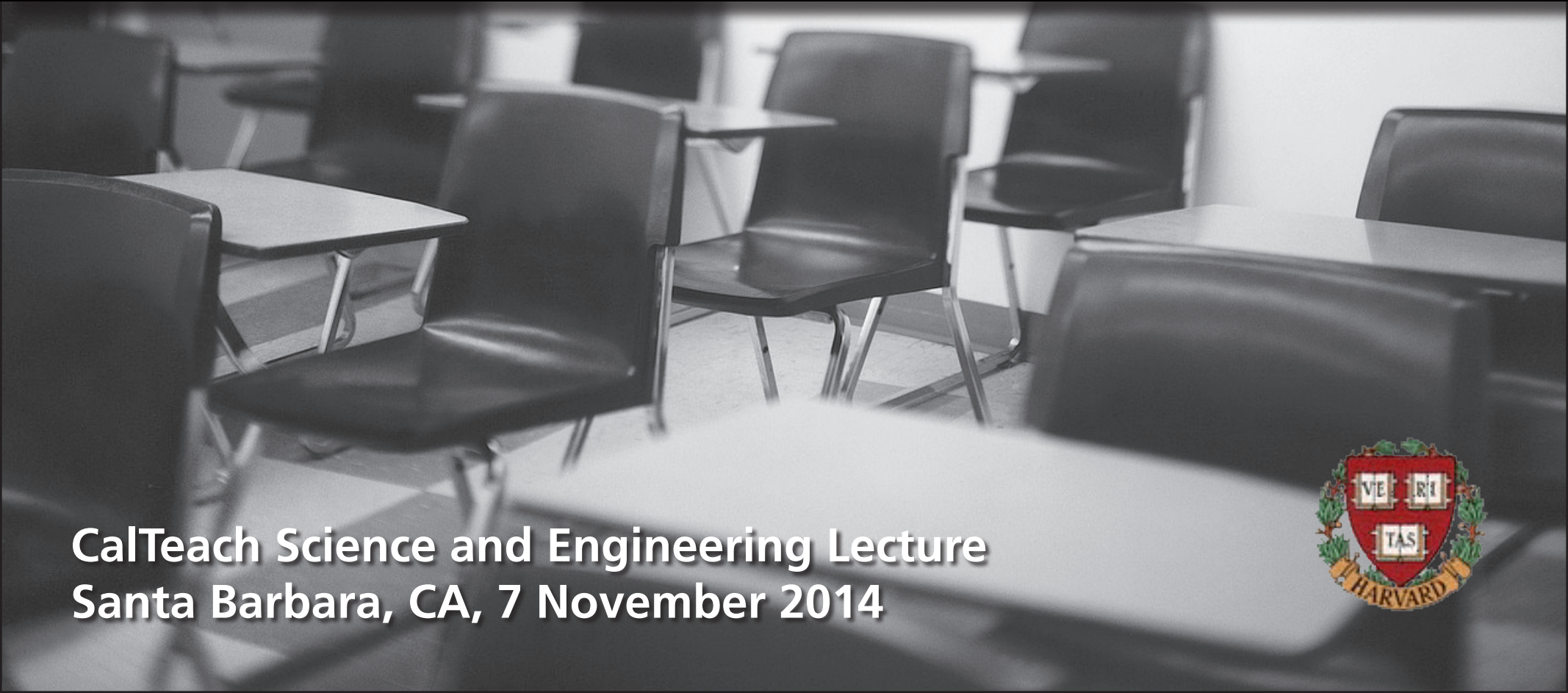


Assessment: The silent killer of learning



CalTeach Science and Engineering Lecture
Santa Barbara, CA, 7 November 2014



Assessment: The silent killer of learning



@eric_mazur

CalTeach Science and Engineering Lecture
Santa Barbara, CA, 7 November 2014



kosten

1. die Kosten (*pl.*)
2. kostbar

455

krank

1. die Krankheit, —, —en

COW

377

magnificent
glor

1. magnificent
2. master

430

das Kind, —(e)s, —er

1. kindisch
2. kindlich

der Kellner, —s, —

1. der Keller, —s, —

kennen

kannte-gekantt *irreg.*

1. kennen-lernen
2. erkennen
3. bekant
4. d

428

think



kosten

1. die Kosten

2. 1.

accel.

poco rit.

think

428

kennen

kannte-gekant

1. kennen-lernen

2. erkennen

3. bekant

4. d

51

**35 % retained
after 1 week**

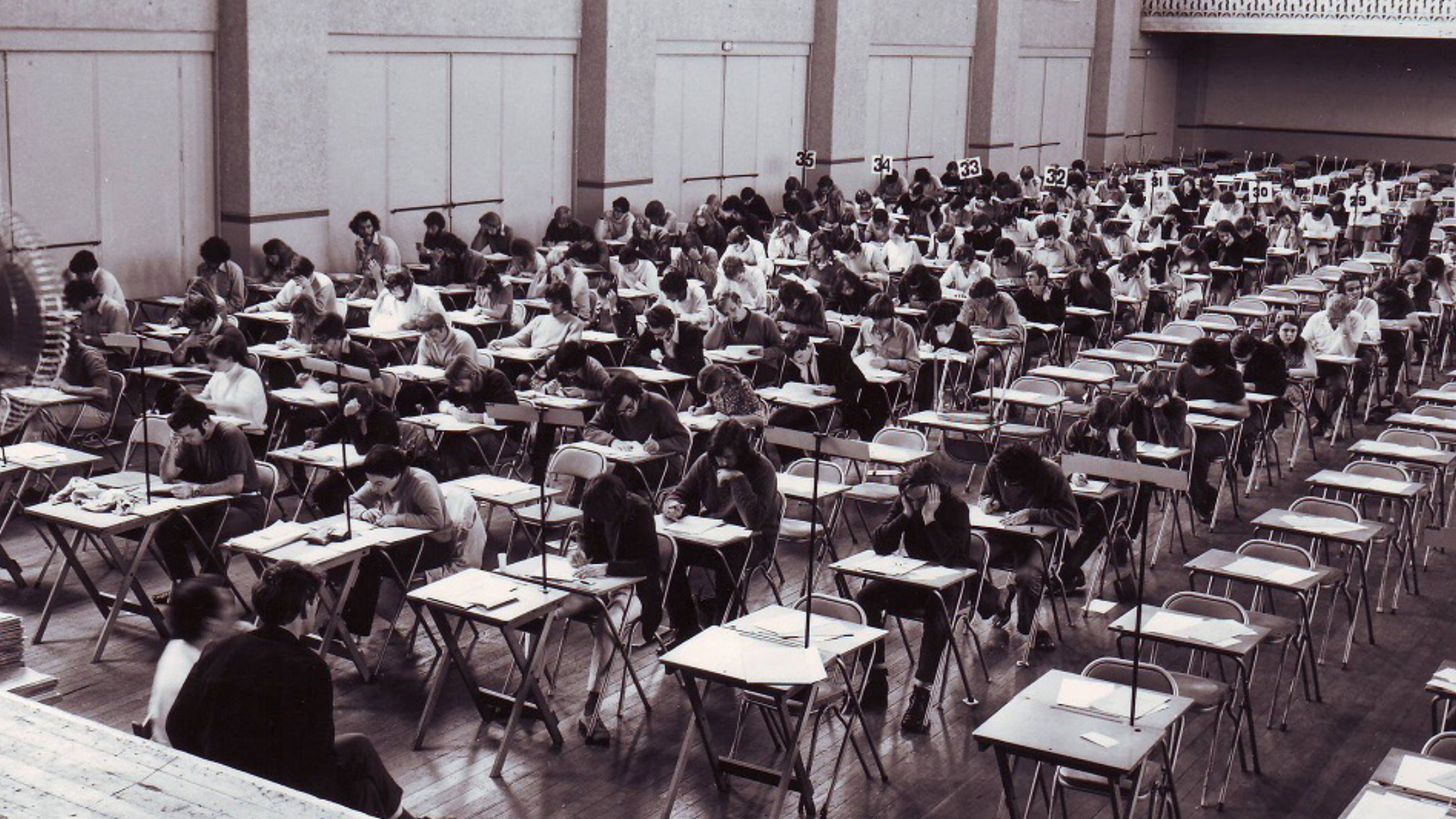
**we only guarantee
they'll pass the test**











A large, dimly lit classroom filled with students sitting at desks, appearing to be in a test or lecture setting. The students are mostly seen from behind, looking towards the front of the room. The desks are arranged in rows, and the overall atmosphere is one of a formal, high-stakes environment.

**assessment focussed on ranking and classifying,
not on developing 21st century skills**



1 purposes



1 purposes

2 problems



1 purposes

2 problems

3 improvements



**how many different purposes
of assessment can you think of?**

1 purposes

- 1. rate students**
- 2. rate professor and course**
- 3. motivate students to keep up with work**
- 4. provide feedback on learning to students**
- 5. provide feedback to instructor**
- 6. provide instructional accountability**
- 7. improve teaching and learning**



1 purposes



1 purposes

2 problems



inauthentic tests

1 purposes

2 problems

what is the meaning/definition of...?

1 purposes

2 problems



inauthentic problem solving

1 purposes

2 problems

problem

1 purposes

2 problems

problem

outcome

EDUCACION

1 purposes

2 problems

problem

outcome

KNOWN

1 purposes

2 problems

problem

solution

outcome

KNOWN

1 purposes

2 problems

problem

solution

outcome

UNKNOWNN

KNOWNN

1 purposes

2 problems

problem

solution

outcome

UNKNOWNN
KNOWNN

problem

1 purposes

2 problems

problem

solution

outcome

UNKNOWN

KNOWN

problem

procedure

KNOWN

1 purposes

2 problems

problem

solution

outcome

UNKNOWN

KNOWN

problem

procedure

answer

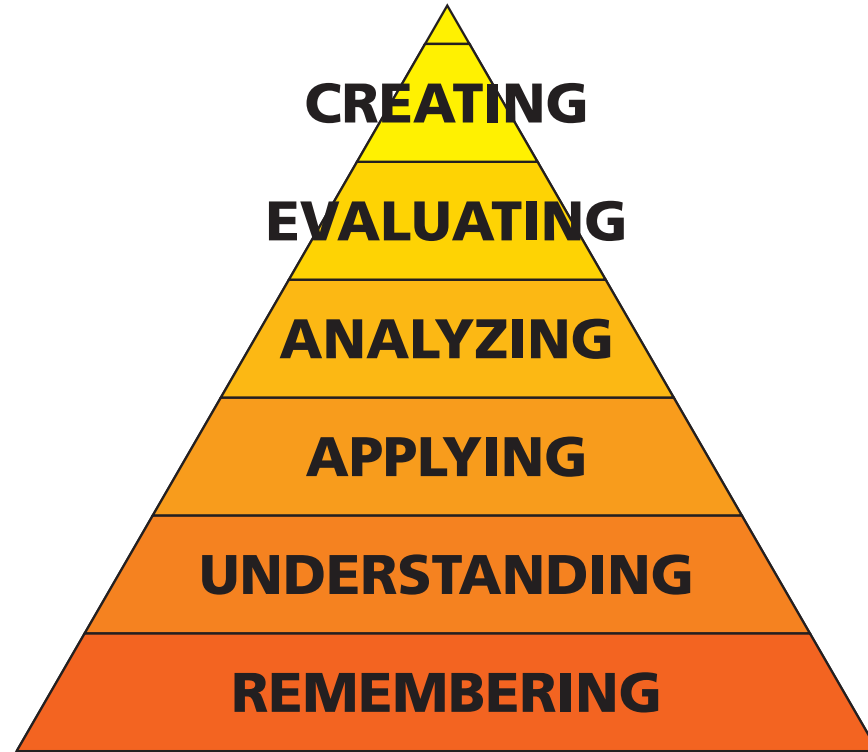
KNOWN

UNKNOWN

1 purposes

2 problems

Thinking skills



prob

prob

WIN

DOWN

1 purposes

2 problems

On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

Requires:

Assumptions

Developing a model

Applying that model

On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

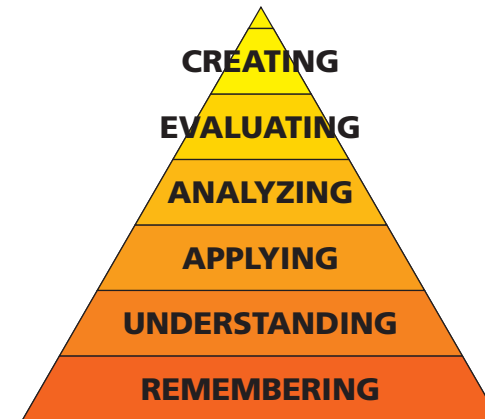
How long do you have to wait before someone frees up a space?

Requires:

Assumptions

Developing a model

Applying that model



On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. **On average people shop for 2 hours.**

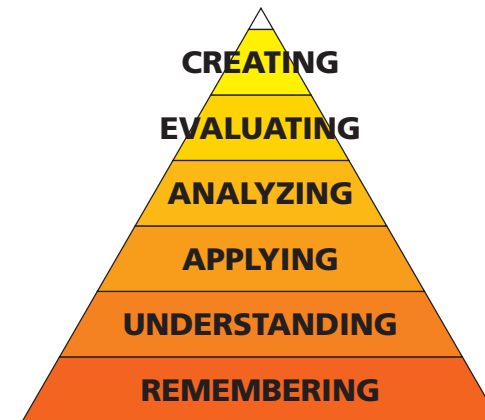
How long do you have to wait before someone frees up a space?

Requires:

Assumptions

Developing a model

Applying that model



On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. On average people shop for 2 hours.

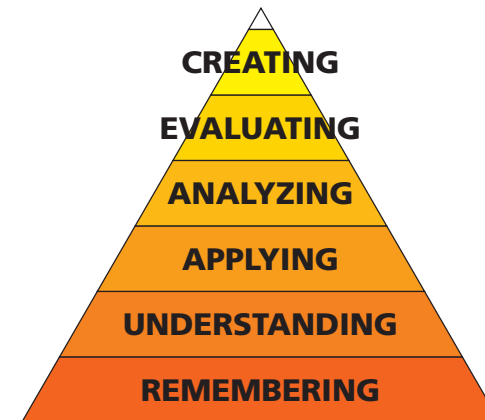
Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

Requires:

Assumptions

Developing a model

Applying that model



On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. On average people shop for 2 hours.

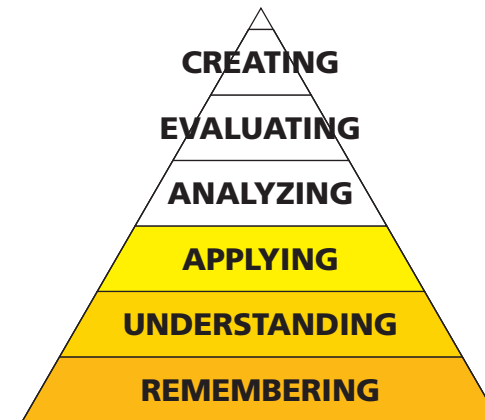
Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

Requires:

Assumptions

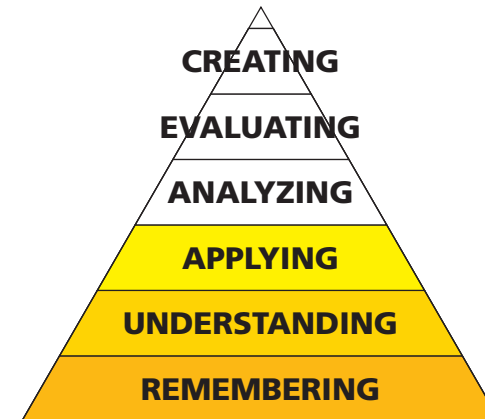
Developing a model

Applying that model



On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

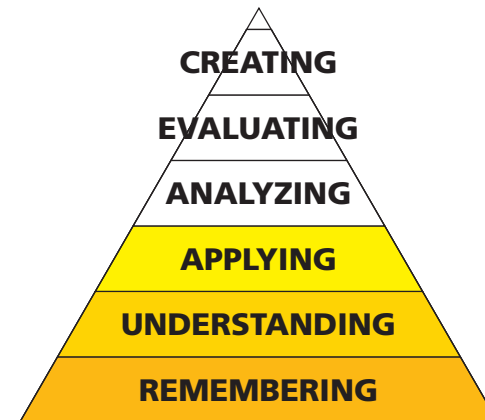
How long do you have to wait before someone frees up a space?



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How long do you have to wait before someone frees up a space?

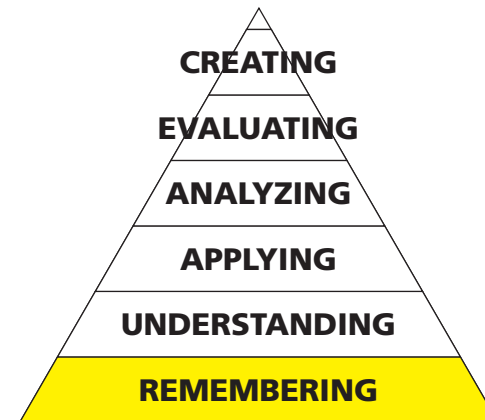
$$t_{wait} = \frac{T_{shop}}{N_{spaces}}$$



On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

$$t_{wait} = \frac{T_{shop}}{N_{spaces}}$$



pro

**computers
can do this!**

outcome

problem

procedure

answer

KNOWN

UNKNOWN

1 purposes

2 problems



1 purposes

2 problems



1 purposes

2 problems

problem

solution

outcome

UNKNOWN

KNOWN

problem

problem solving

KNOW

REAL

1 purposes

2 problems

problem

approach 1

approach 3

approach 2

outcome

grading incompatible with real problem solving

1 purposes

2 problems



1 purposes

2 problems



isolation

1 purposes

2 problems

④ We will use spherical coordinates:

$$0 \leq \rho \leq 4, \quad 0 \leq \theta \leq 2\pi, \quad \frac{\pi}{2} \leq \phi \leq \pi$$

integral is thus:

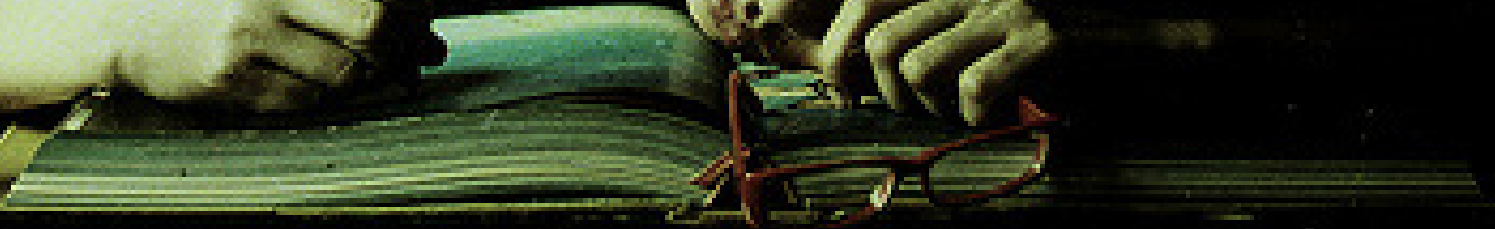
$$\int_0^{2\pi} \int_{\pi/2}^{\pi} \int_0^4 (\rho^2 \sin \phi) \rho \, d\rho \, d\theta \, d\phi$$

$$= \left\{ \int_{\rho=0}^4 \rho^3 \, d\rho \right\} \left\{ \int_{\theta=0}^{2\pi} d\theta \right\} \left\{ \frac{1}{2} \int_{\phi=0}^{\pi} \sin(2\phi) \, d\phi \right\} = \boxed{0}$$

1 purposes

2 problems

high-stakes examinations promote cramming



1 purposes

2 problems

A person with dark hair is sleeping at a desk. They are holding a pen over an open book. A white mug is on the desk to the left. A clock is visible in the bottom left corner. The scene is dimly lit, suggesting a quiet study environment.

information stored in short-term memory

1 purposes

2 problems



no retention

information stored in short-term memory

no transfer

1 purposes

2 problems

grades: measure of standing relative to others

1 purposes

2 problems

grades: measure of standing relative to others
feedback: reflection on what has been learnt

1 purposes

2 problems

assessment produces a conflict

1 purposes

2 problems

assessment produces a conflict

coach or judge?

1 purposes

2 problems

conflict resolved by:

objectivity (fairness, reliability)

1 purposes

2 problems

Law Model

mass makes me
fairly in humanity

Describe the Law of conservation of mass: Sometimes called the Law, states that mass of a closed system will remain constant, regardless of the process. Also, matter cannot be created nor destroyed.

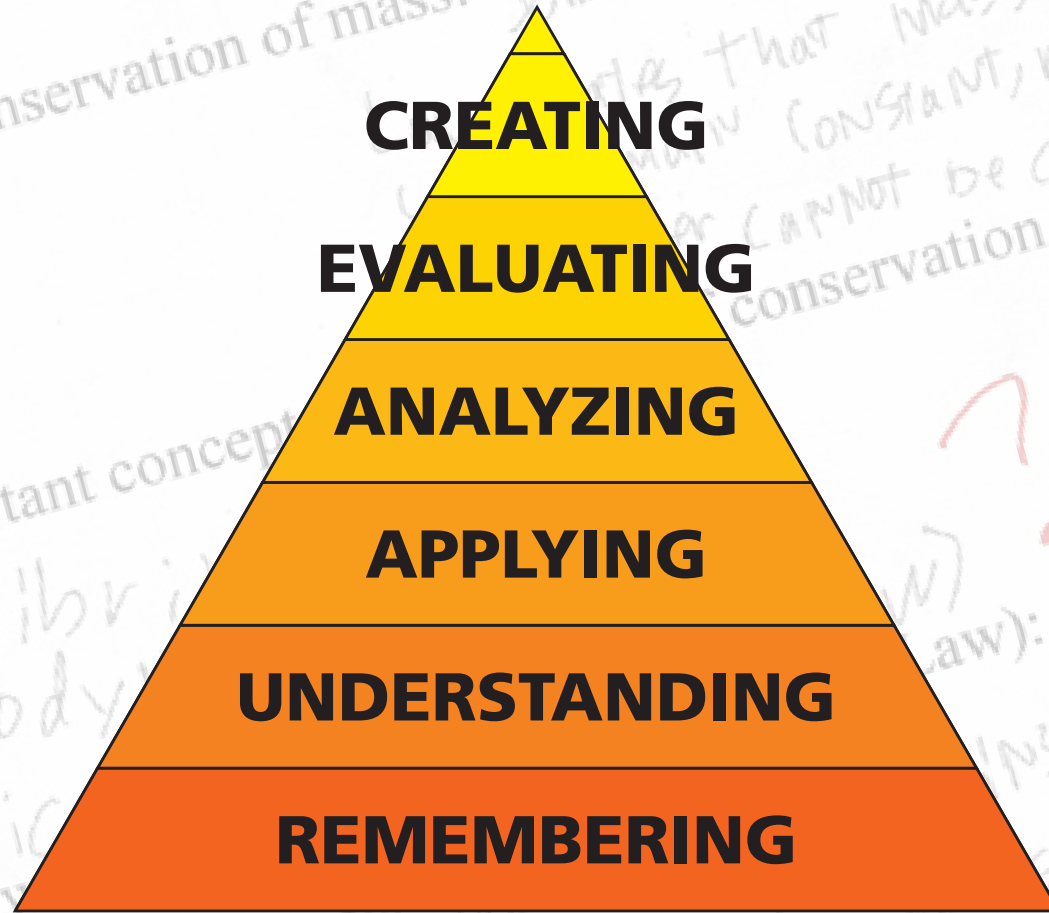
List the three important concepts that the Law of conservation of Energy leads to:
Equilibrium (boiling)
Thermodynamics (boiling)
Kinetics (how-chicka-wow-wow)

... but ...

Describe the Law of definite composition (Dalton's Law):
... always contains exactly the same parts by mass.

1 purposes

2 problems



1 purposes

2 problems

**only lowest order thinking skills
can be judged objectively**

1 purposes

2 problems

and then there is...

- grade inflation
- cheating

1 purposes

2 problems



1 purposes

2 problems

3 improvements



1

mimic real life

1 purposes

2 problems

3 improvements



open-book exam

1 purposes

2 problems

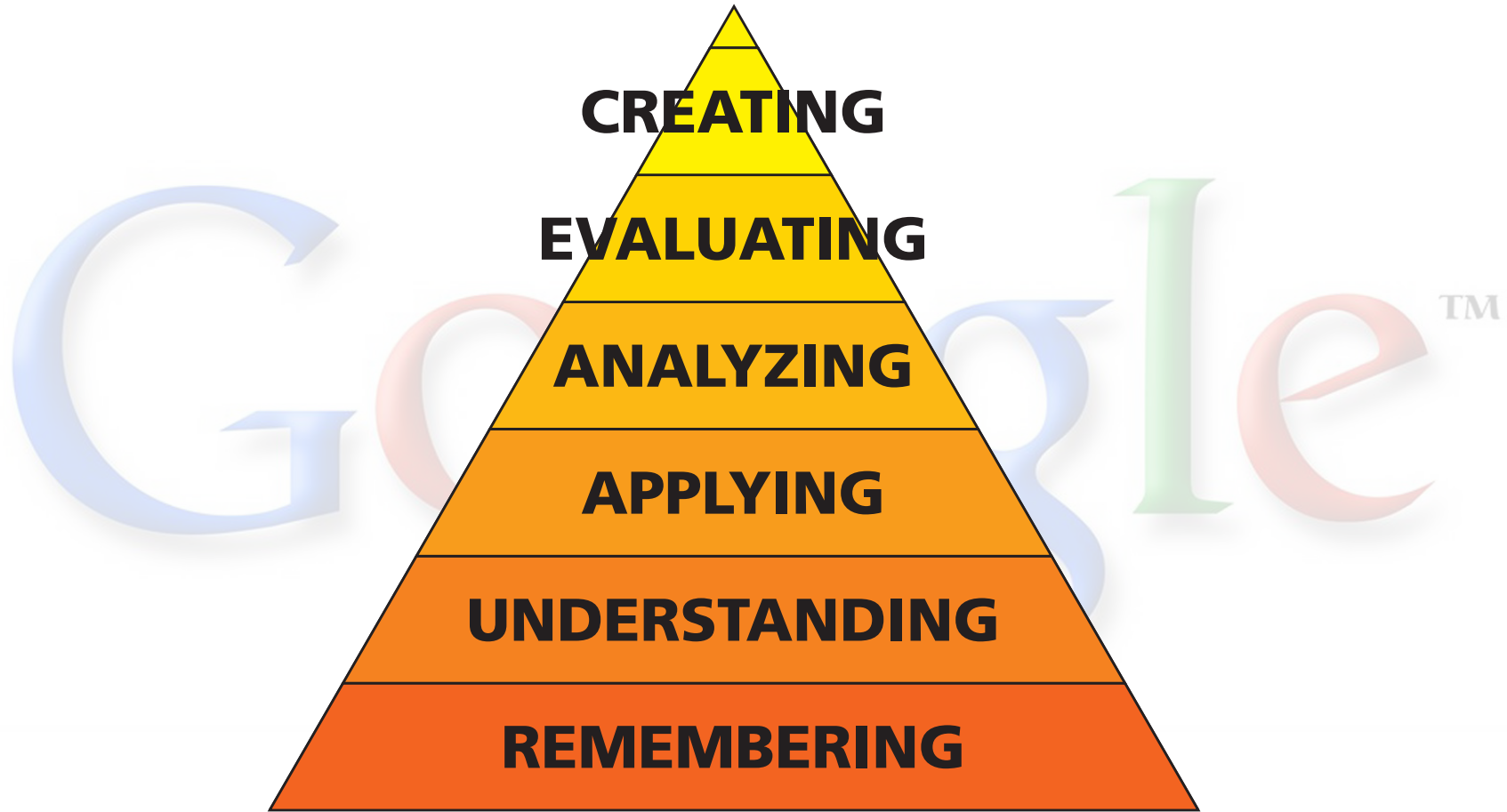
3 improvements

Google™

1 purposes

2 problems

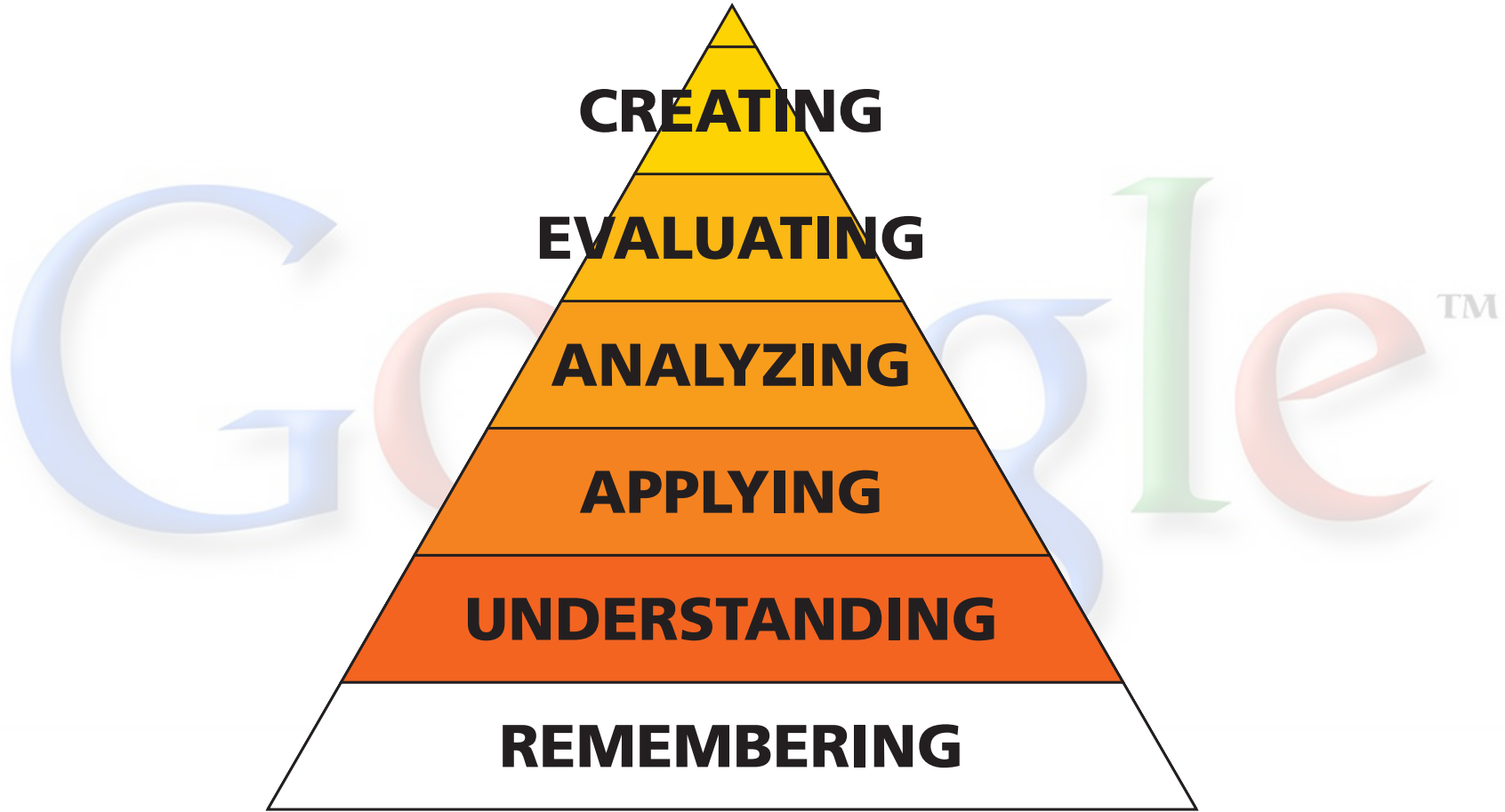
3 improvements



1 purposes

2 problems

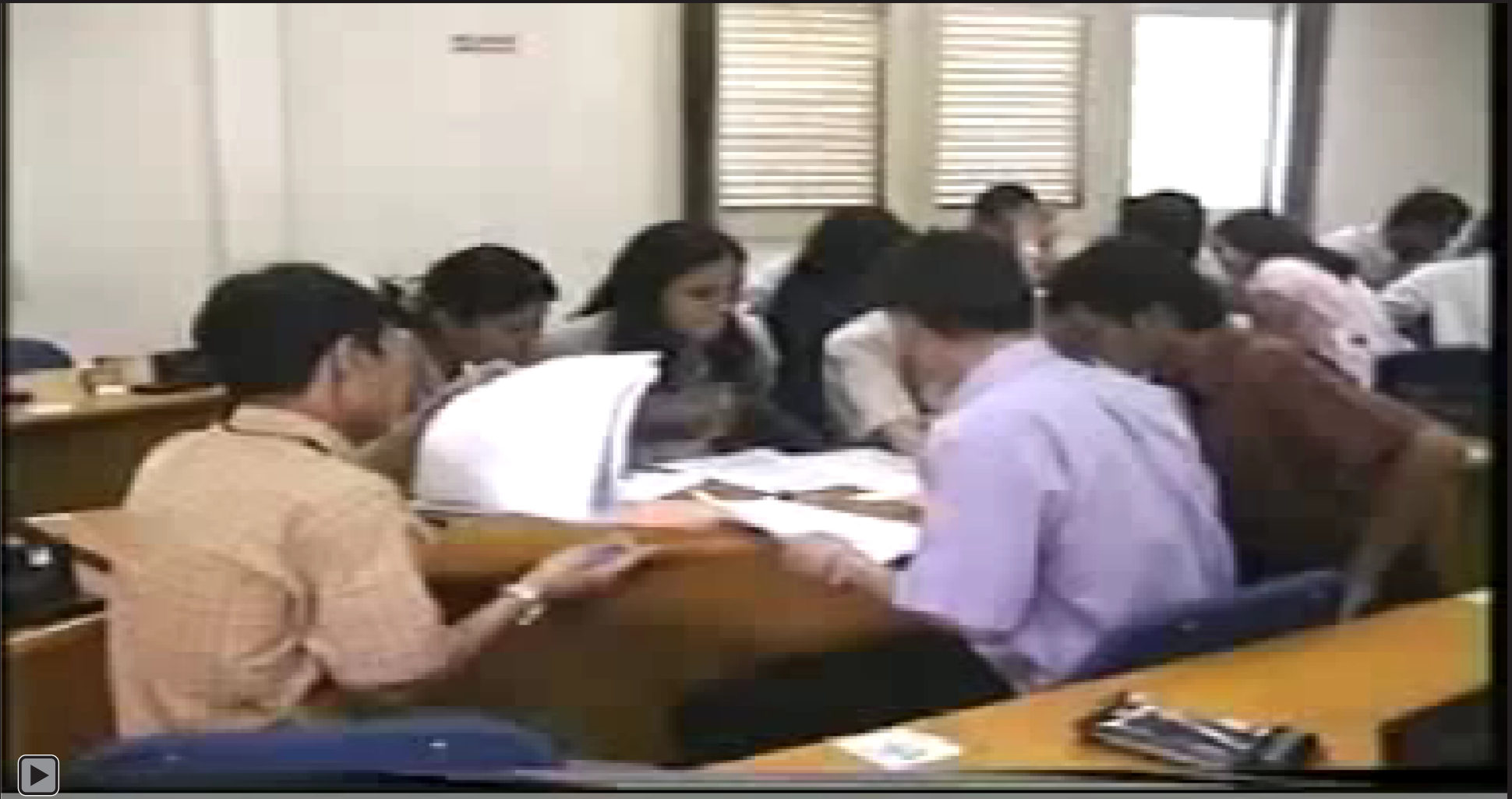
3 improvements



1 purposes

2 problems

3 improvements



1 purposes

2 problems

3 improvements

IMMEDIATE FEEDBACK ASSESSMENT TECHNIQUE (IF AT)

Name Team # 3

Test # 1

Subject _____

Total 23

SCRATCH OFF COVERING TO EXPOSE ANSWER

	A	B	C	D	Score
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>4</u>
2.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>2</u>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<u>4</u>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<u>1</u>
5.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>4</u>
6.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>4</u>
7.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>0</u>
8.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>4</u>
9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u> </u>
10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u> </u>

1 purposes

2 problems

3 improvements



1 purposes

2 problems

3 improvements

Session 389314

This is the individual round; work on these questions on your own.



Jump to ▼

1

2

3

4

5

expression question

What is the derivative of $f(x) = 3x^2 - 6x$?

Submit response

Enter an expression, e.g., x^2 for x^2 , $\ln(y) - \sin(x)$ for $\ln y - \sin x$, $x/(y+1)$ for $\frac{x}{y+1}$, $(1/2)x$ for $\frac{1}{2}x$. Do not enter a complete equation.

Current team: **Blue team**  [Change team](#)

 [Change seat](#)

 [Send a message to the instructor](#)

 [Join another](#)

1 purposes

2 problems

3 improvements

This is the individual round;

expression question

What is the derivative of $f(x) = 3x^2 - 6x$?

Submit response

Enter an expression, e.g., x^2 for x^2 , $\ln(y) - \sin(x)$ for $\ln y - \sin$

1 purposes

2 problems

3 improvements

This is the individual round;

expression question

What is the derivative of $f(x) = 3x^2 - 6x$?

Submit response

Enter an expression, e.g., x^2 for x^2 , $\ln(y) - \sin(x)$ for $\ln y - \sin$

1 purposes

2 problems

3 improvements

$6x - 6$

Brian Lukoff

$6x$

Brent Jones

$6x - 6$

Beth Sawyer

$6x^2 - 6$

Kip Harmon

expression question

What is the derivative of $f(x) = 3x^2 - 6x$?

Submit response

Enter an expression, e.g., x^2 for x^2 , $\ln(y) - \sin(x)$ for $\ln y - \sin$

1 purposes

2 problems

3 improvements



1 purposes

2 problems

3 improvements



2

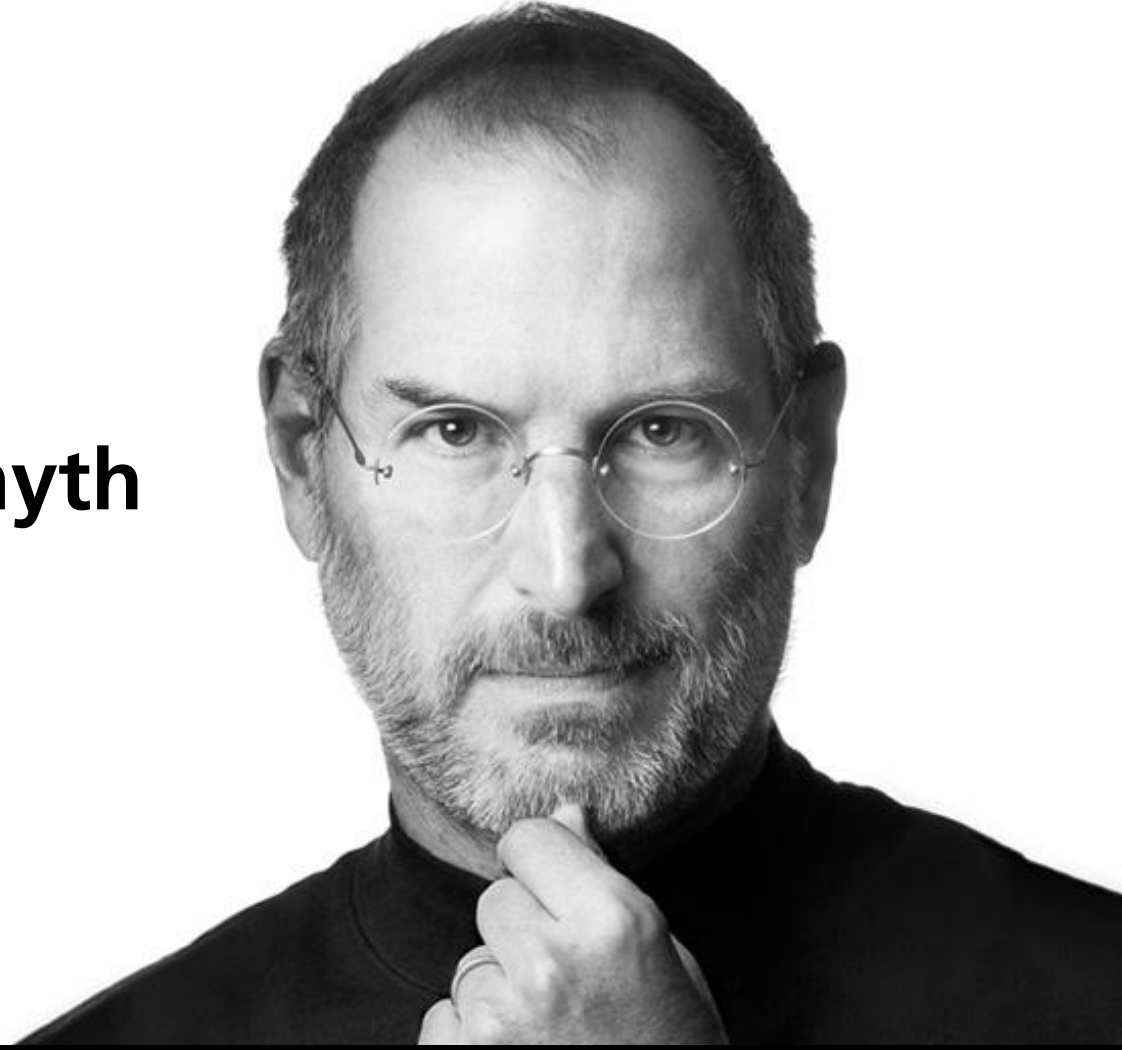
focus on feedback, not ranking

1 purposes

2 problems

3 improvements

objective ranking: a myth

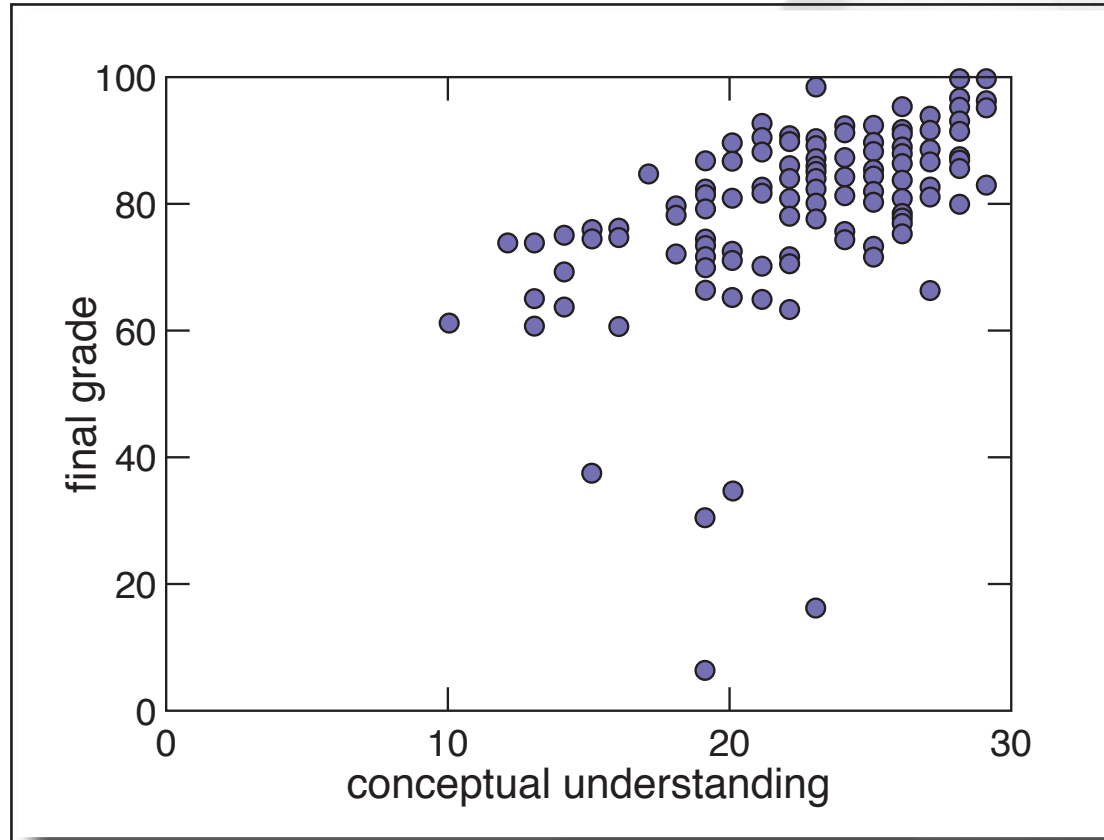


1 purposes

2 problems

3 improvements

2 metrics, 2 results

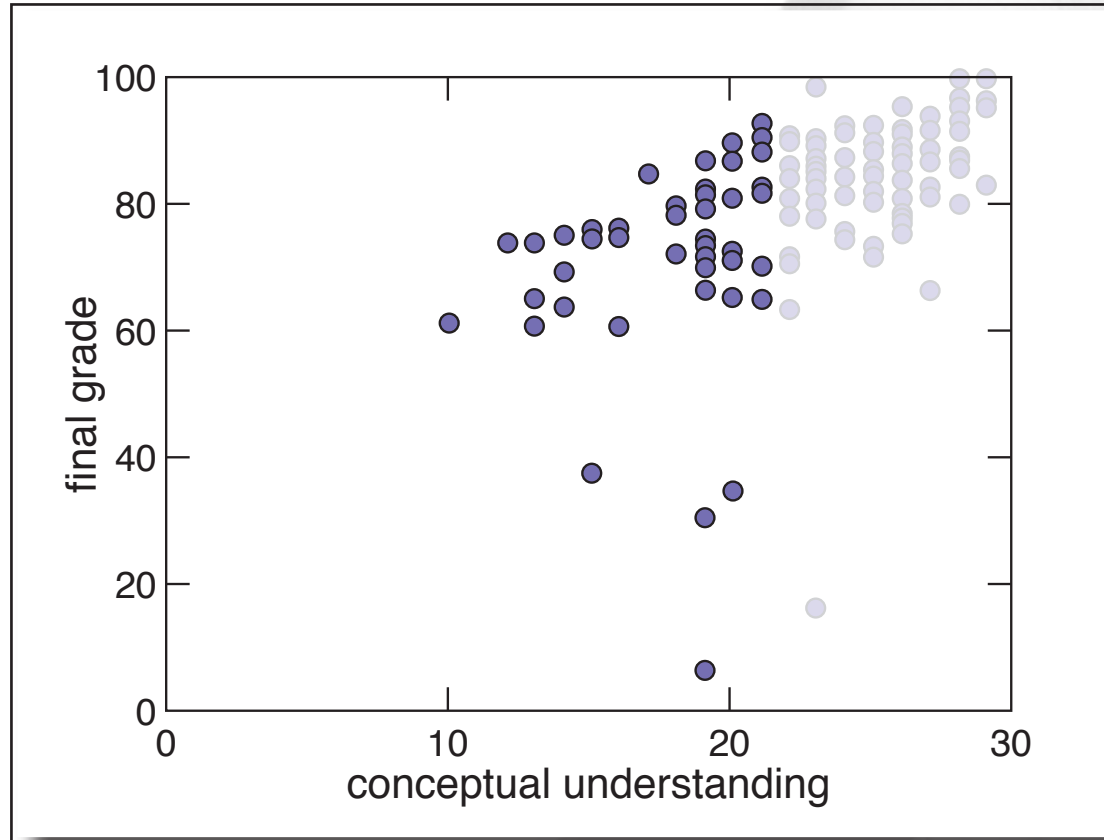


1 purposes

2 problems

3 improvements

Aristotelian thinkers

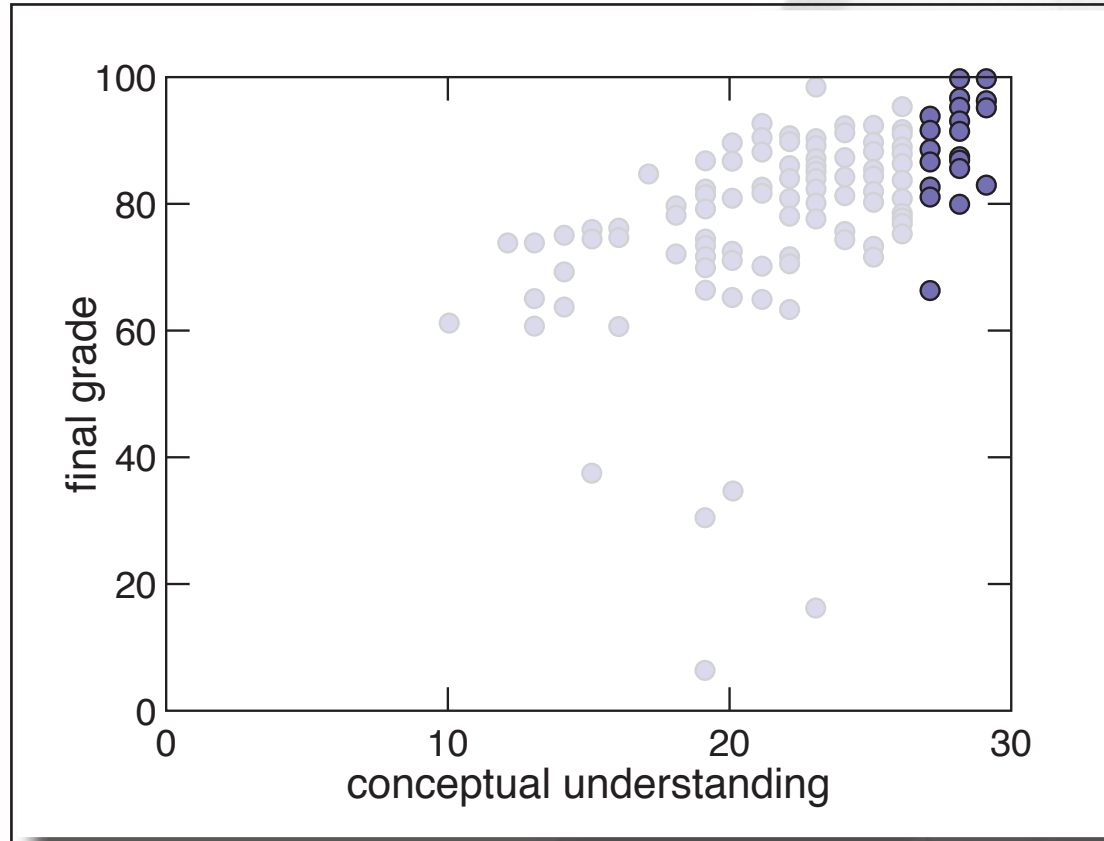


1 purposes

2 problems

3 improvements

top performers, broad grade distribution

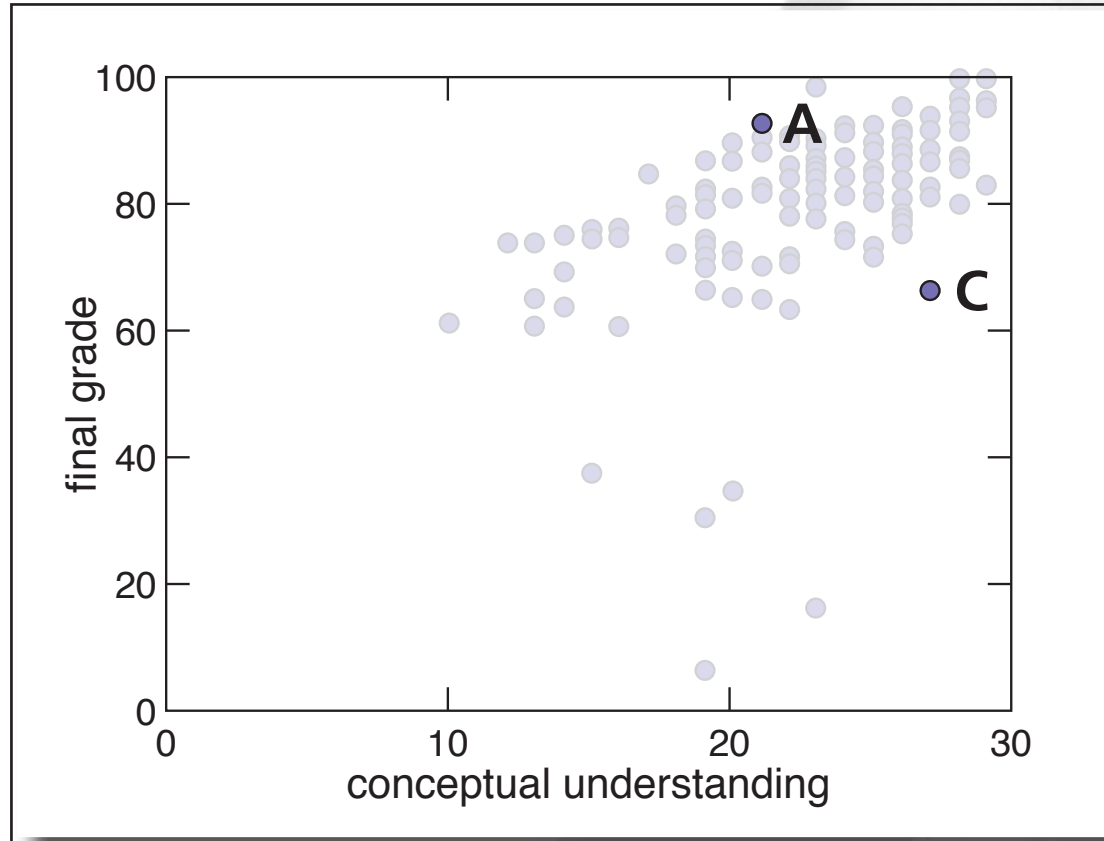


1 purposes

2 problems

3 improvements

objectivity or injustice?



1 purposes

2 problems

3 improvements



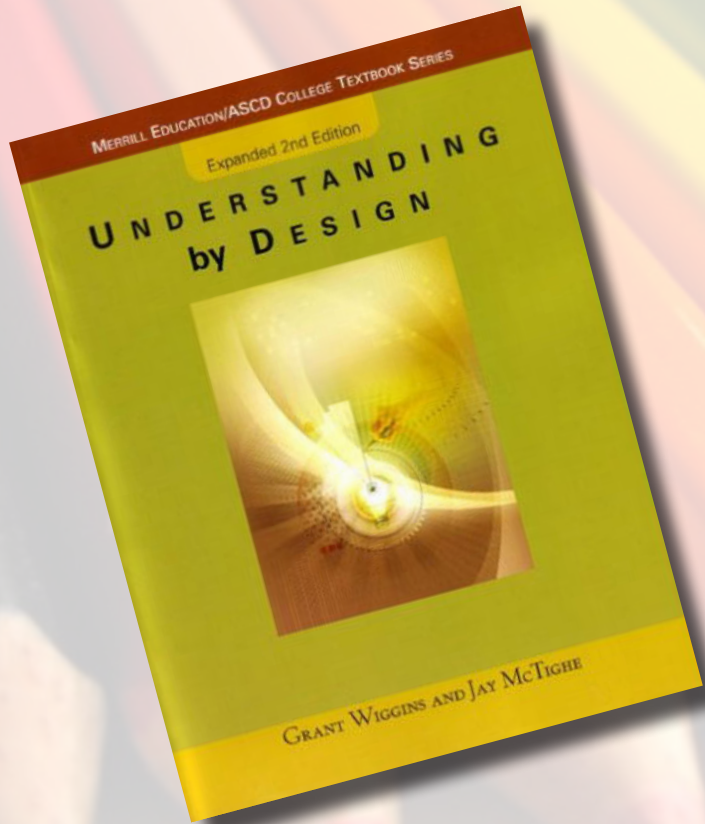
3

focus on skills, not content

1 purposes

2 problems

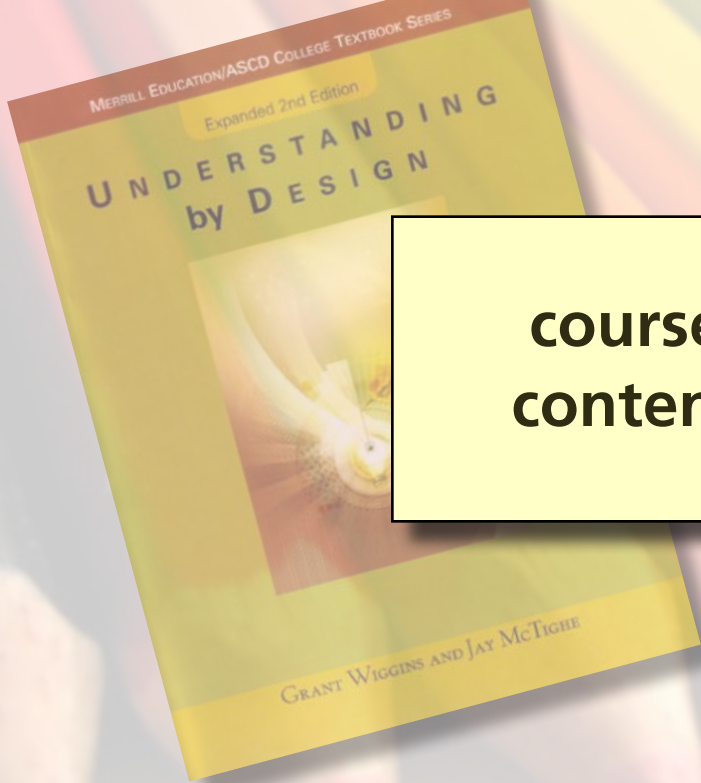
3 improvements



Grant Wiggins and Jay McTighe, *Understanding by Design* (Prentice Hall, 2001)

- 1 purposes
- 2 problems
- 3 improvements

Traditional approach to course planning



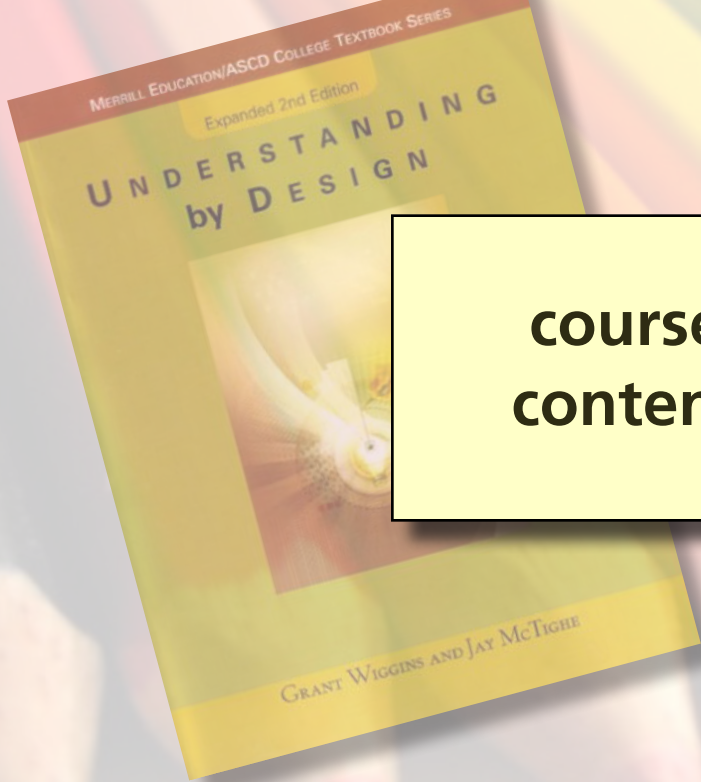
**course
content**

1 purposes

2 problems

3 improvements

Traditional approach to course planning



**course
content**



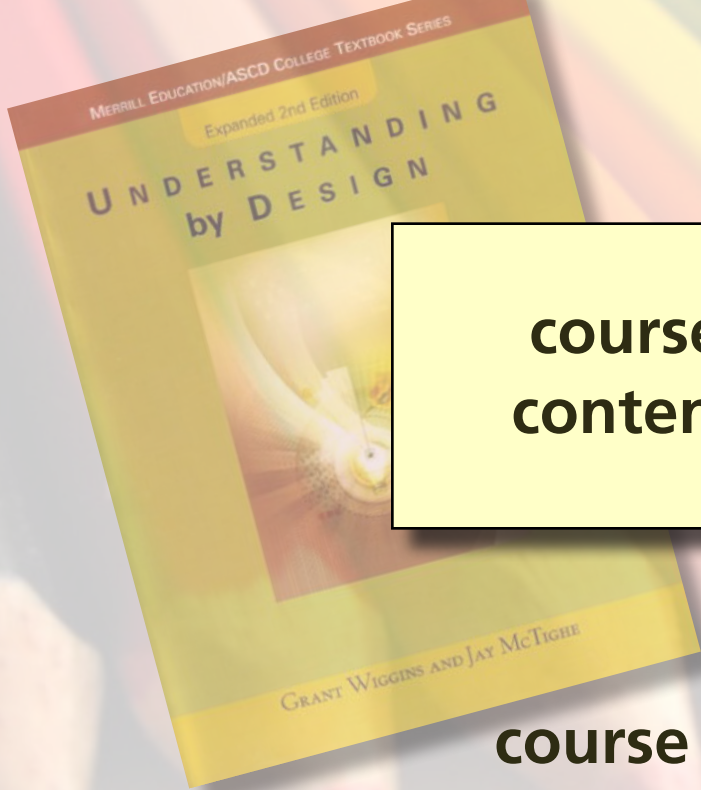
assessment

1 purposes

2 problems

3 improvements

Traditional approach to course planning



**course
content**



assessment

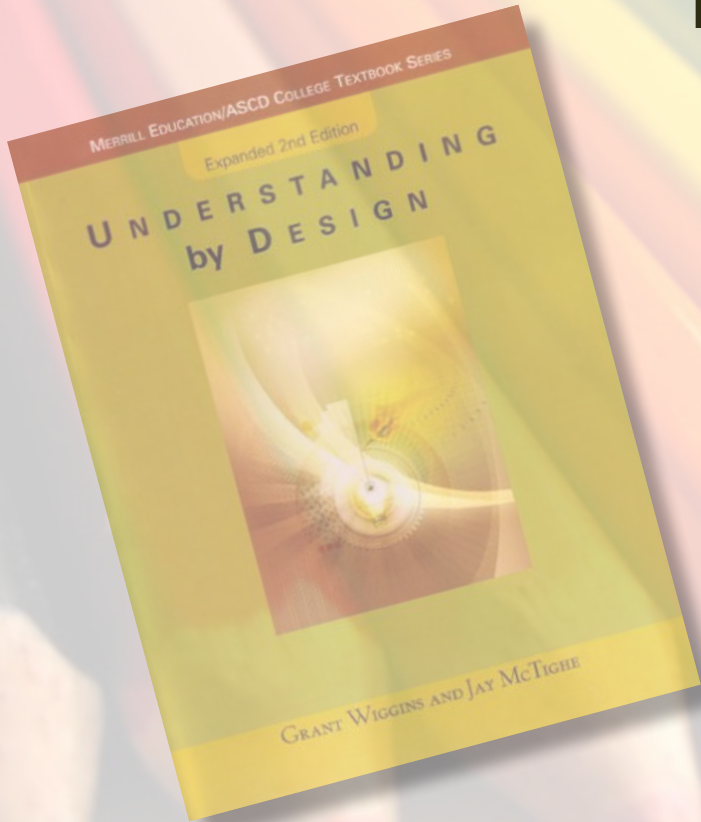
course determined by content

1 purposes

2 problems

3 improvements

Backward design



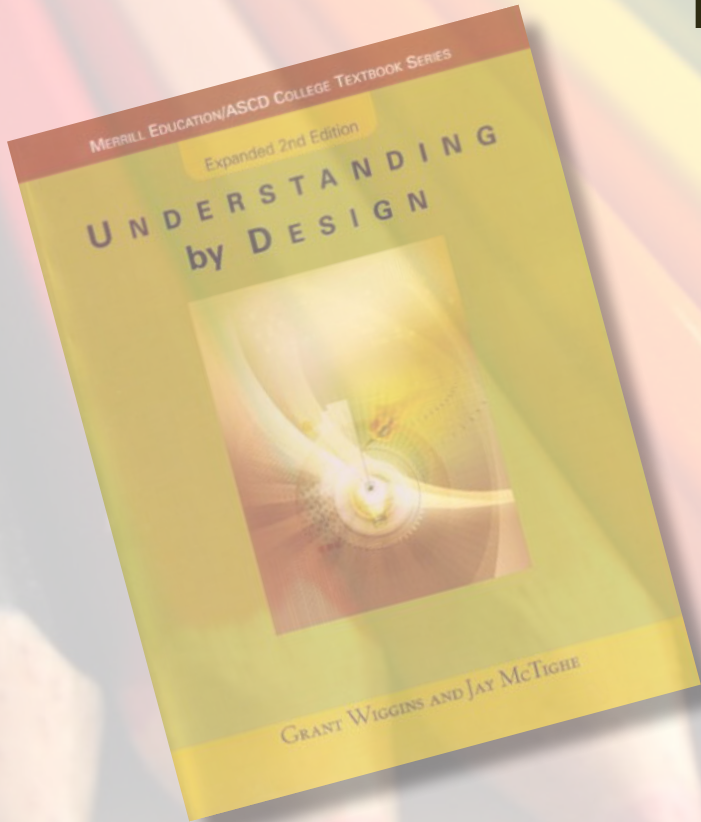
**desired
outcomes**

1 purposes

2 problems

3 improvements

Backward design



acceptable
evidence



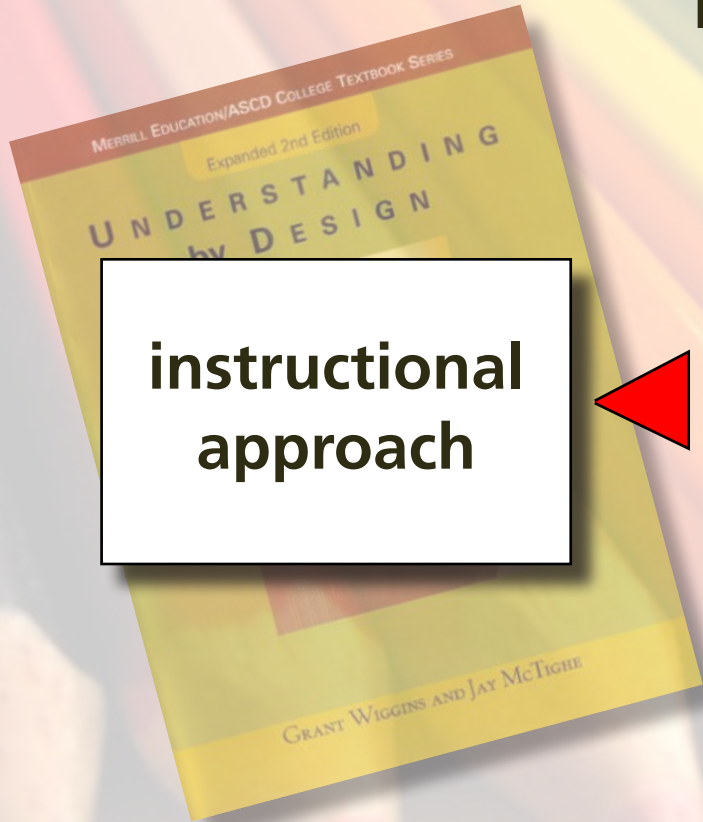
desired
outcomes

1 purposes

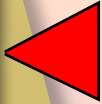
2 problems

3 improvements

Backward design



**instructional
approach**



**acceptable
evidence**



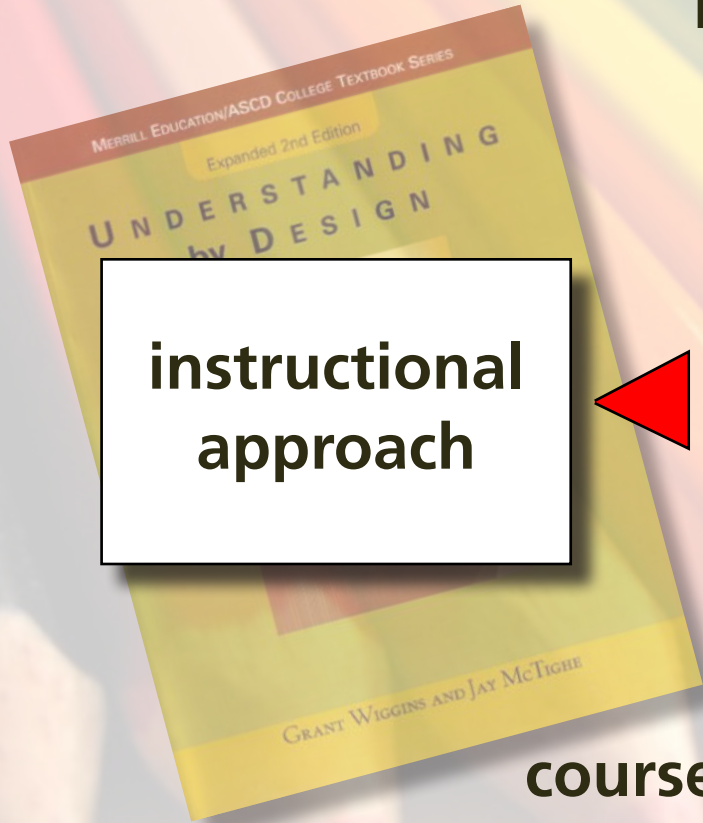
**desired
outcomes**

1 purposes

2 problems

3 improvements

Backward design



instructional approach



acceptable evidence

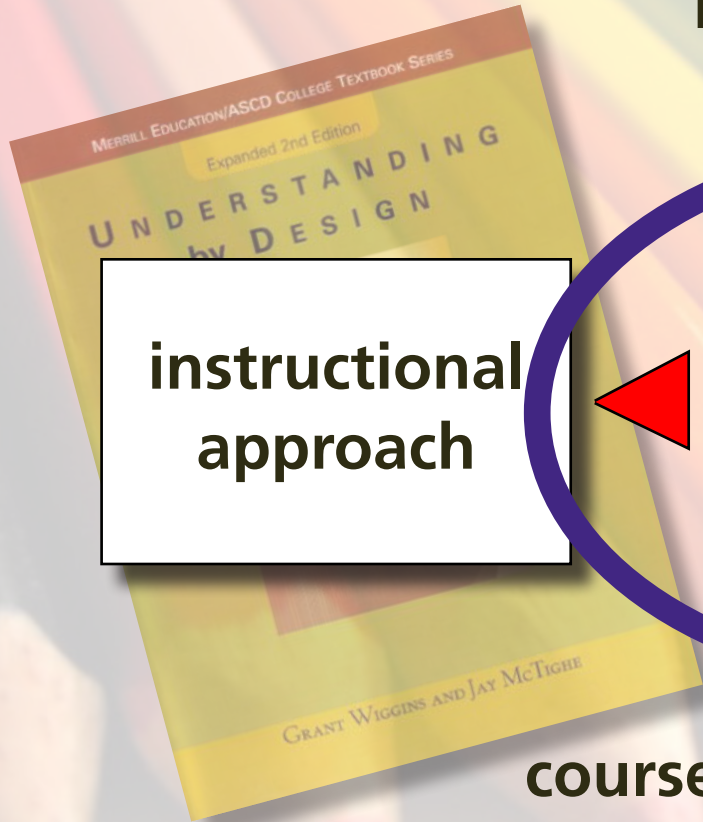


desired outcomes

course defined by outcomes

- 1 purposes**
- 2 problems**
- 3 improvements**

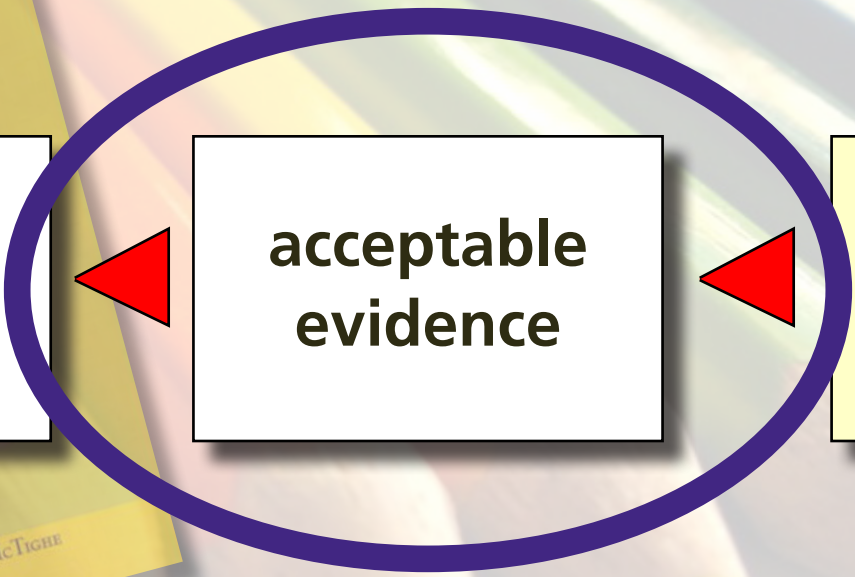
Backward design



instructional approach

acceptable evidence

desired outcomes



course defined by outcomes

- 1 purposes**
- 2 problems**
- 3 improvements**



4

resolve coach/judge conflict

1 purposes

2 problems

3 improvements

use external evaluators

1 purposes

2 problems

3 improvements

peer- and self-assessment

1 purposes

2 problems

3 improvements

Calibrated Peer Review

cpr.molsci.ucla.edu

1 purposes

2 problems

3 improvements

Step 1: assignment & rubric

cpr.molsci.ucla.edu

1 purposes

2 problems

3 improvements

...st the three important concepts

3 = admin...
exceeds expectations
(rarely selected)

WRITING RUBRIC

1 = needs improvement
does not meet expectations entirely

2 = satisfactory
meets expectations
(what you should aim for)

Catchy title drawing audience into article

Compelling audience appropriate hook or lead present AND first few paragraphs orient lay reader to subject

All paragraphs are short (1-5 sentences)

Headings structure paper in organized, logical way AND paragraphs linked by transitions

Ends compellingly with an important idea or though provoking question AND ties back to title and opening hook

Rubric for Calibrated Peer Review

Wordy, long, unimaginative, or inappropriate title

Basic title

Hook or lead present OR first few paragraphs orient reader to subject

Missing a "hook" or a lead in the first paragraphs AND does not orient reader to subject

Some paragraphs are long (6 or more sentences), most are short (1-5 sentences)

Many paragraphs are long (6 or more sentences)

A few headings OR most paragraphs linked by transitions

Lacks organization, no logical headings, no transitions between paragraphs

Summary-like closing, but does not tie back to title or opening hook

Does not end compellingly or with an important idea AND does not tie back to opening

All facts are 100% correct, relevant, and necessary

Includes fact-checked expert and/or lay testimony (newspaper article only)

Contains incorrect, misstated, irrelevant, or unnecessary facts

Most, but not all, facts backed up with proper, convincing, or interesting sources or evidence

Original presentation of material; uses the unexpected to capture attention

Does not back up facts with proper, convincing, or interesting sources or evidence

Some originality apparent

Material appropriate and aimed at target audience AND relates to practical/everyday concerns AND uses analogies or other techniques to relate unfamiliar content to familiar concepts; no jargon, colloquialisms, or acronyms

Mostly predictable based on available

Material appropriate and aimed at target audience AND mostly avoids scientific content that contains no colloquialisms or acronyms and uses clearly

Structure

Title

Opening

Paragraph length

Organization

Closing

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Content/Ideas

Scientific facts

Sources/evidence

1 purposes

2 problems

3 improvements

Step 2: upload
Step 3: review

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- 1 purposes
- 2 problems
- 3 improvements

MEDIUM

HIGH

UPLOAD

LOW

nt new addition to night sky
quires fear and awe – Mona Lisa

By now everyone has noticed the
mistakable new addition to our sky, which
outshines the brightest star at night and
continues to shine alongside the sun during
the day. None of us have seen such a sight in
the course of our lives and for many it has
served as a jarring reminder of the violent
and powerful cosmic events that occur in
what often appears to be a calm and constant

The New York Times

January 20, 2009

OBSERVATORY

Spectacular Supernova Observed

By John Glenn

New York, N.Y. – People around the world witnessed the
in recorded history this morning. The supernova, named
Eastern Time, appearing as bright as the full moon. At
continued to shine for several hours.

Traffic was interrupted in New York City, as early-ris
of the amazing sight. As of press time, the

Galileo
20 January 2008

Yesterday at about 4 p.m., I observed a peculiar
appeared in the sky. A glowing flash emitted
seconds, accompanied its appearance. The object
it even in broad daylight. How did this unprecedented
its consequences for Earth? In order to understand
on Earth will most likely ever see again, we have
galaxies. To fully appreciate it and not be alarmed
understand the life cycle of stars and how they
classified as consisting of eight planets (Pluto, etc.)

1 purposes

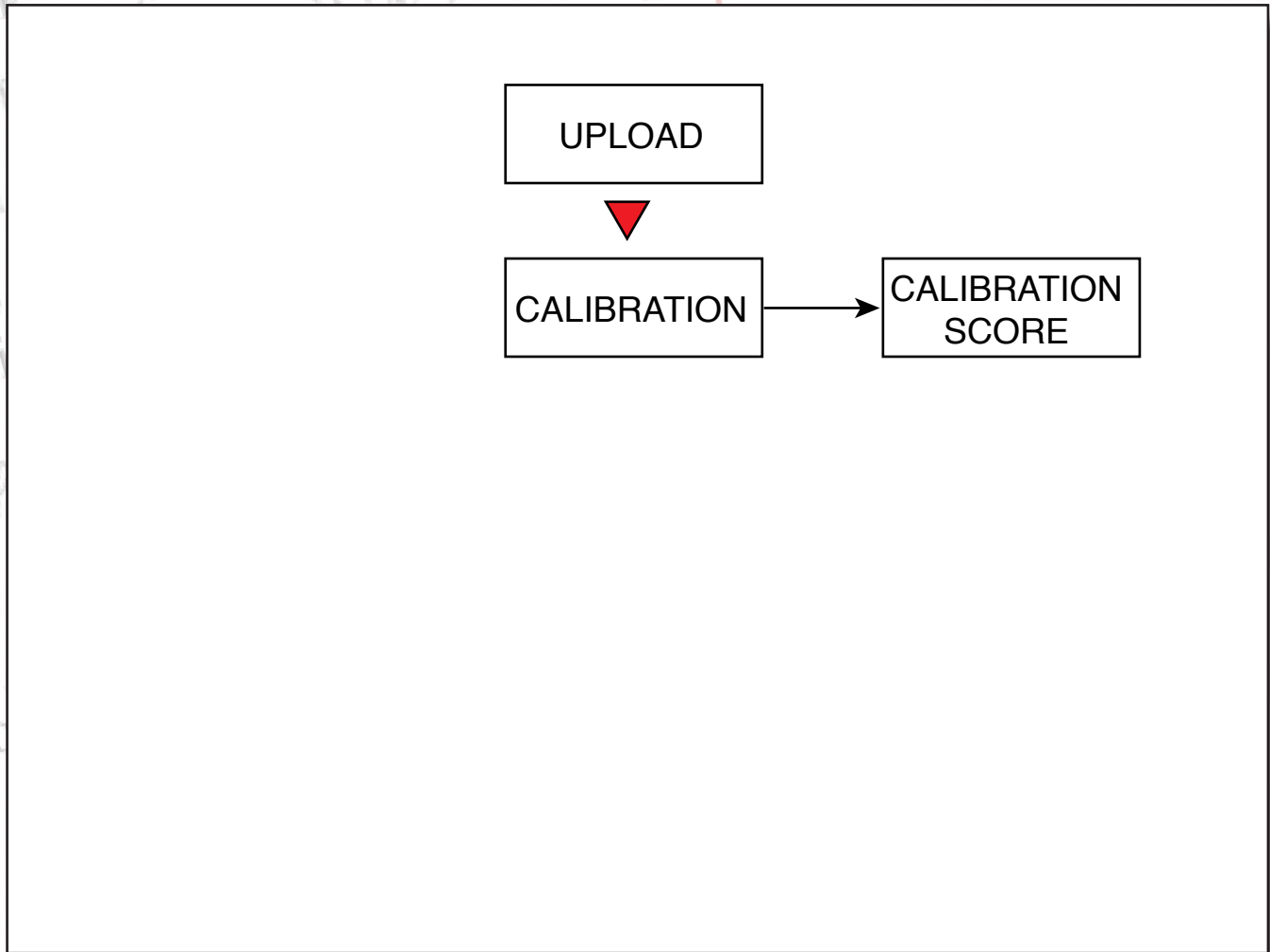
2 problems

3 improvements

cpr.molsci.ucla.edu

...st the three important concepts
Equilibrium
Thermodynamics
Kinetics (both)
Describe the Law of definite
A chemical compound
Same proportion
Unrelated, I saw
5 pts) A chemical reaction do

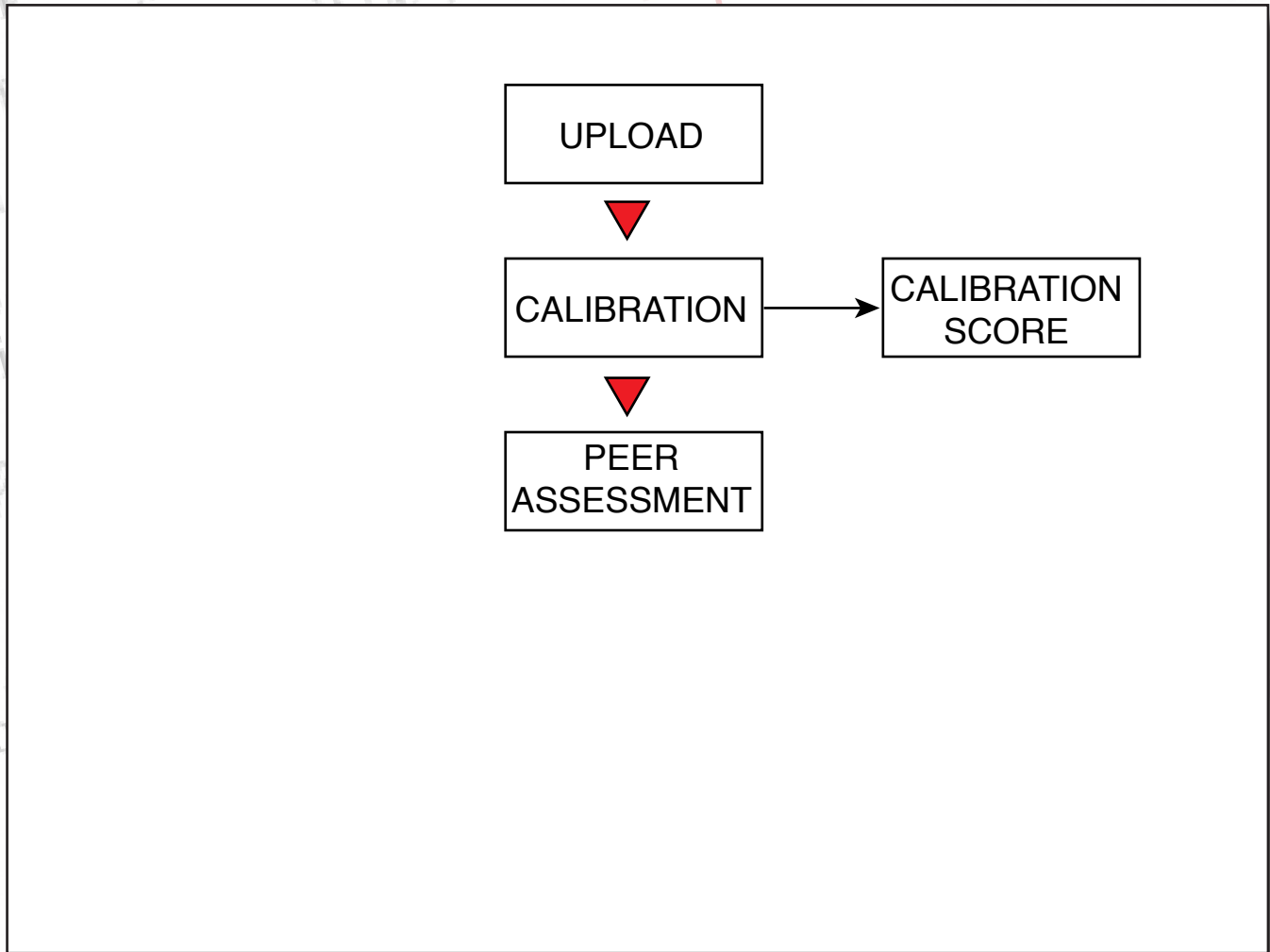
cpr.molsci.ucla.edu



- 1 purposes
- 2 problems
- 3 improvements

...st the three important concepts
Equilibrium
Thermodynamics
Kinetics (both)
Describe the Law of definite
A chemical compound
Same proportion
Unrelated, I saw
5 pts) A chemical reaction do

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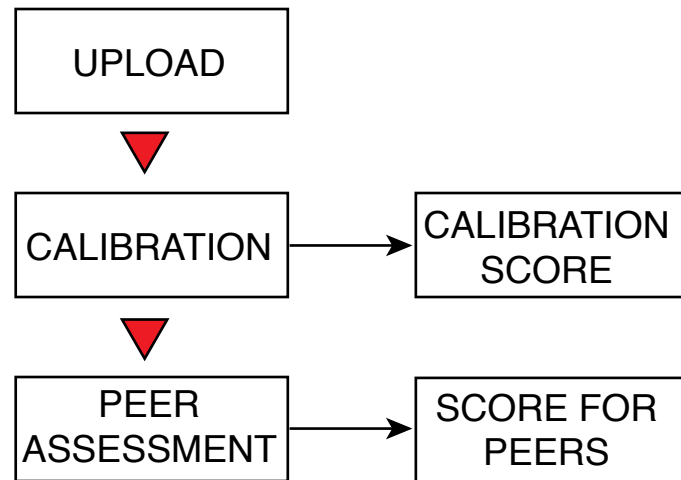
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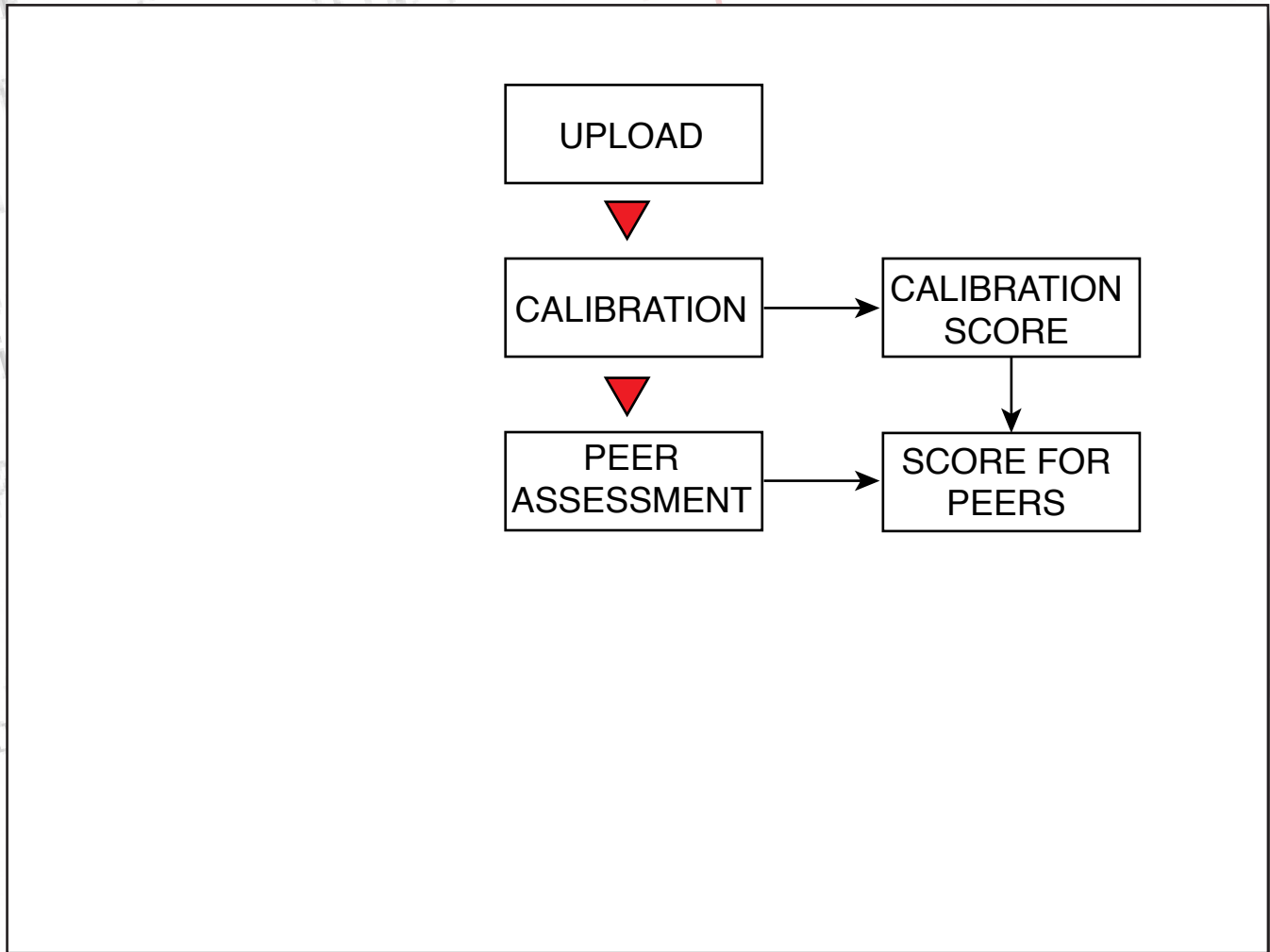
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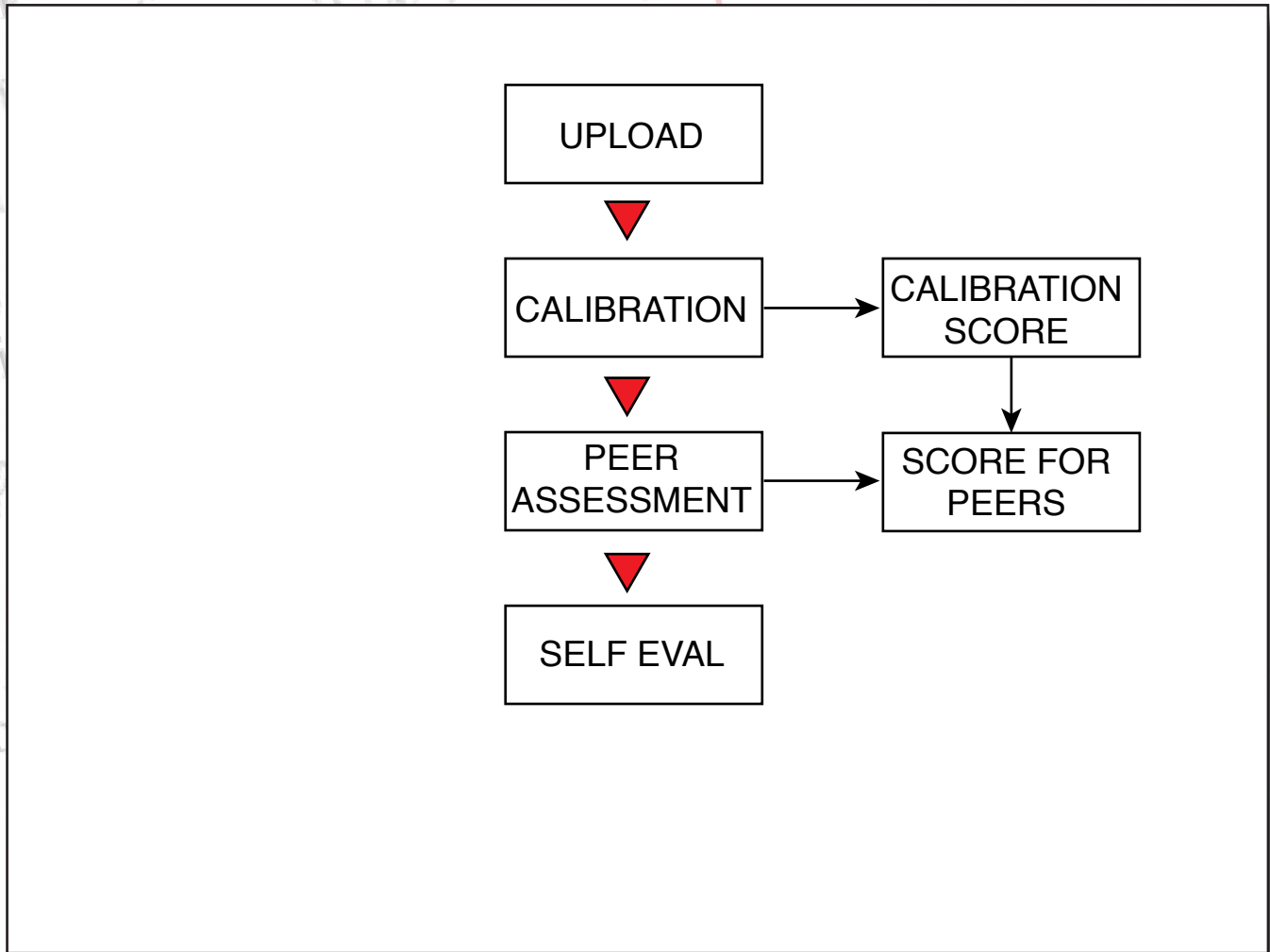
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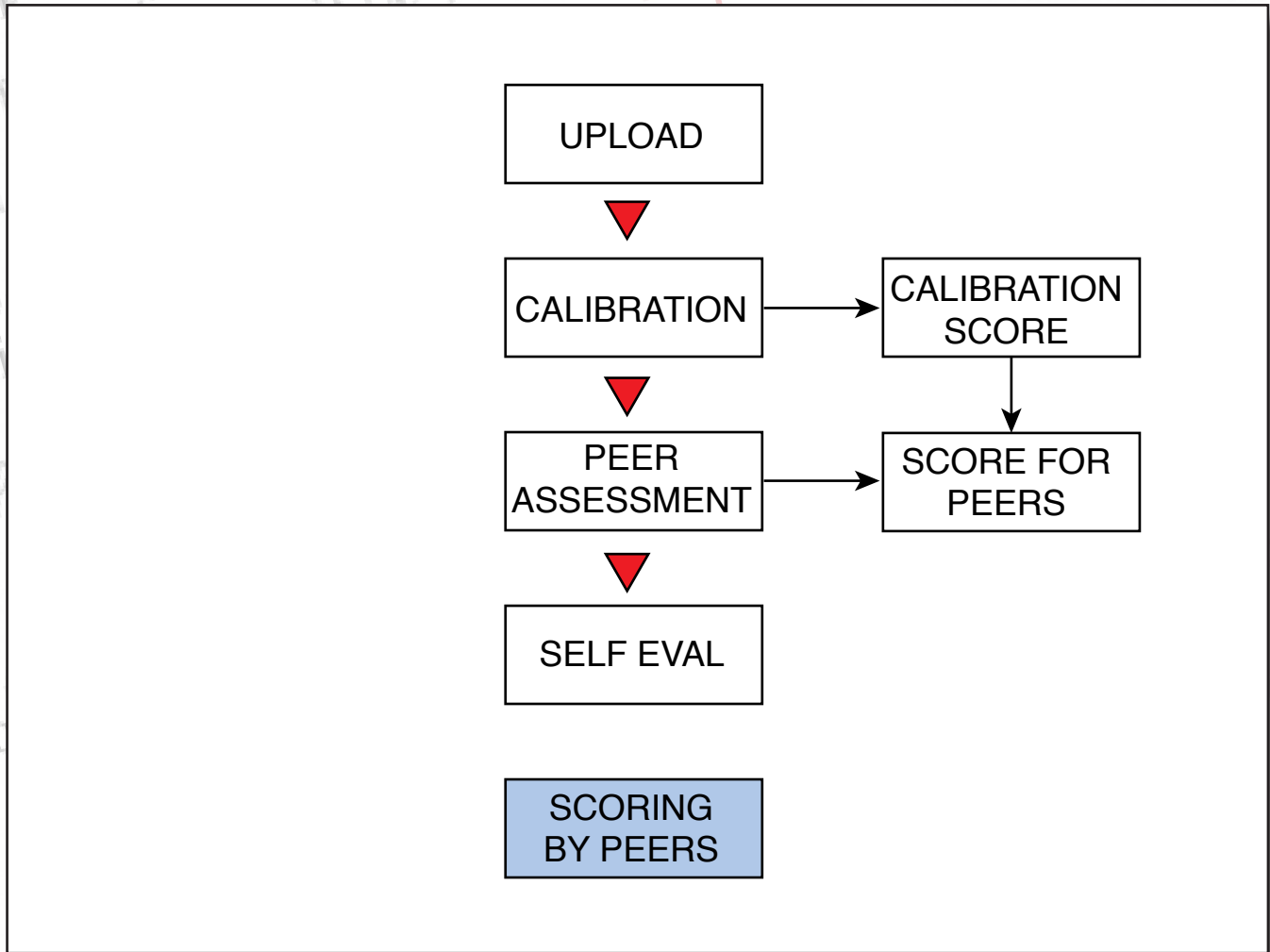
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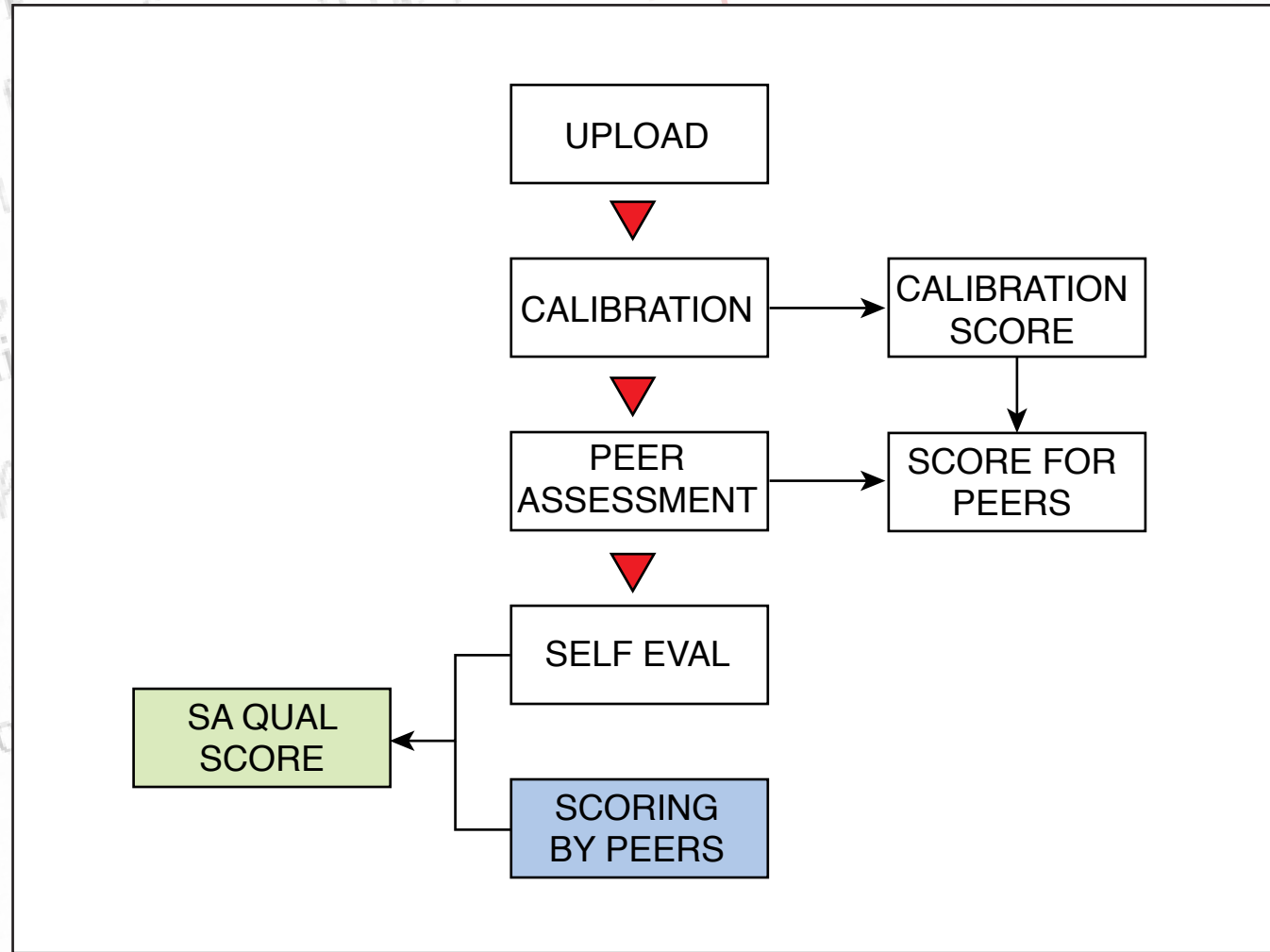


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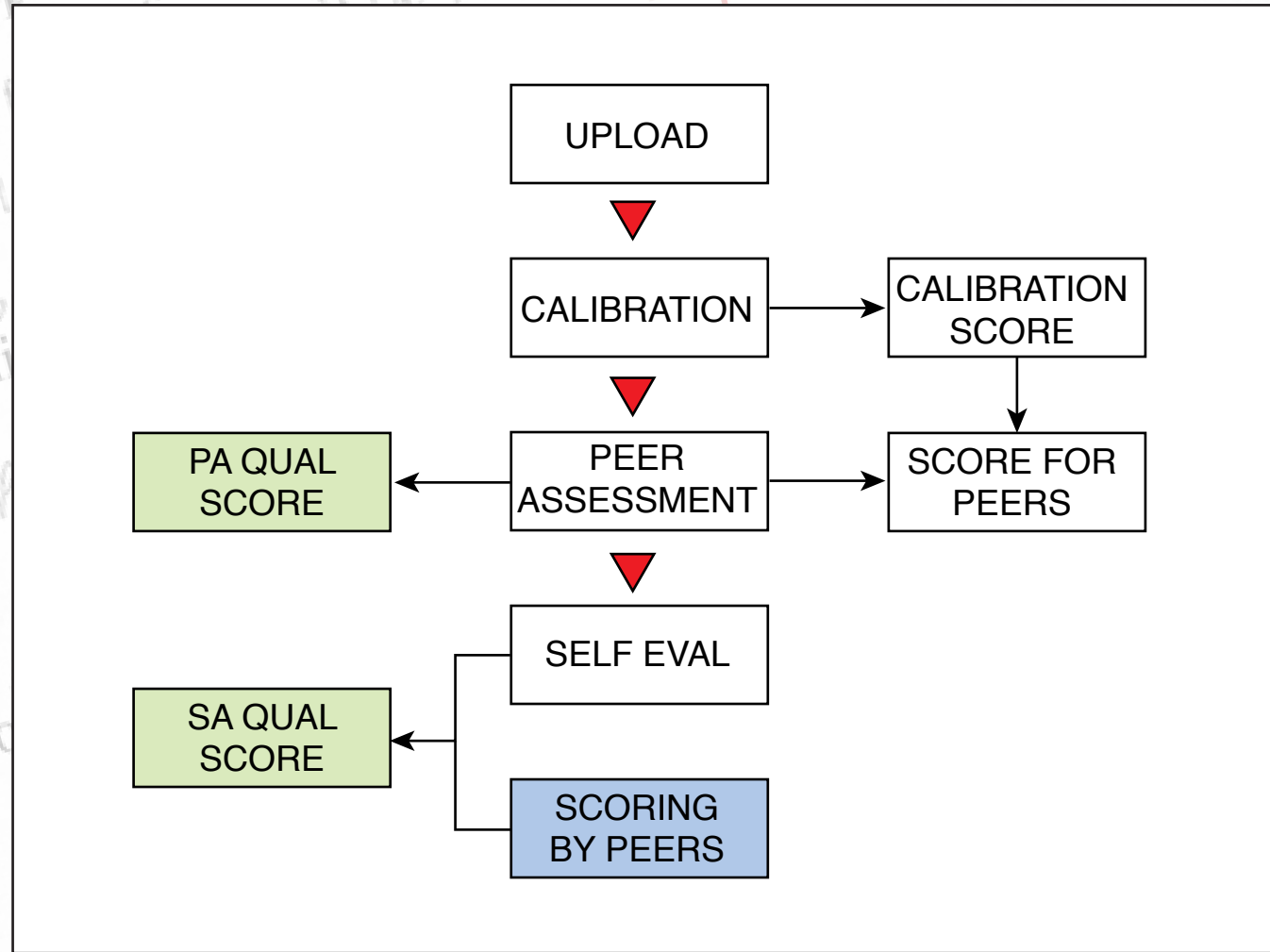
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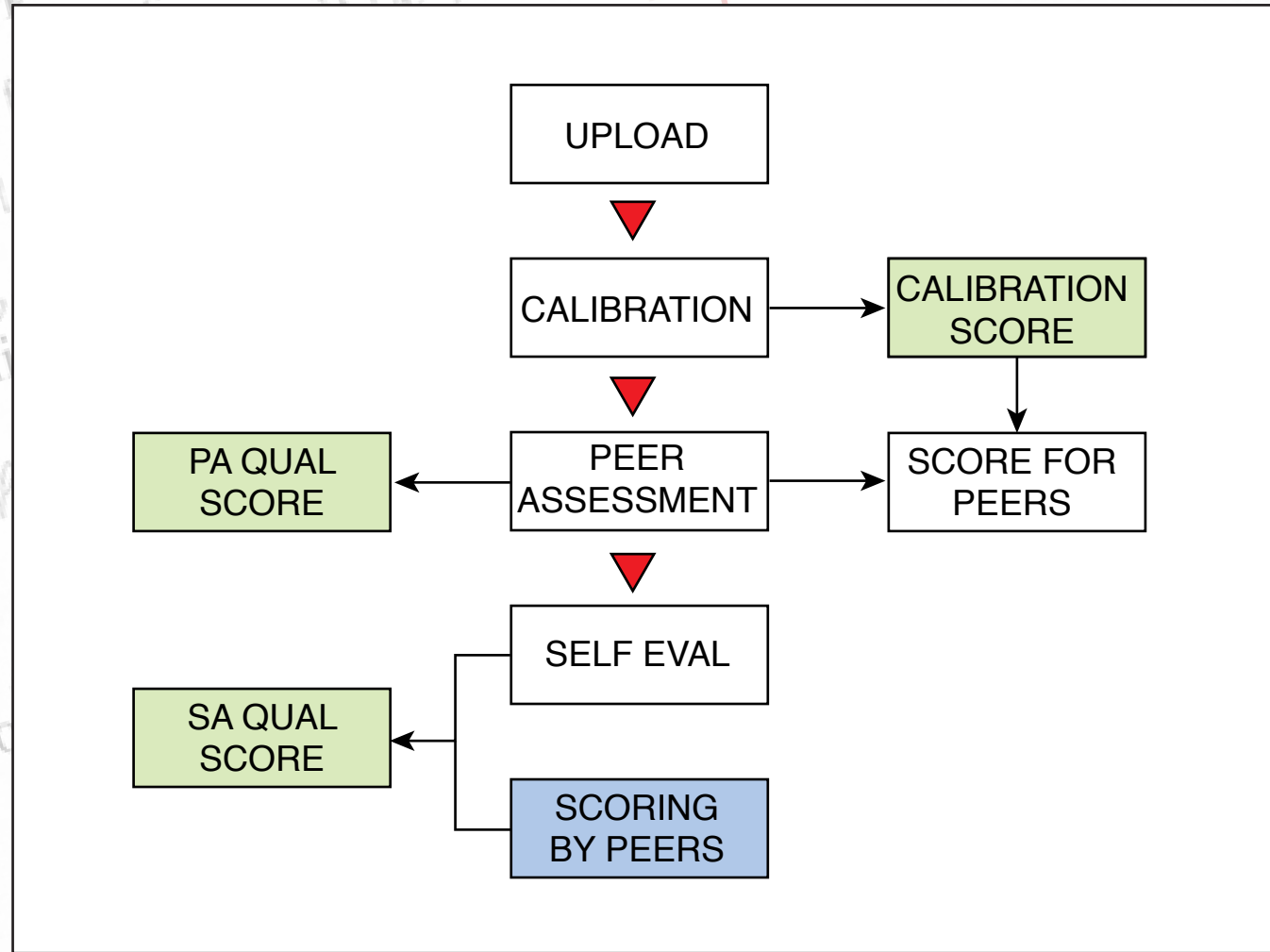
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A large, empty classroom with rows of desks and chairs. The text "rethink assessment" is overlaid in the center in a large, bold, black font with a blue outline. The classroom has a light blue floor with yellow and red lines, and a white wall with a door in the background.

**rethink
assessment**



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