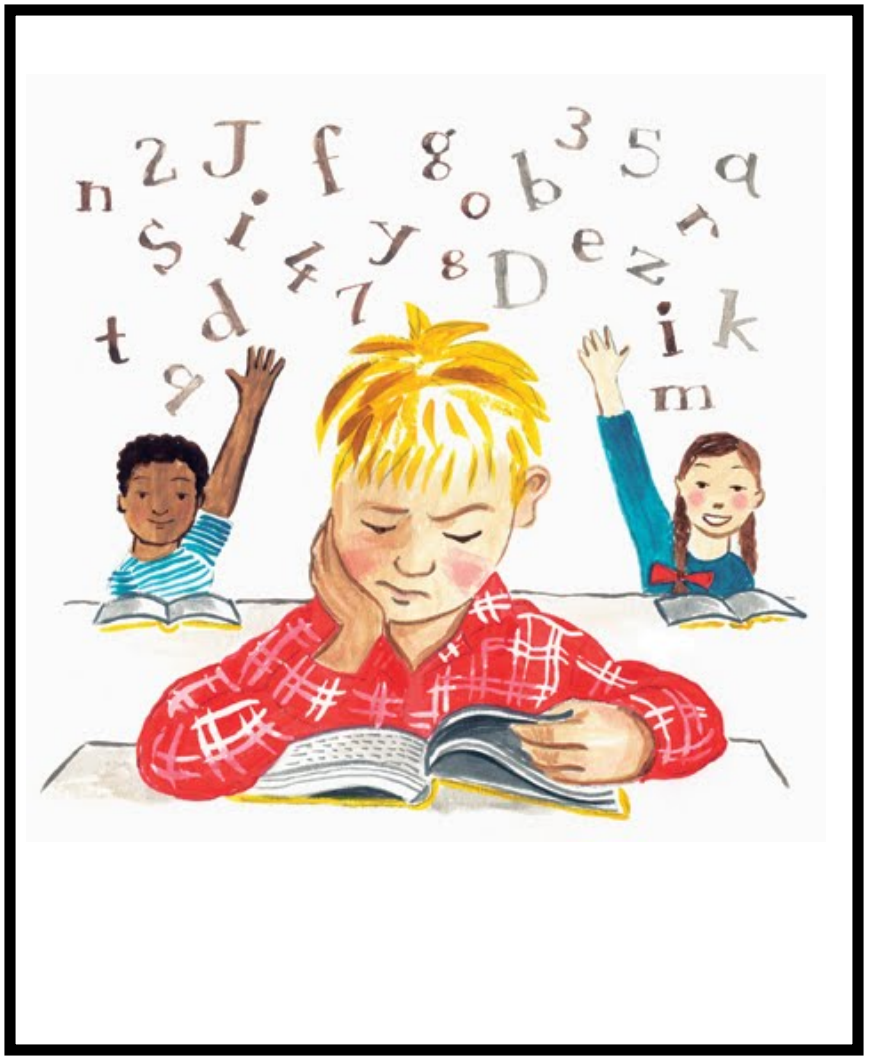
The Learning Trajectory



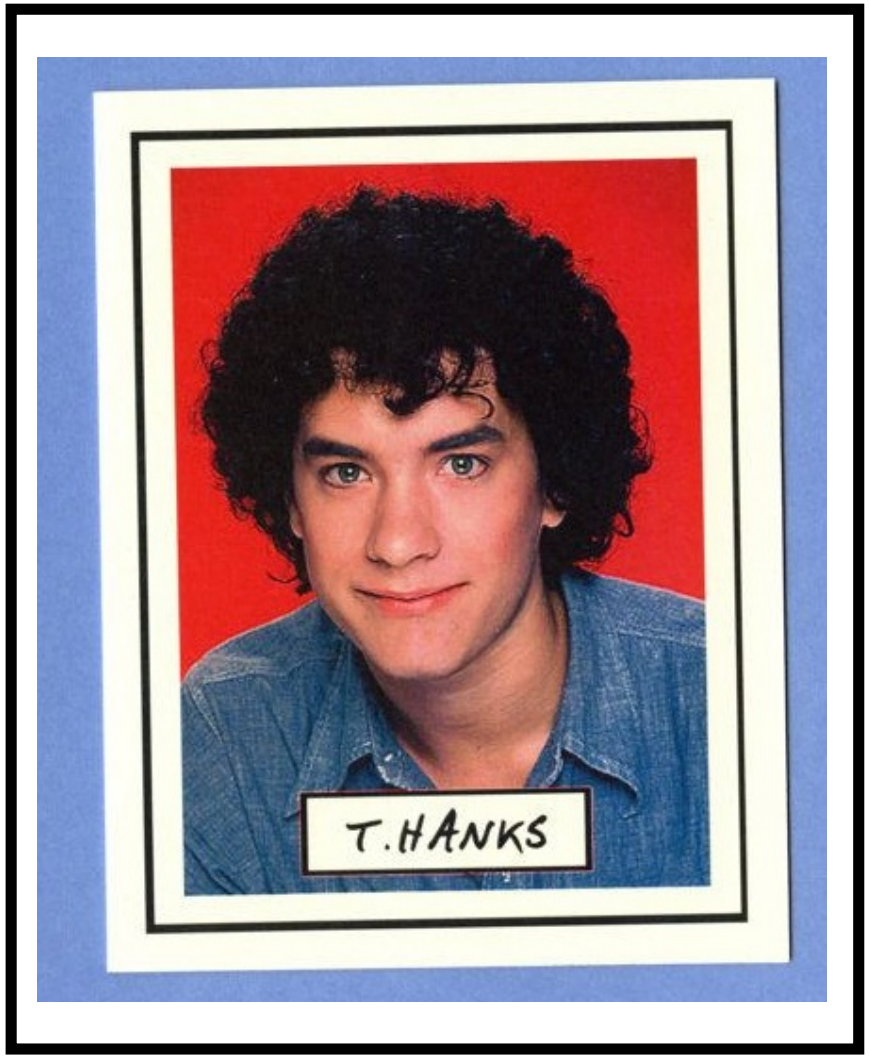
Remember…

You are an Expert!

DIFFERENTIATION!?



T. Hanks

Jared.Cooney.Horvath@gmail.com

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