

# Assessment: The silent killer of learning



CIIGE  
Tec de Monterrey  
Monterrey, Mexico, 26 May 2014



# Assessment: The silent killer of learning



@eric\_mazur

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**kosten**

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

**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-gekannt *irreg.*

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



kosten

1. die Kosten

2. 1. Kosten

think

428

kennen

kannte-gekannt

1. kennen

2. erkennen

3. bekannt

4. d.





**35 % retained  
after 1 week**

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







# 5-minute university



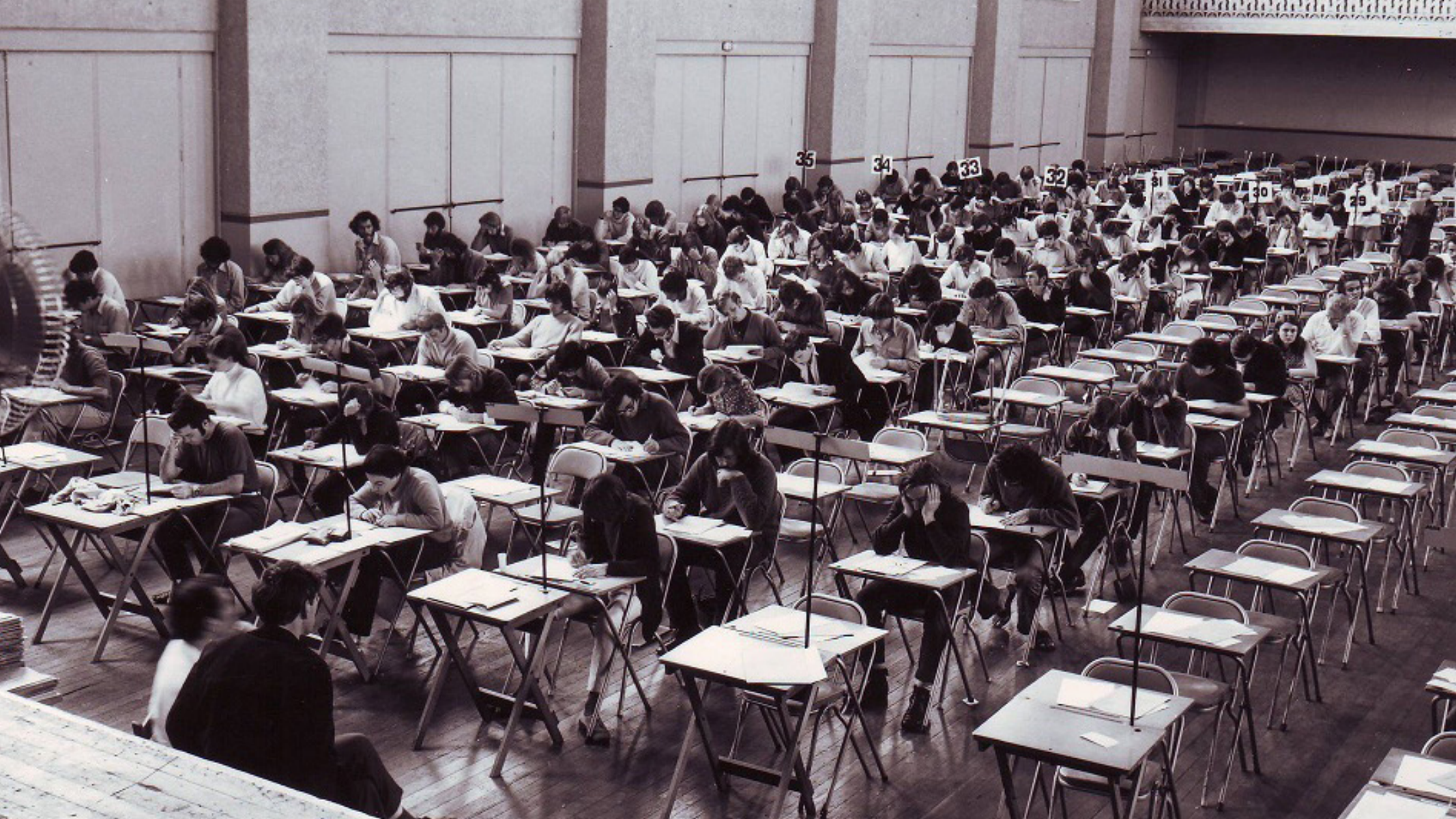
















**assessment focussed on ranking and classifying,  
not on developing 21st century skills**



1 purposes





1 purposes

2 problems



1 purposes

2 problems

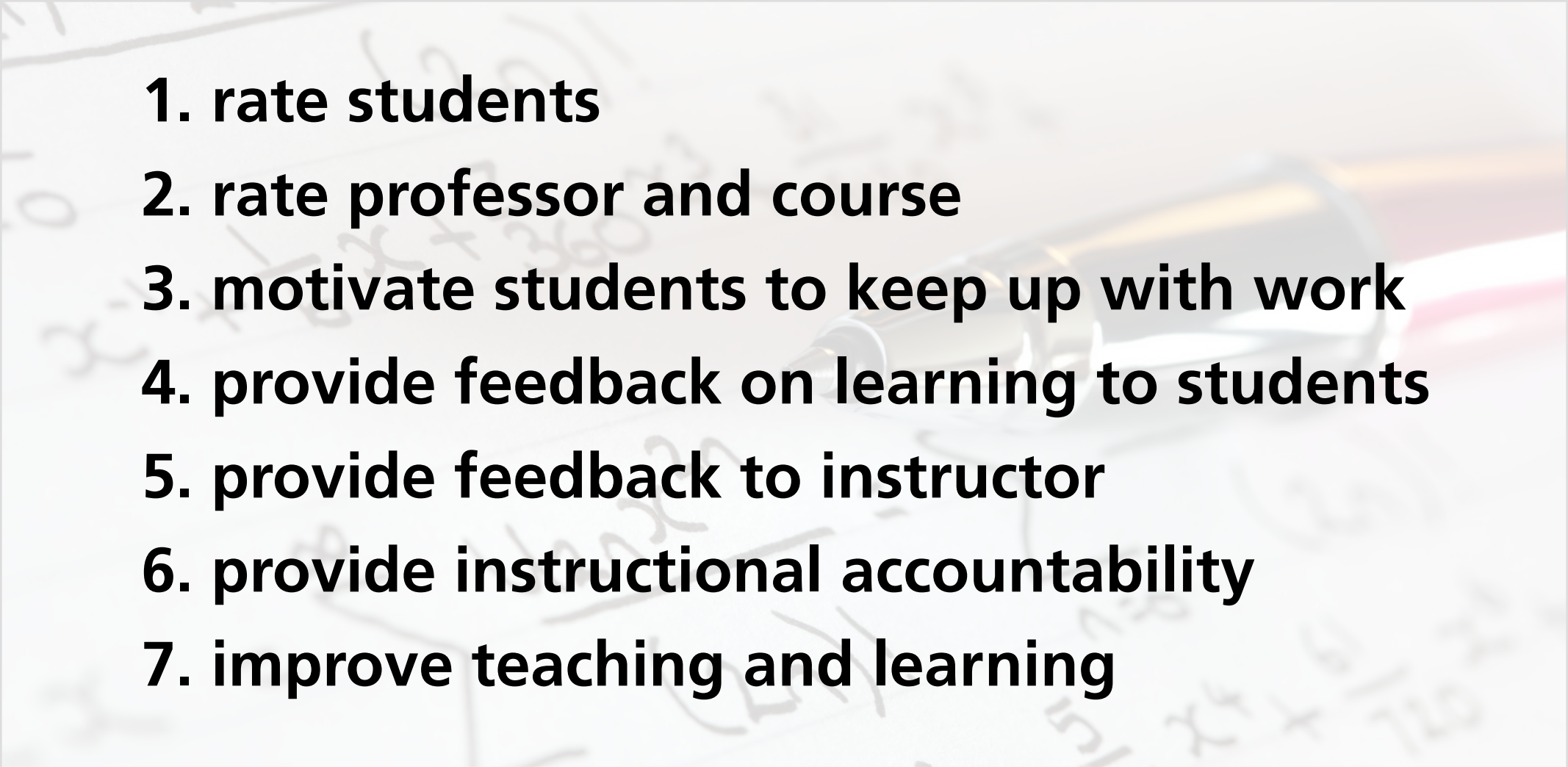
3 improvements



**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**

**1** purposes

**2** problems



problem

outcome

**KNOWN**

**1** purposes

**2** problems

**problem**

**solution**

**outcome**

**KNOWN**

**1** purposes

**2** problems



problem

solution

outcome

UNKNOWN

KNOWN

1 purposes

2 problems

problem

solution

outcome

UNKNOWN

KNOWN

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

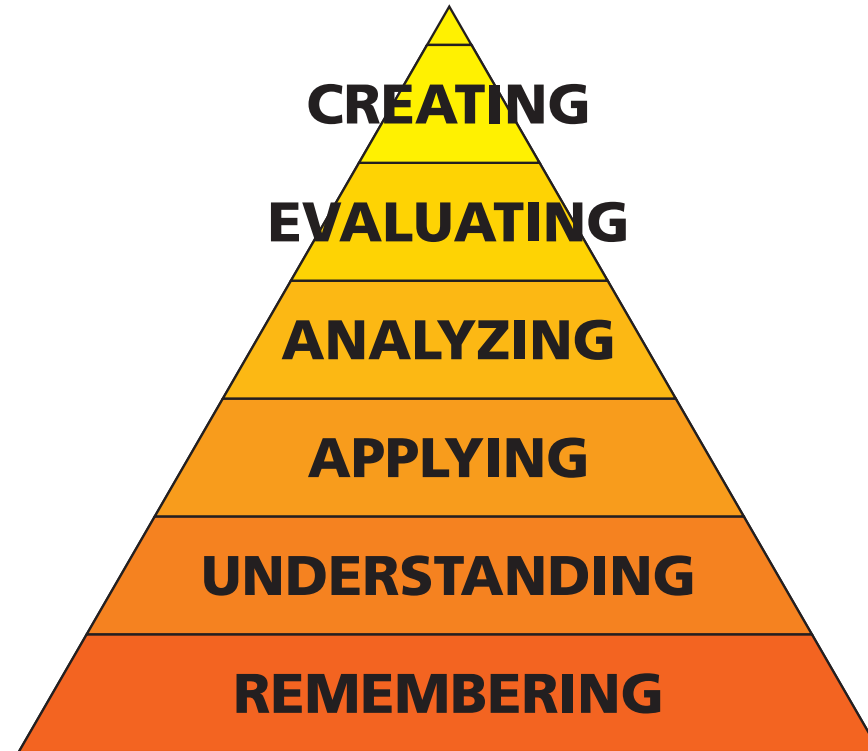
KNOWN

UNKNOWN

1 purposes

2 problems

## Thinking skills



prob

prob

① purposes

② problems

**On a Saturday afternoon, you pull into a parking lot with unmetered 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 unmetered 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.**

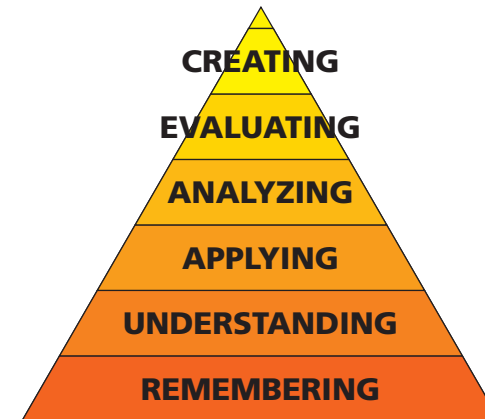
**How long do you have to wait before someone frees up a space?**

**Requires:**

**Assumptions**

**Developing a model**

**Applying that model**



On a Saturday afternoon, you pull into a parking lot with unmetered 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.**

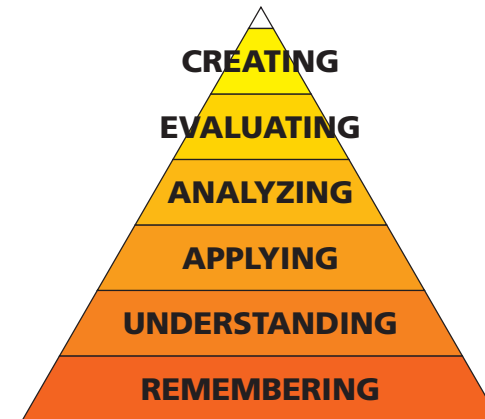
How long do you have to wait before someone frees up a space?

**Requires:**

Assumptions

**Developing a model**

**Applying that model**





On a Saturday afternoon, you pull into a parking lot with unmetered 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.

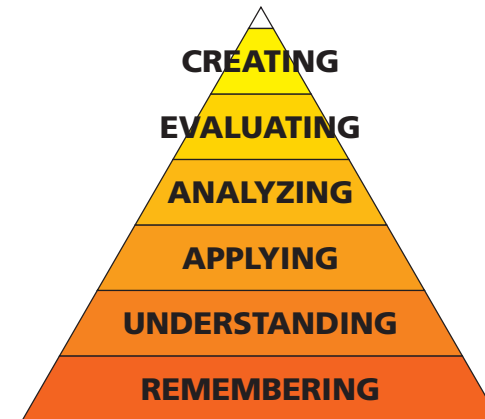
**Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?**

**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. 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.

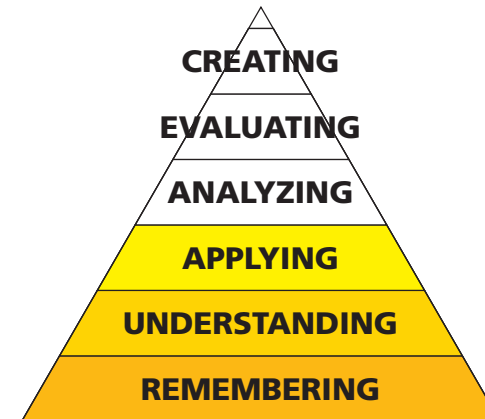
**Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?**

**Requires:**

**Assumptions**

**Developing a model**

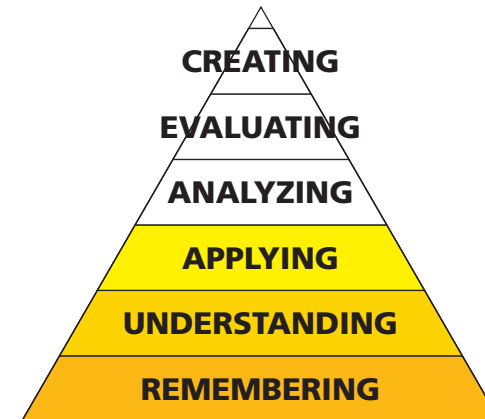
**Applying that model**





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.

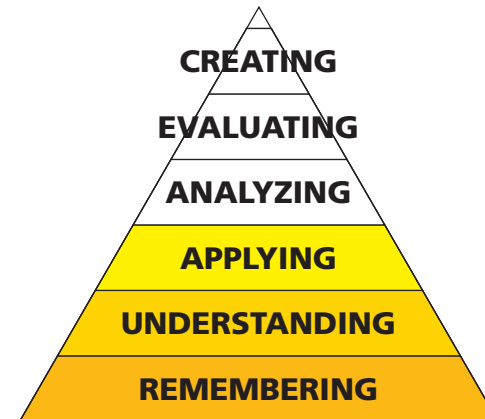
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How long do you have to wait before someone frees up a space?

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

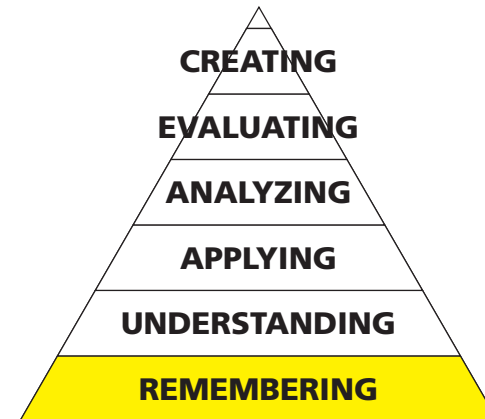




On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

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

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





1 purposes

2 problems





**1** purposes

**2** problems





1 purposes

2 problems



problem

solution

outcome

problem

**REAL**  
problem solving

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:

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

integral is thus:

$$\int_0^4 \int_0^{2\pi} \int_0^\pi (\rho^2 \sin \phi) \rho \, d\phi \, d\theta \, d\rho$$
$$= \left\{ \int_{\rho=0}^4 \rho^3 \, d\rho \right\} \left\{ \int_{\theta=0}^{2\pi} d\theta \right\} \left\{ \frac{1}{2} \int_{\phi=0}^\pi \sin(2\phi) \, d\phi \right\} = \boxed{0}$$



A person with dark hair is sleeping at a desk. Their head is resting on their hand, and a pen is held in their other hand, poised over an open book. A white mug is on the desk to the left. The scene is dimly lit, suggesting a late night or early morning.

# high-stakes examinations promote cramming



**1** purposes

**2** problems

A person with dark hair is sleeping at a desk, their head resting on their hand. A white mug is on the desk to the left. In the background, a clock is visible. The text 'information stored in short-term memory' is overlaid in the center.

# 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

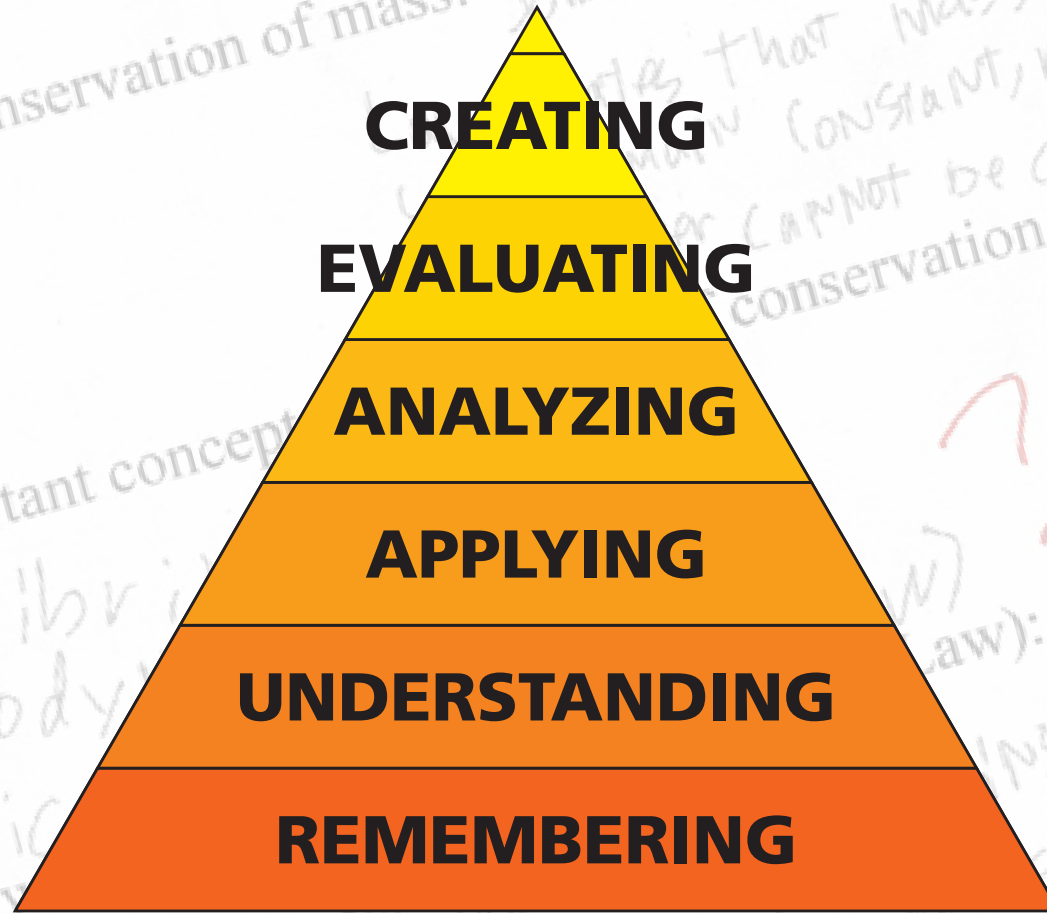
**2** problems

...but ...

1 purposes

2 problems





**1** purposes

**2** problems

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

**REMEMBERING**

**1** purposes

**2** problems

and then there is...

- grade inflation
- cheating

1 purposes

2 problems





**1** purposes

**2** problems

**3** improvements



**mimic real life**

**1** purposes

**2** problems

**3** improvements



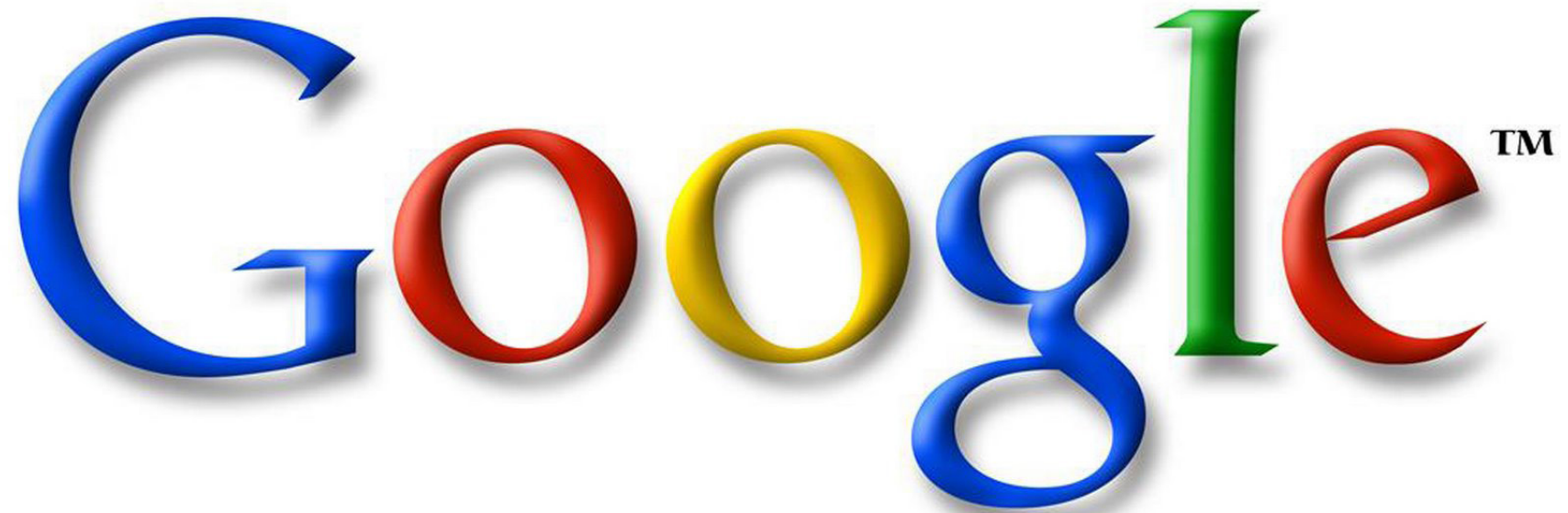
# open-book exam

**1** purposes

**2** problems

**3** improvements

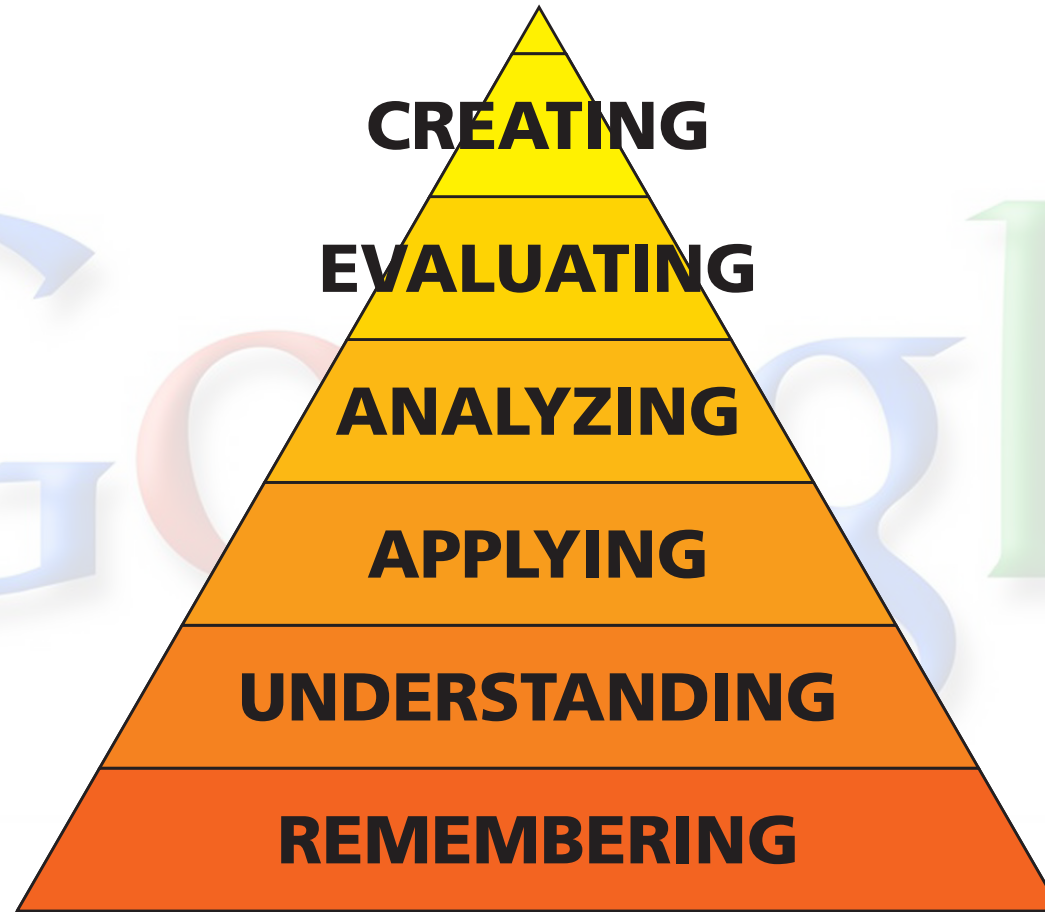




1 purposes

2 problems

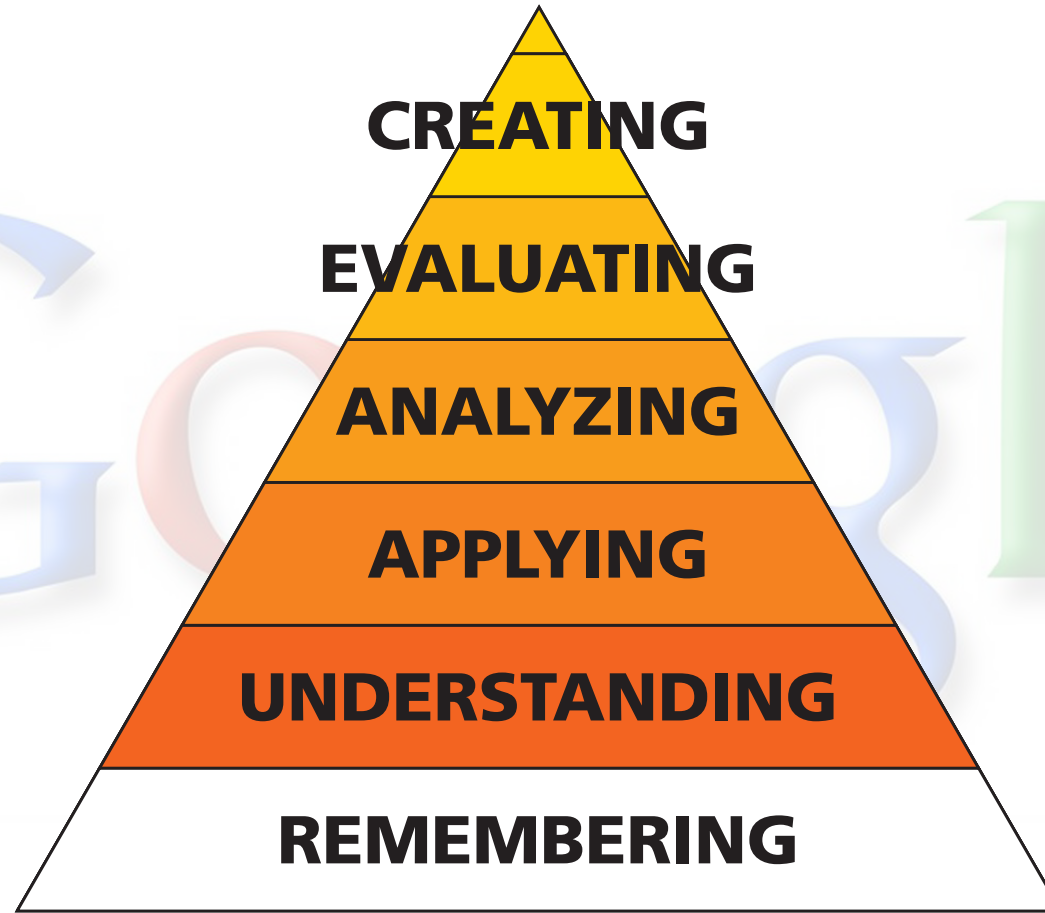
3 improvements



**1** purposes

**2** problems

**3** improvements

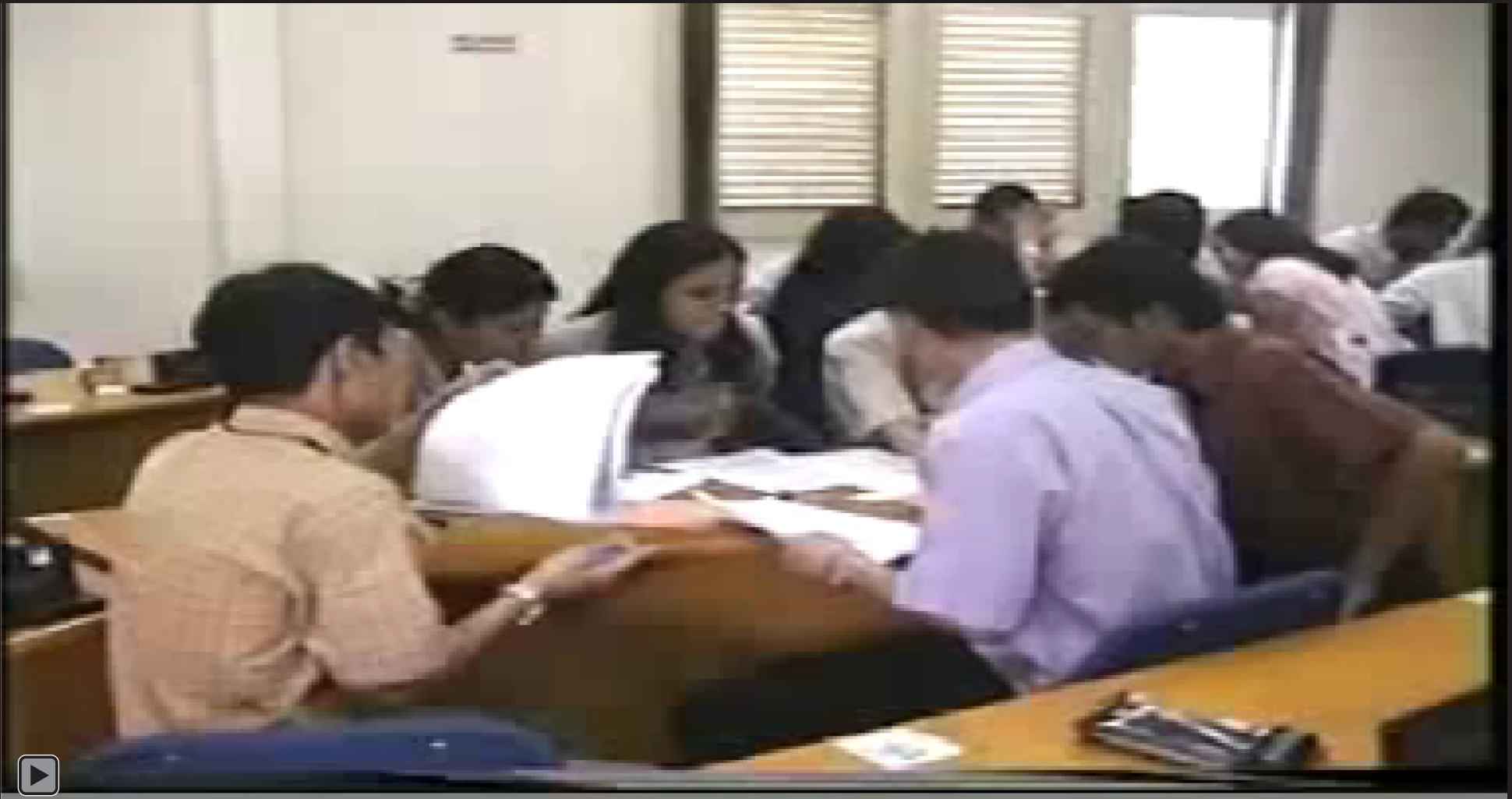


**1** purposes

**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  $\ln y - \sin x$

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  $\ln y - \sin x$

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  $\ln y - \sin x$

1 purposes

2 problems

3 improvements



**1** purposes

**2** problems

**3** improvements



**focus on feedback, not ranking**

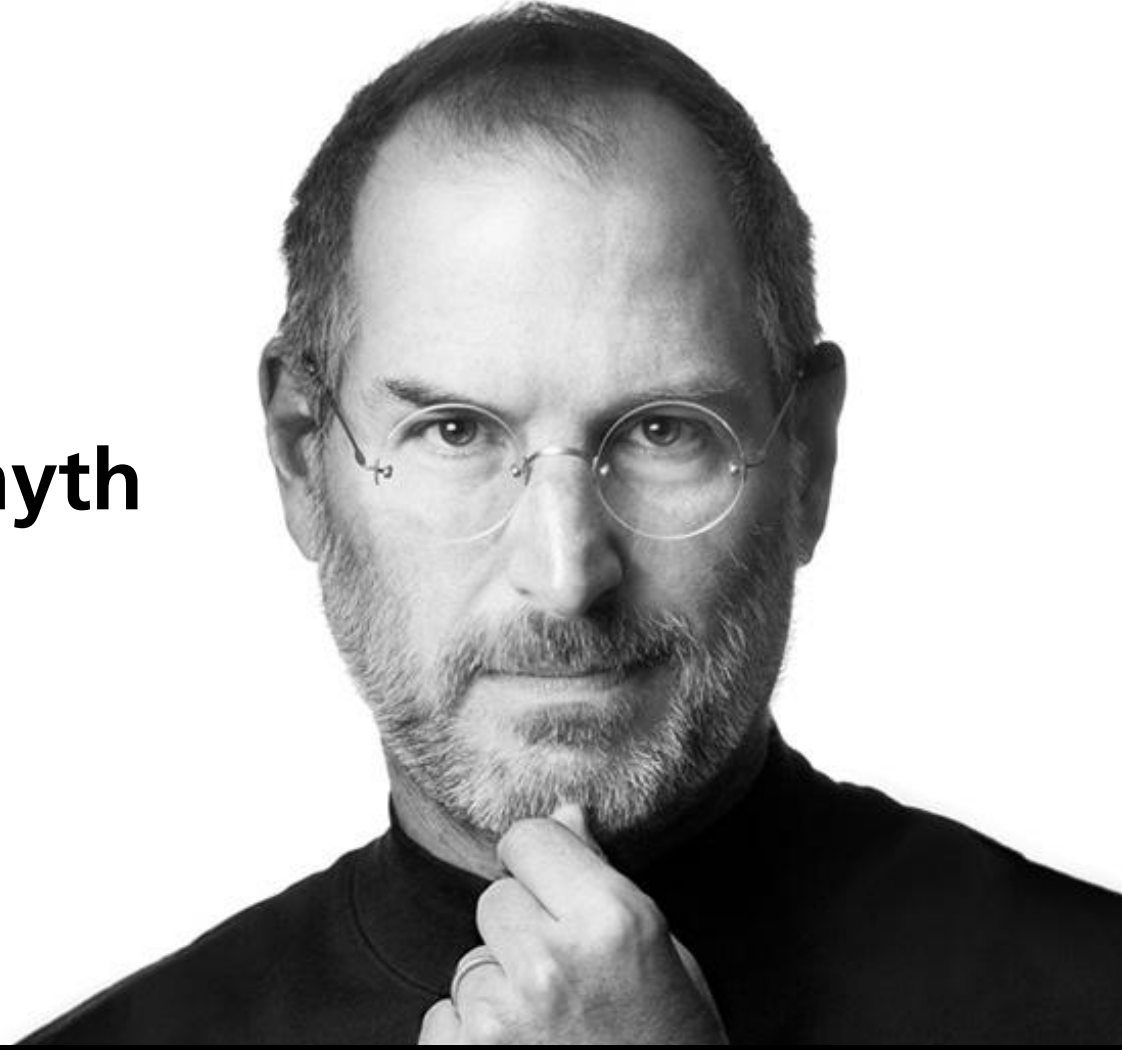
**1** purposes

**2** problems

**3** improvements



# objective ranking: a myth

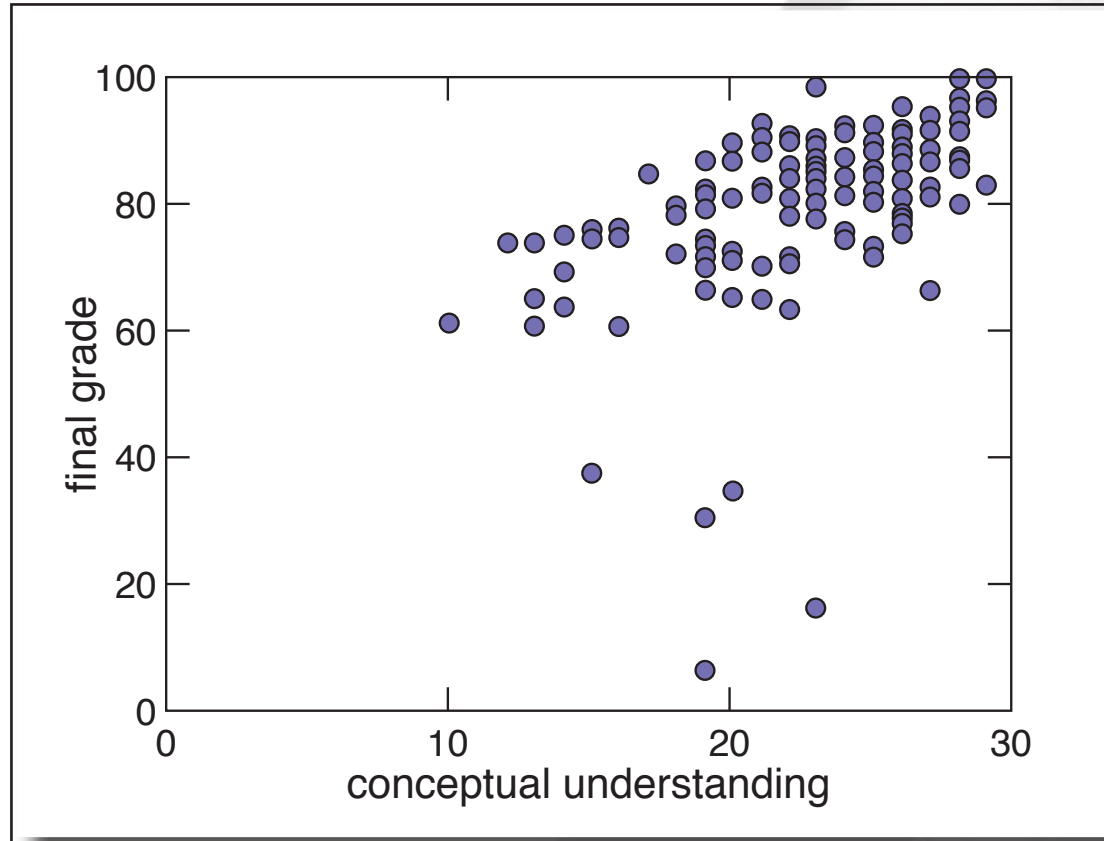


**1** purposes

**2** problems

**3** improvements

# 2 metrics, 2 results

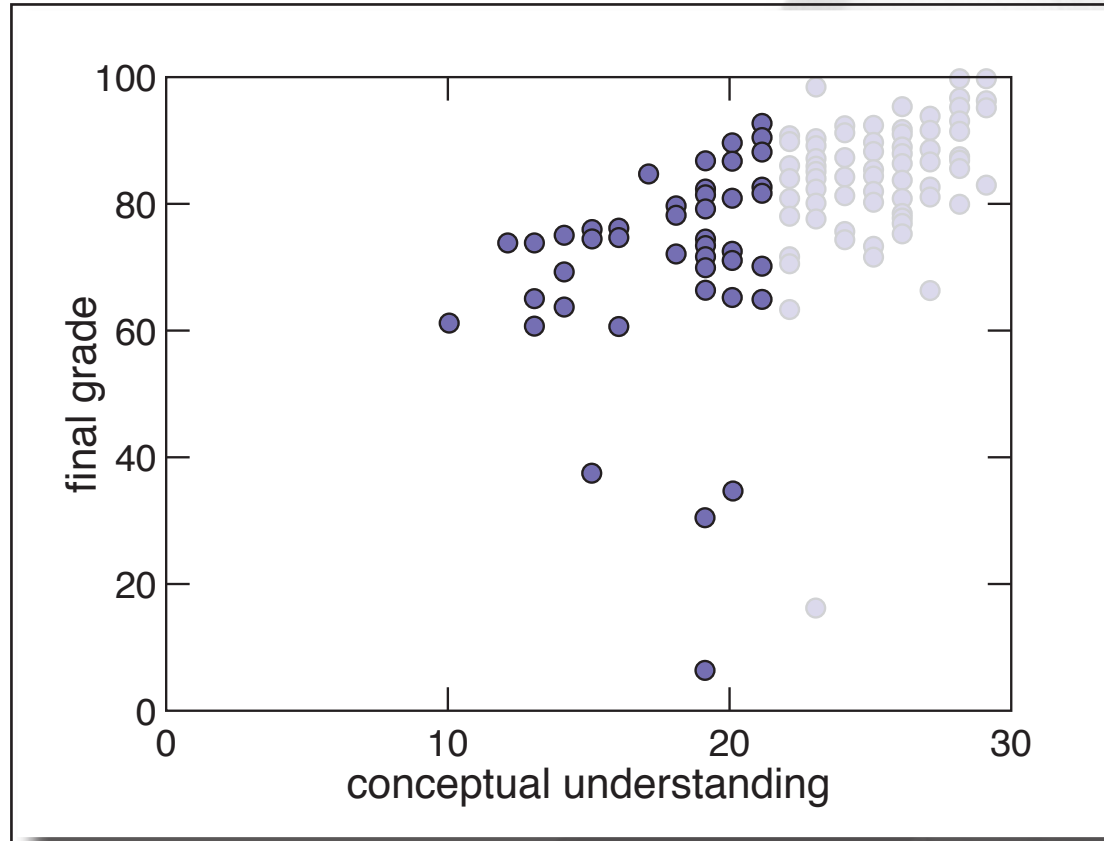


1 purposes

2 problems

3 improvements

# Aristotelian thinkers



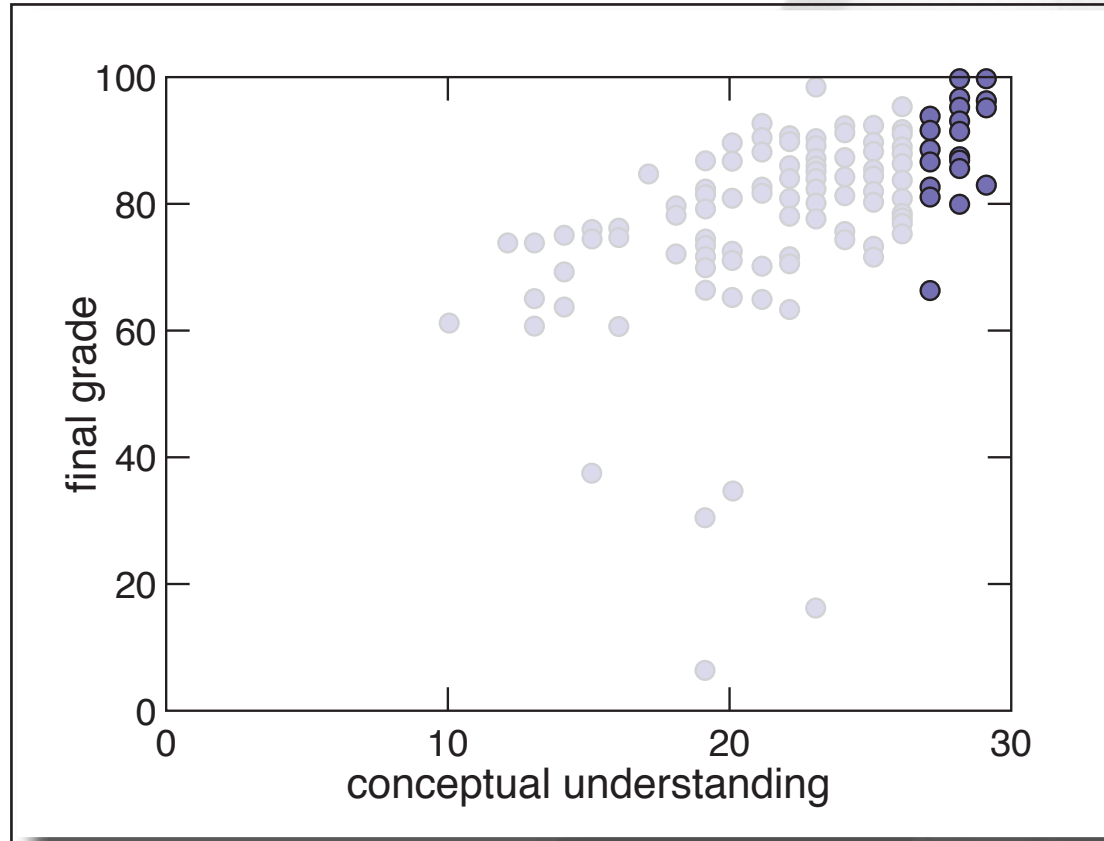
1 purposes

2 problems

3 improvements



# top performers, broad grade distribution

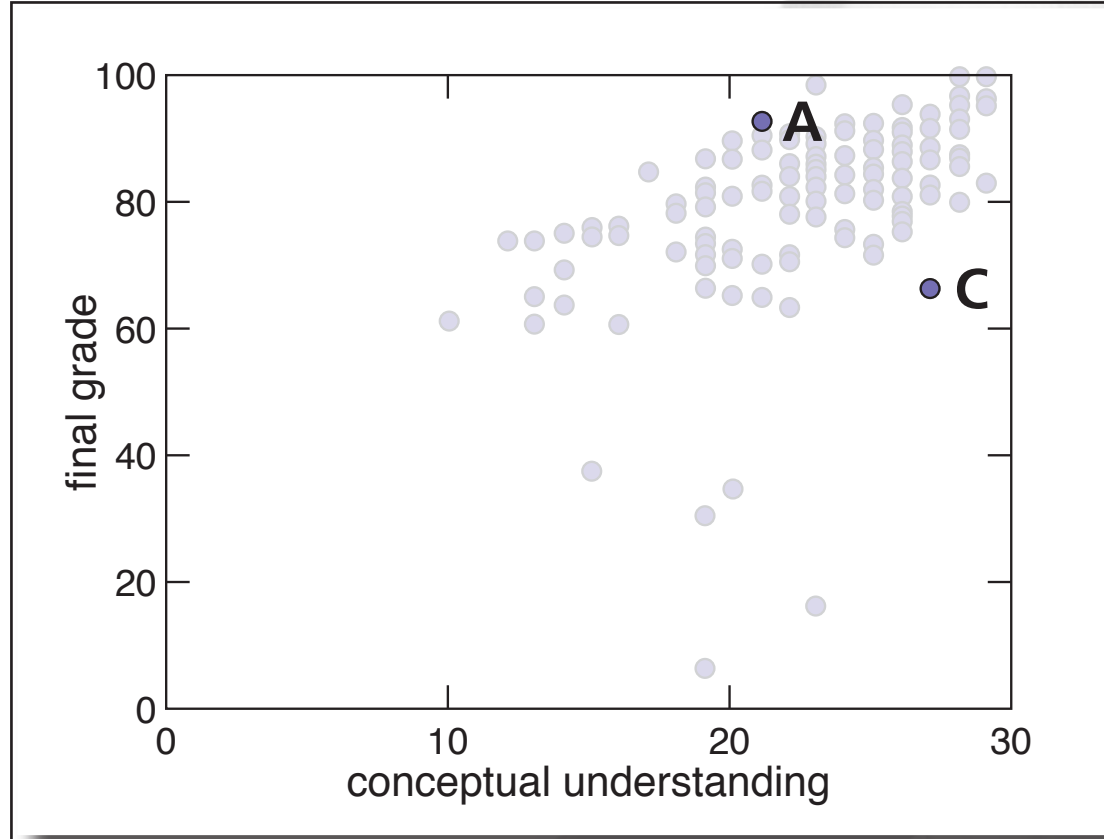


① purposes

② problems

③ improvements

# objectivity or injustice?



① purposes

② problems

③ improvements



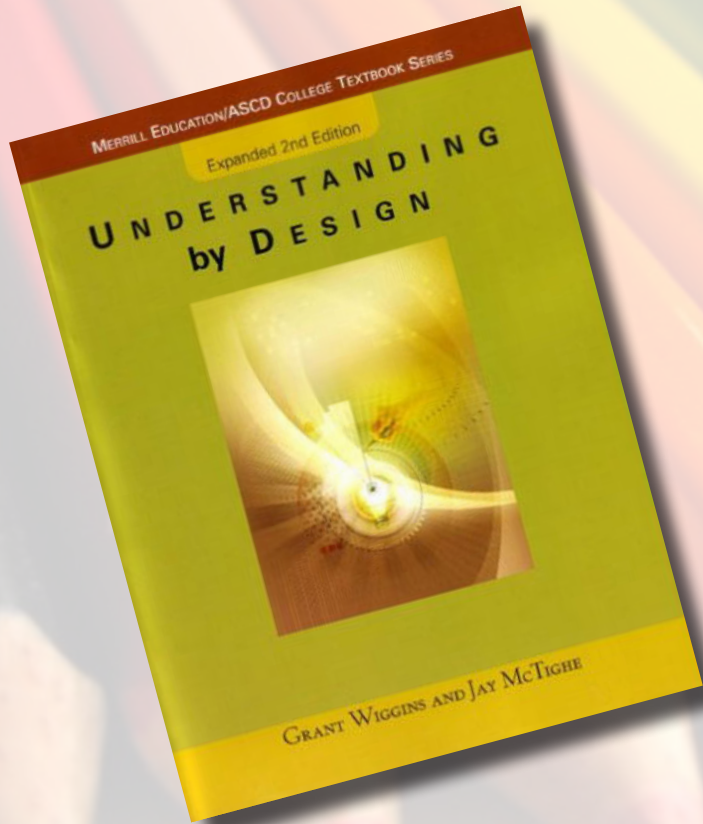
**focus on skills, not content**

**1** purposes

**2** problems

**3** improvements





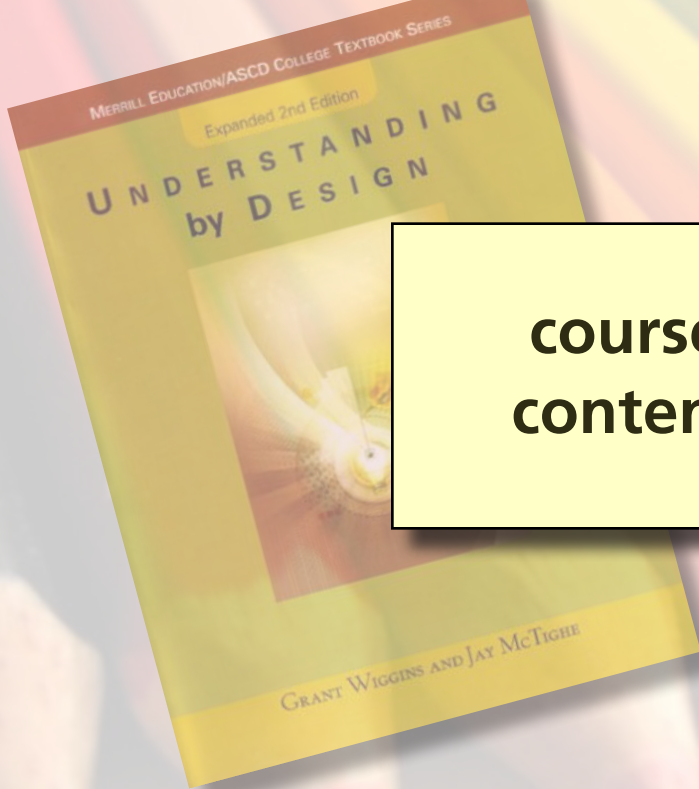
Grant Wiggins and Jay McTighe, *Understanding by Design* (Prentice Hall, 2001)

**1** purposes

**2** problems

**3** improvements

# Traditional approach to course planning



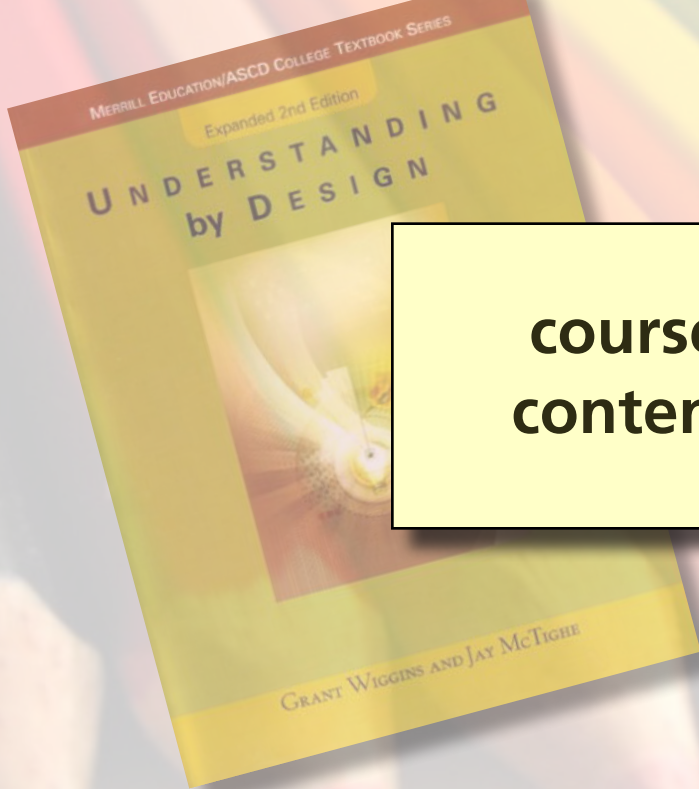
**course  
content**

**1** purposes

**2** problems

**3** improvements

# Traditional approach to course planning



**course  
content**



**assessment**

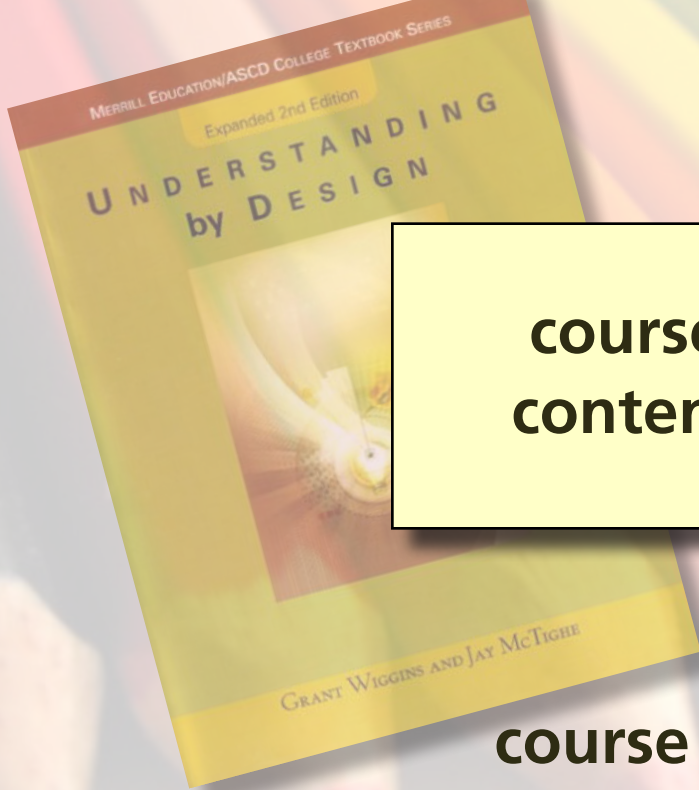
**1** purposes

**2** problems

**3** improvements



# Traditional approach to course planning



**course  
content**



**assessment**

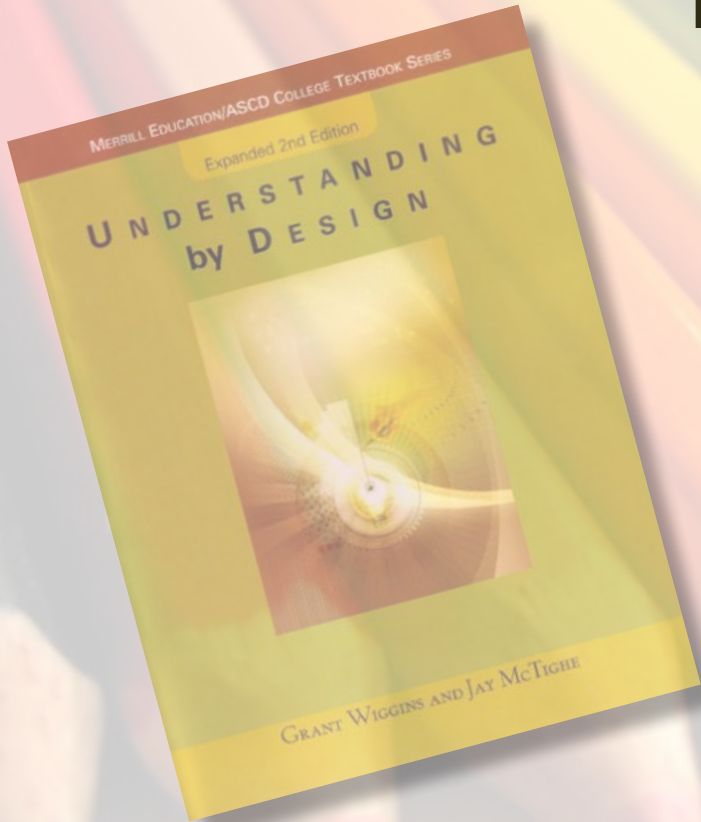
**course determined by content**

**1** purposes

**2** problems

**3** improvements

# Backward design



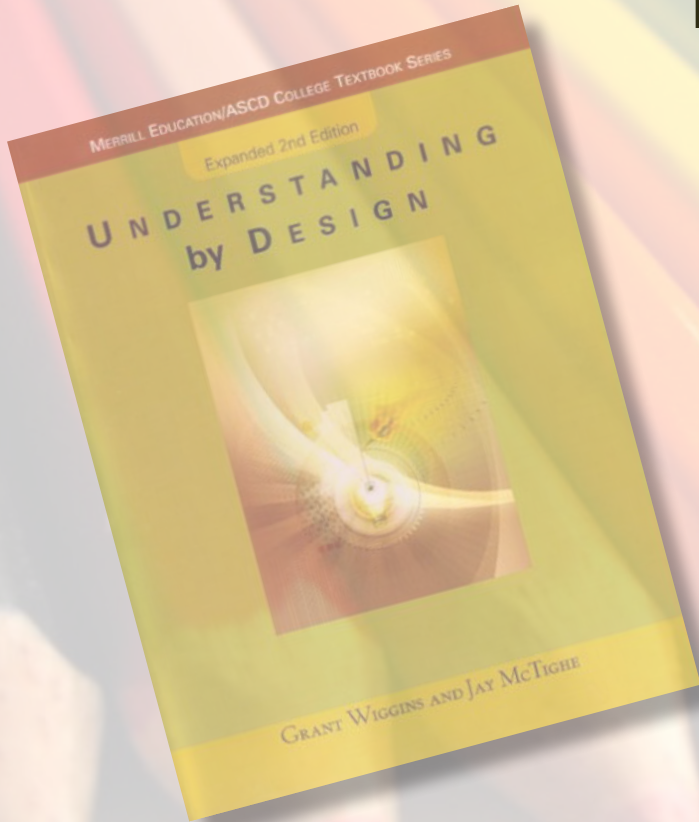
**desired  
outcomes**

**1** purposes

**2** problems

**3** improvements

# Backward design



**acceptable  
evidence**



**desired  
outcomes**

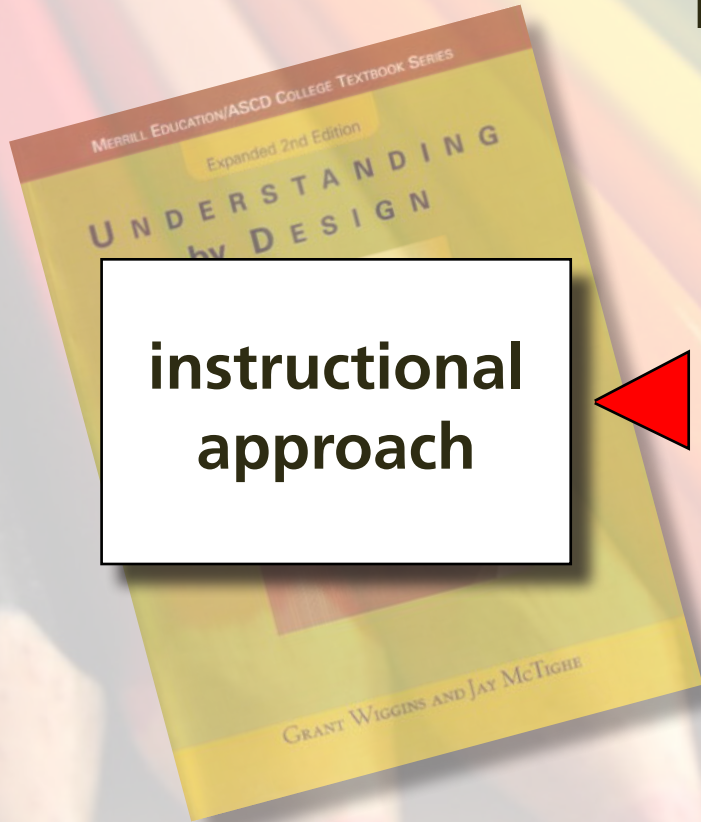
**1 purposes**

**2 problems**

**3 improvements**



# Backward design



**instructional  
approach**



**acceptable  
evidence**



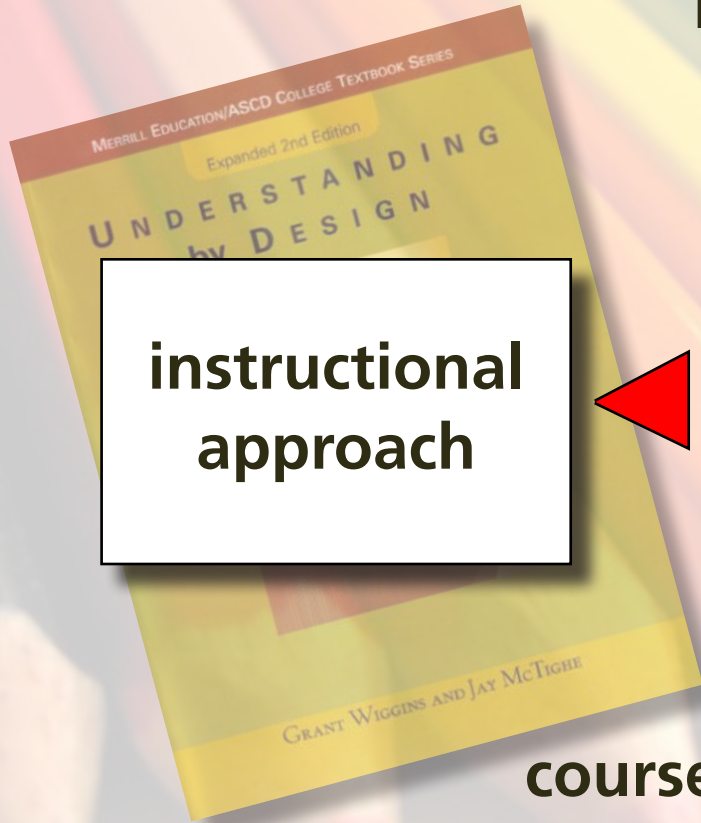
**desired  
outcomes**

**1 purposes**

**2 problems**

**3 improvements**

# Backward design



**instructional  
approach**



**acceptable  
evidence**



**desired  
outcomes**

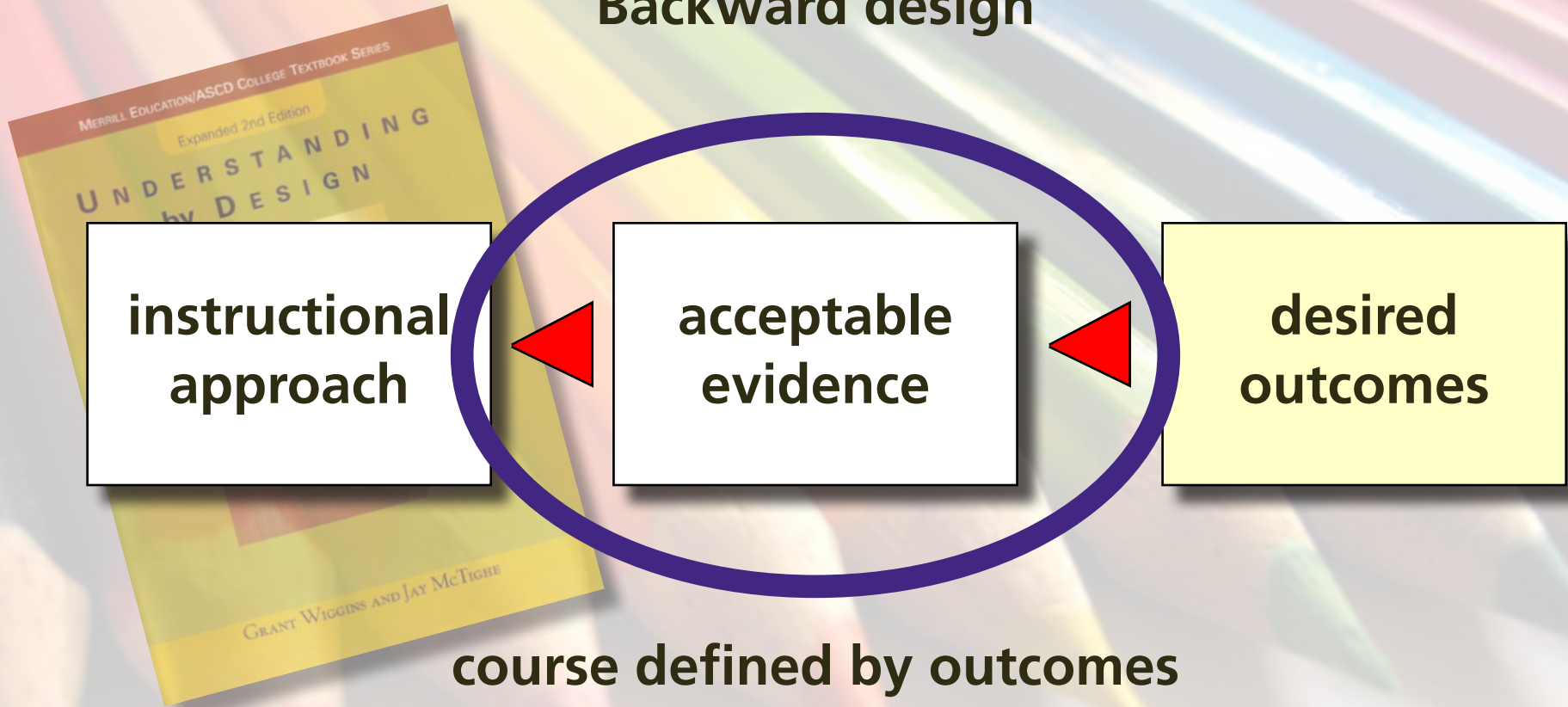
**course defined by outcomes**

**1 purposes**

**2 problems**

**3 improvements**

## Backward design



1 purposes

2 problems

3 improvements





**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](http://cpr.molsci.ucla.edu)

1 purposes

2 problems

3 improvements

# Calibrated Peer Review

[cpr.molsci.ucla.edu](http://cpr.molsci.ucla.edu)

1 purposes

2 problems

3 improvements

# Step 1: assignment & rubric

[cpr.molsci.ucla.edu](http://cpr.molsci.ucla.edu)

1 purposes

2 problems

3 improvements



the three important concepts

Rubric for Calibrated Peer Review

Structure

Title

Opening

Paragraph length

Organization

Closing

# WRITING RUBRIC

**1 = needs improvement**  
does not meet expectations entirely

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

**3 = admirable**  
exceeds expectations  
(rarely selected)

Wordy, long, unimaginative, or inappropriate title

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

Many paragraphs are long (6 or more sentences)

Lacks organization, no logical headings, no transitions between paragraphs

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

Contains incorrect, misstated, irrelevant, or unnecessary facts

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

Mostly predictable based on available information

Basic title

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

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

A few headings OR most paragraphs linked by transitions

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

All facts are 100% correct, relevant, and necessary

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

Some originality apparent

Material appropriate and aimed at target audience AND mostly avoids scientific jargon, colloquialisms or acronyms

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 thought provoking question AND ties back to title and opening hook

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

Original presentation of material; uses the unexpected to capture attention

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

cpr.molsci.ucla.edu

**1** purposes

**2** problems

**3** improvements

**Step 2: upload**

**Step 3: review**

**[cpr.molsci.ucla.edu](http://cpr.molsci.ucla.edu)**

**1** purposes

**2** problems

**3** improvements

**MEDIUM**



**HIGH**

**LOW**

...t new addition to night sky  
...ires fear and awe – Mona Lisa  
...one has noticed  
...ur sky

By now everyone has noticed the unmistakable 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 sky and glaring addition that many fears is in

**The New York Times**

**January 20, 2009**

## OBSERVATORY

# OBSERVATORY

## Spectacular Supernova Observed

By John Glenn

New York, N.Y. — People around the world witnessed the supernova, named 1987A, in recorded history this morning. The supernova, named 1987A, appeared as bright as the full moon. At 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-risers were drawn to the amazing sight. As of press time, the Associated Press reported that the plane was still in the air.

Galileo  
20 January 2008

Yesterday at about 4 p.m., I observed a peculiar object appear in the sky. A glowing flash emitted a few seconds, accompanied its appearance. The object disappeared even in broad daylight. How did this unprecendented event and its consequences for Earth? In order to understand the consequences of this event, we have to look at the life cycle of stars and how they affect the Earth. To fully appreciate it and not be alarmed, we must understand the life cycle of stars and how they affect the Earth. (Pluto, etc.)

1

## 1 purposes

2

## 2 problems

3

### 3 improvements



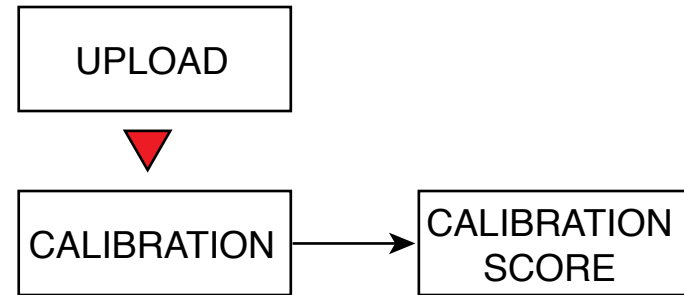
st the three important concepts

Equilibrium  
Thermodynamics  
Kinetics (both)

Describe the Law of definite proportions

A chemical compound  
Same proportion  
Unrelated, I saw  
chemical reaction do

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**1** purposes

**2** problems

**3** improvements

st the three important concepts

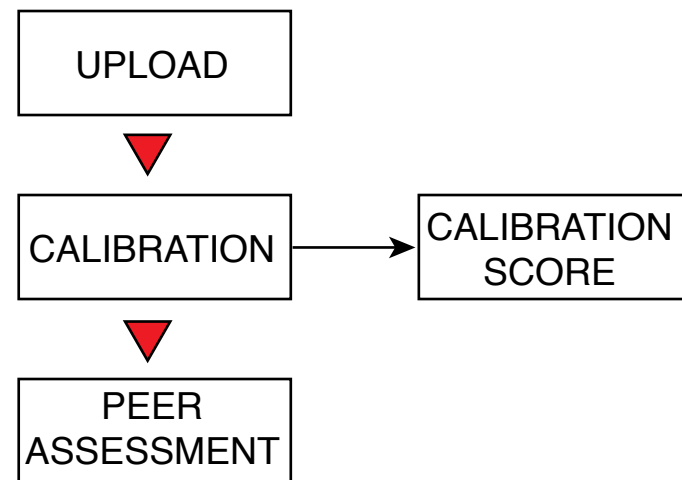
Equilibrium  
Thermodynamics  
Kinetics (both)

Describe the Law of definite proportions

A chemical compound  
Same proportion  
Unrelated, I saw  
A chemical reaction does

5 pts) A chemical reaction does

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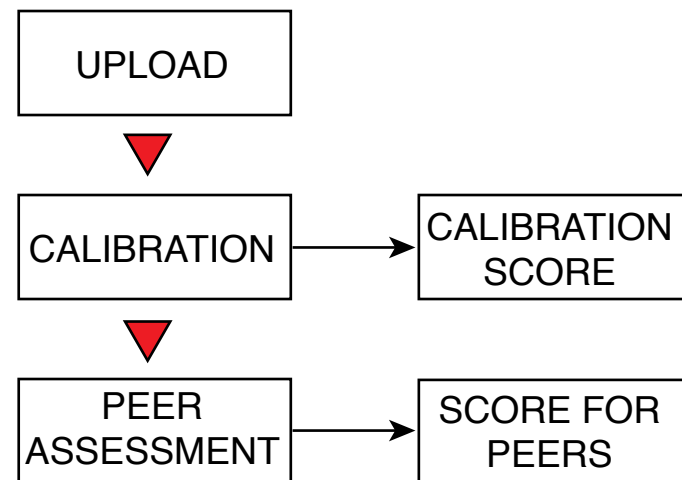
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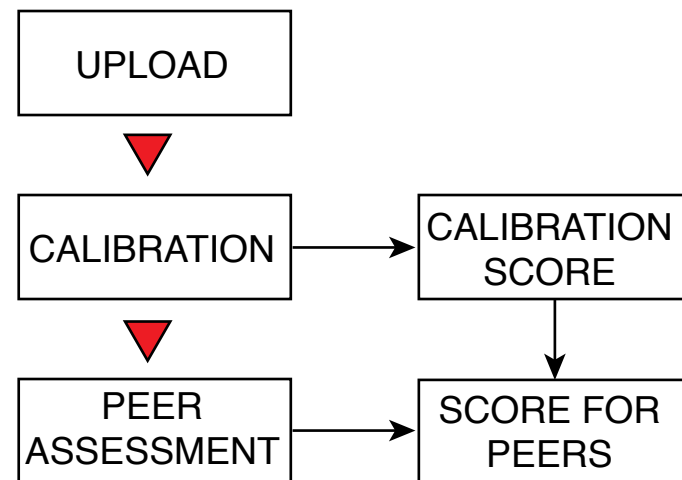
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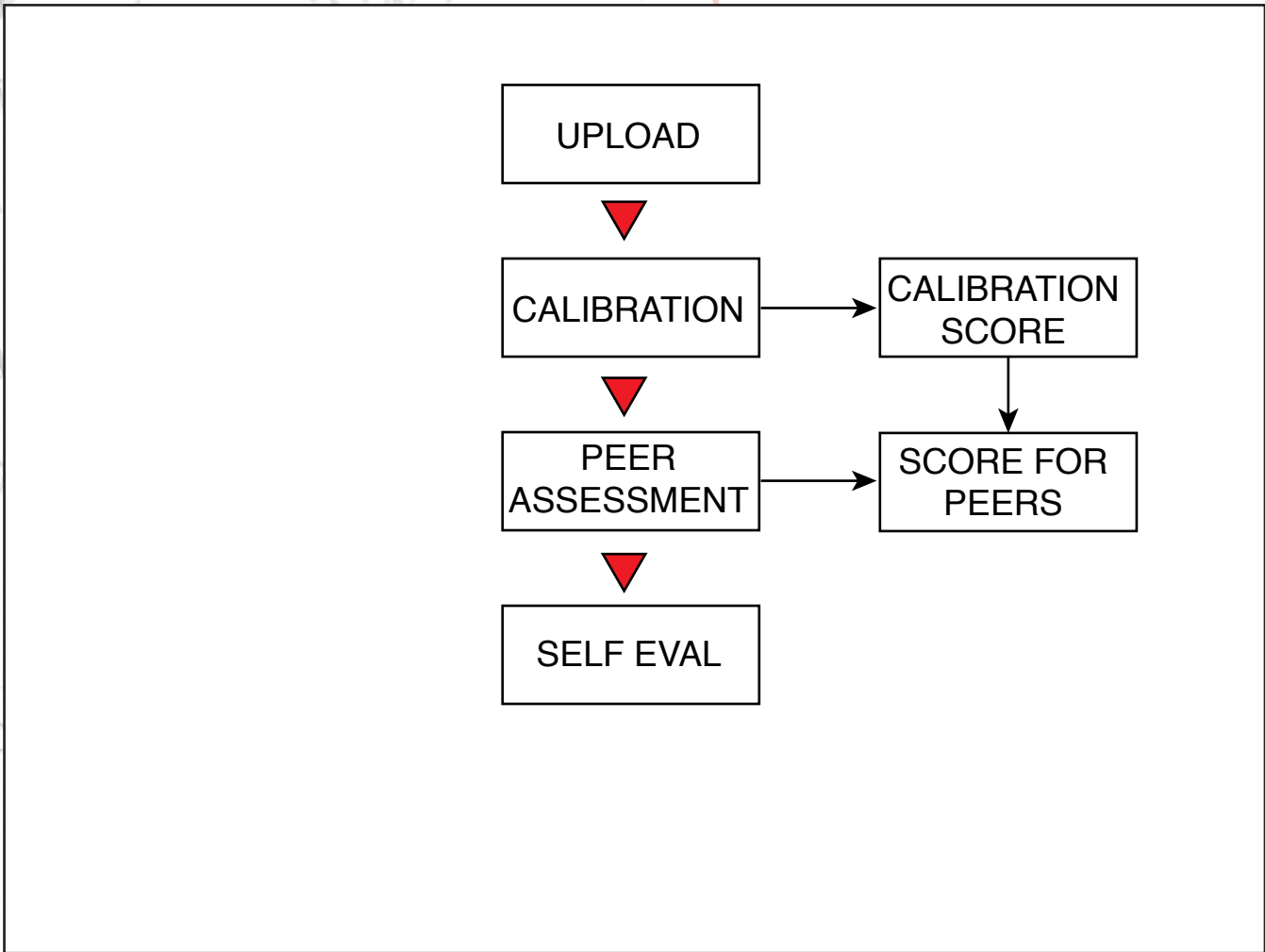
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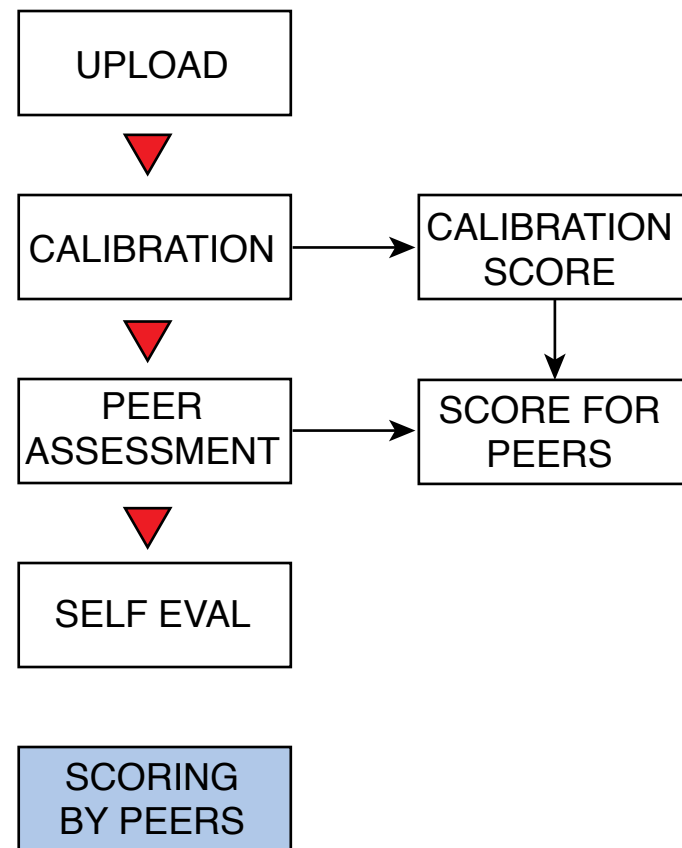
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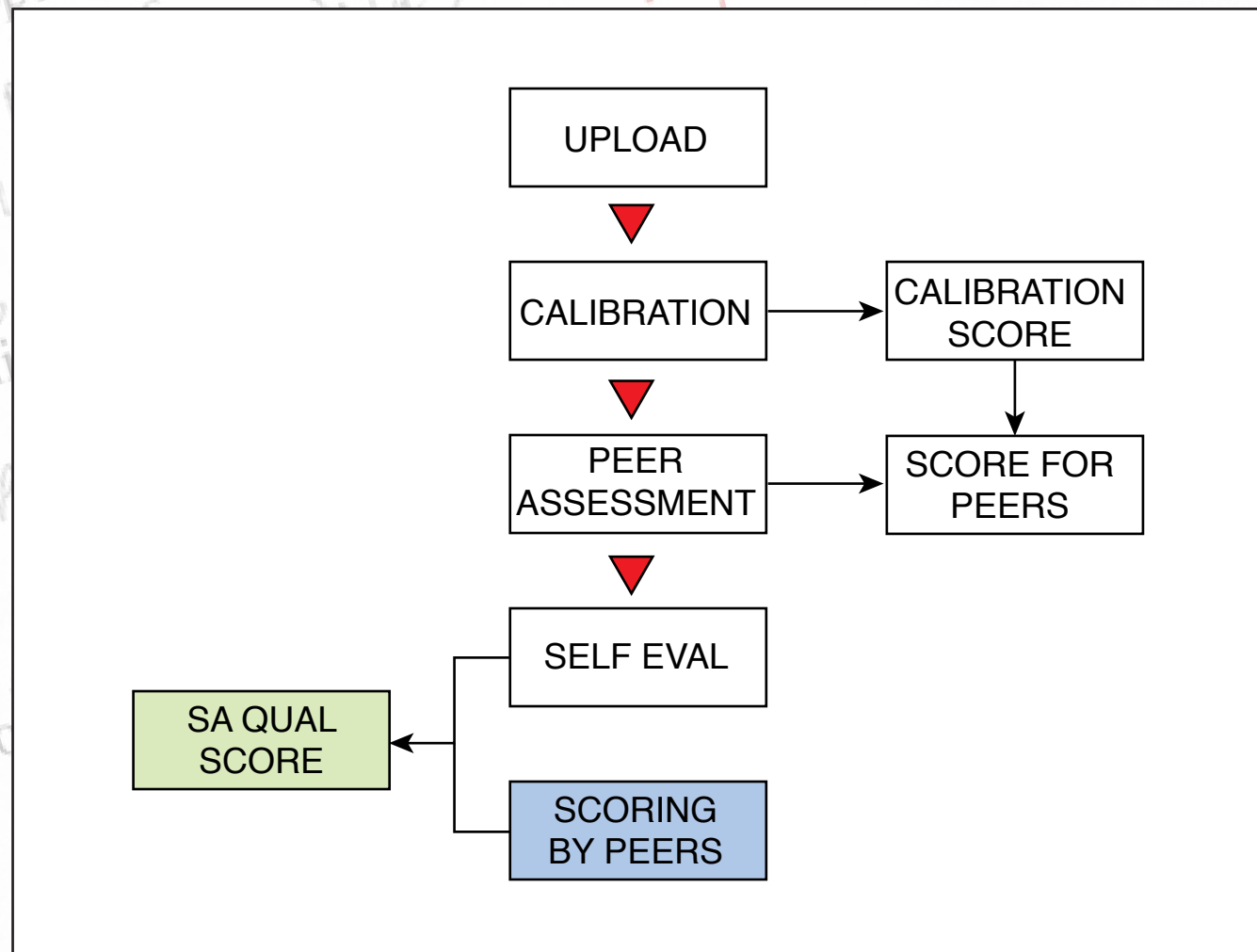
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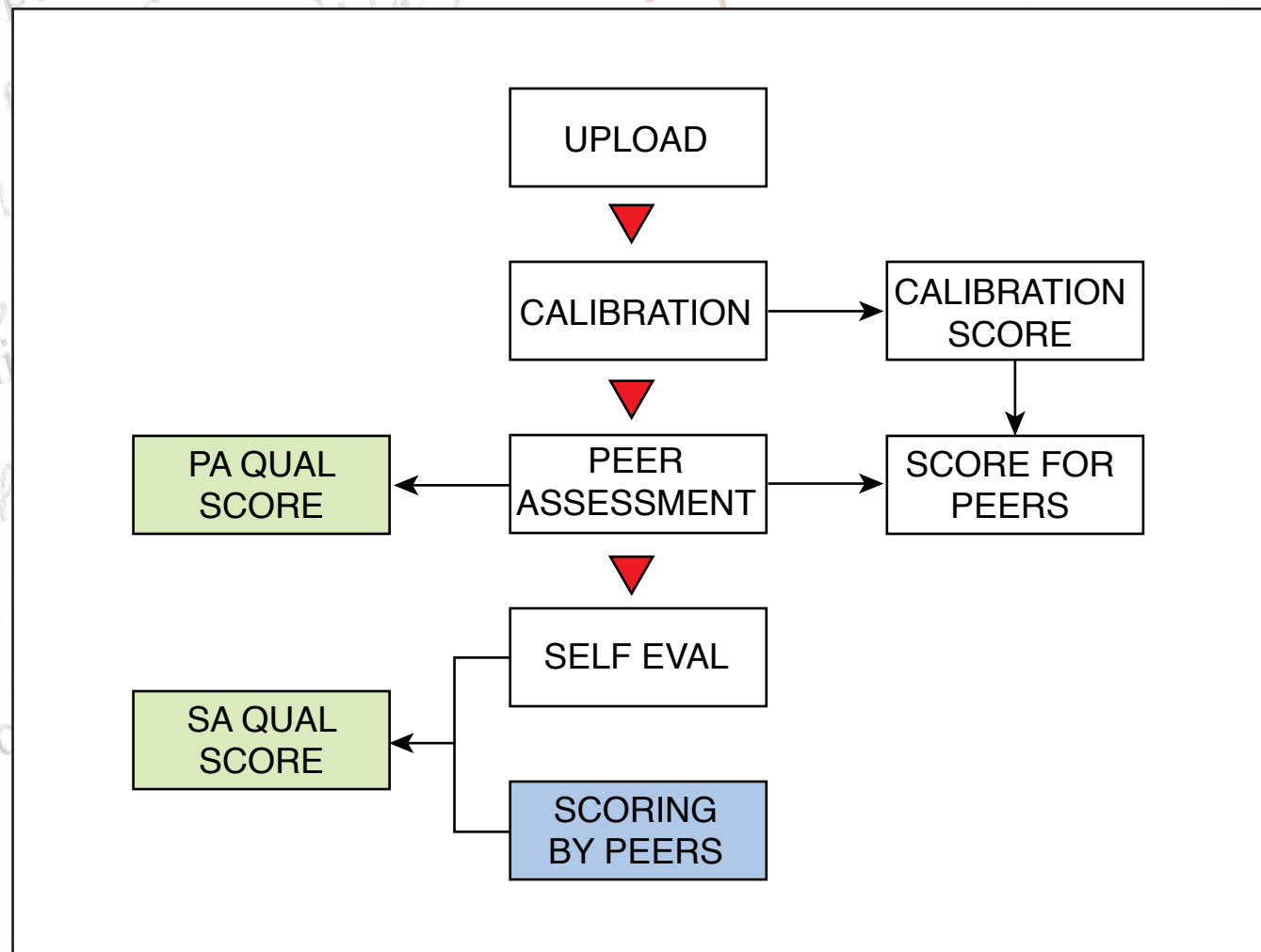
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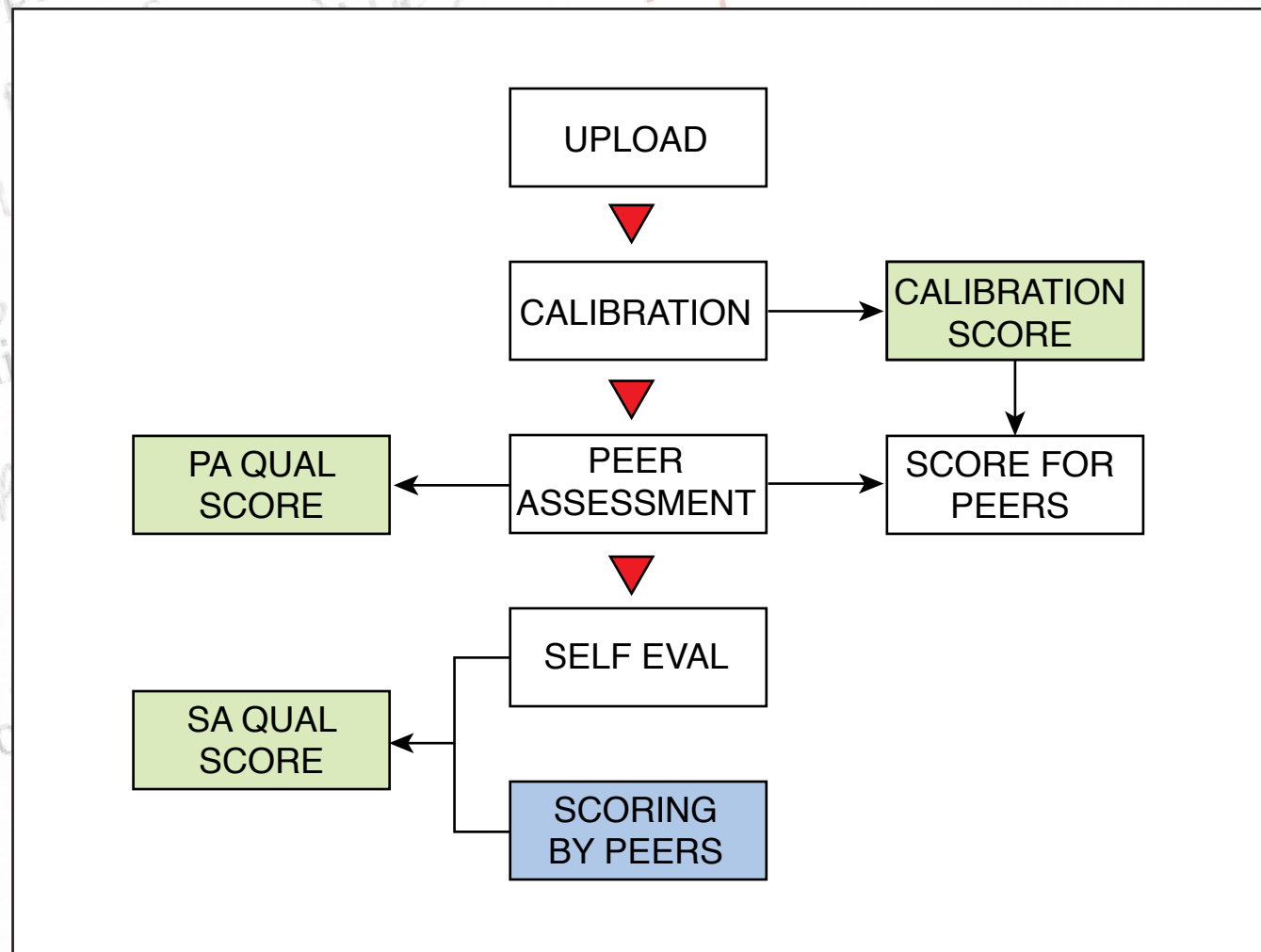
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A large, empty classroom with rows of desks and chairs, overlaid with the text "rethink assessment". The classroom is filled with rows of light-colored wooden desks and black chairs, arranged in a grid pattern. The floor is a light blue color with yellow and red lines marking the aisles. The walls are a light beige color, and there are several doors visible in the background. The text "rethink assessment" is written in a large, bold, black font with a blue outline, centered over the image.

**rethink  
assessment**







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