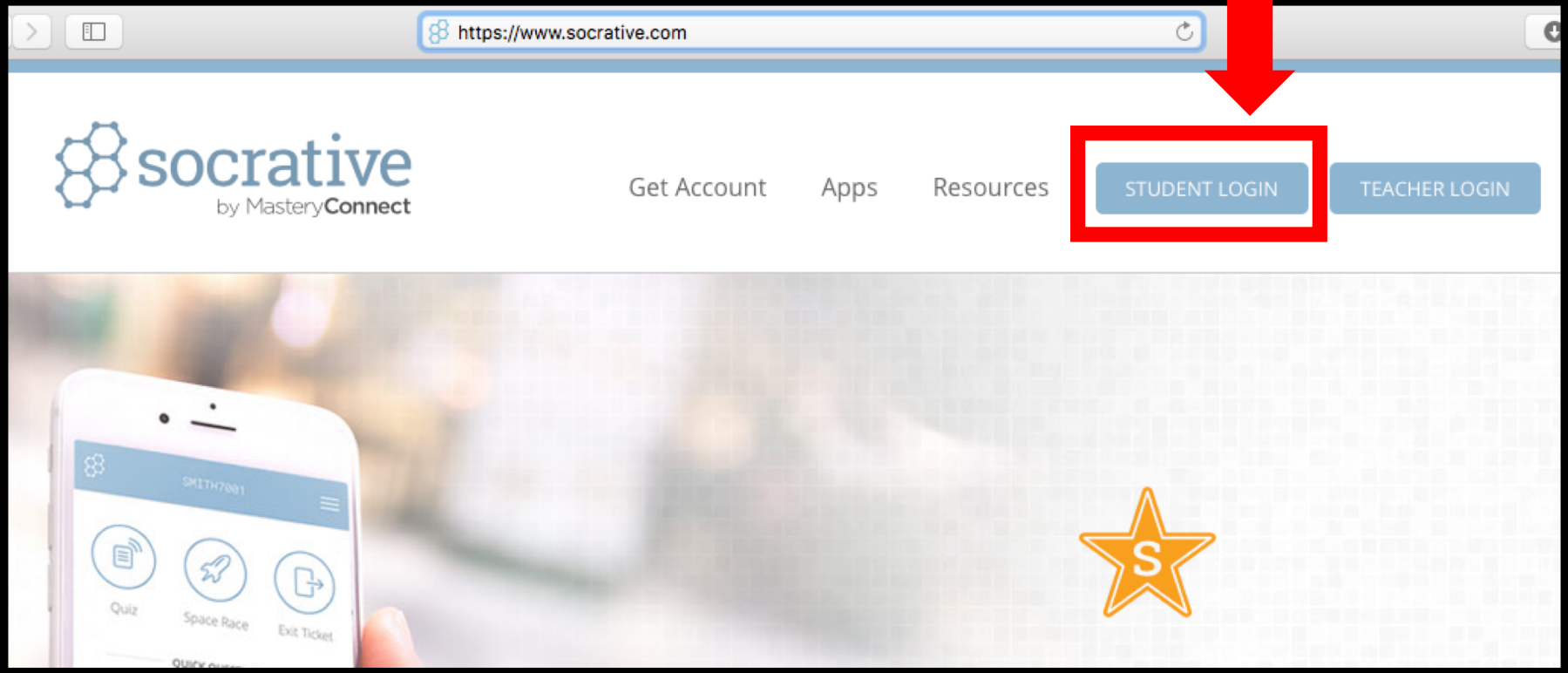
Please visit: socrative.com



Room Name: **myth**

(aka Just Joe, Bio Joe from Fresno…)

- Assistant Professor, Biology, California State University, Fresno
- Ed tech & digital pedagogy *connoisseur*
- Faculty Professional Developer

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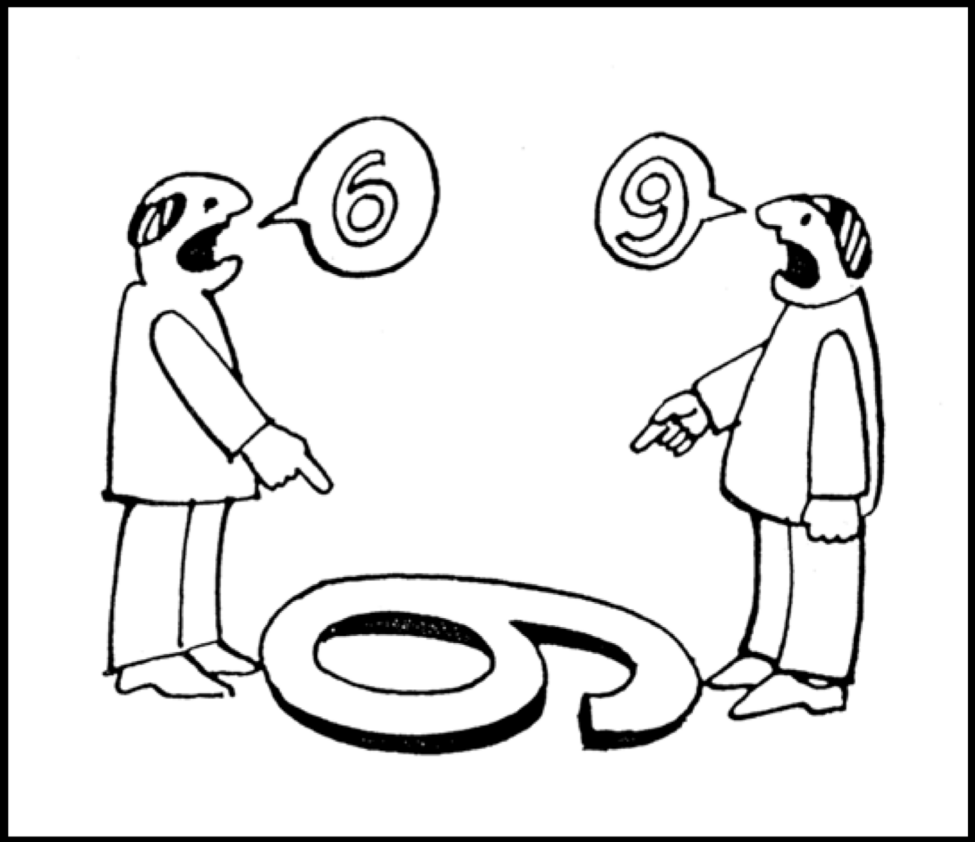
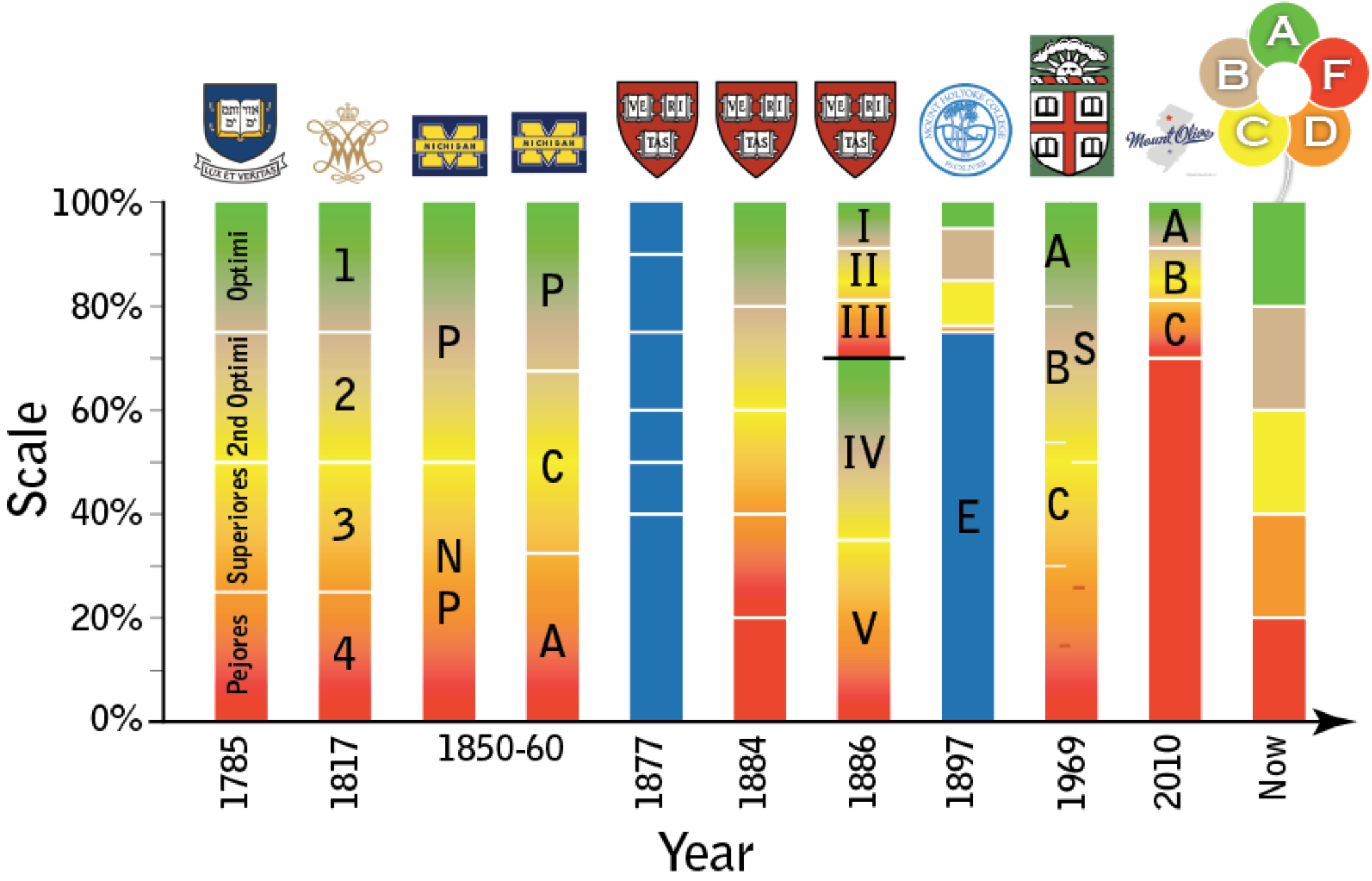
tabletpedagogy.blogspot.com
youtube.com/c/JosephRoss

Syllabus

Student evaluation dogmas (US)

A is for Arbitrary




Scale
100%
80%
60%
40%
20%
0%
Optimi
2nd Optimi
Superiores
Pejores
1
2
3
4
P
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A
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C
A
B
C
1785
1817
1850-60
1877
1884
1886
1897
1969
2010
Now
Year
A
B
C
D
F

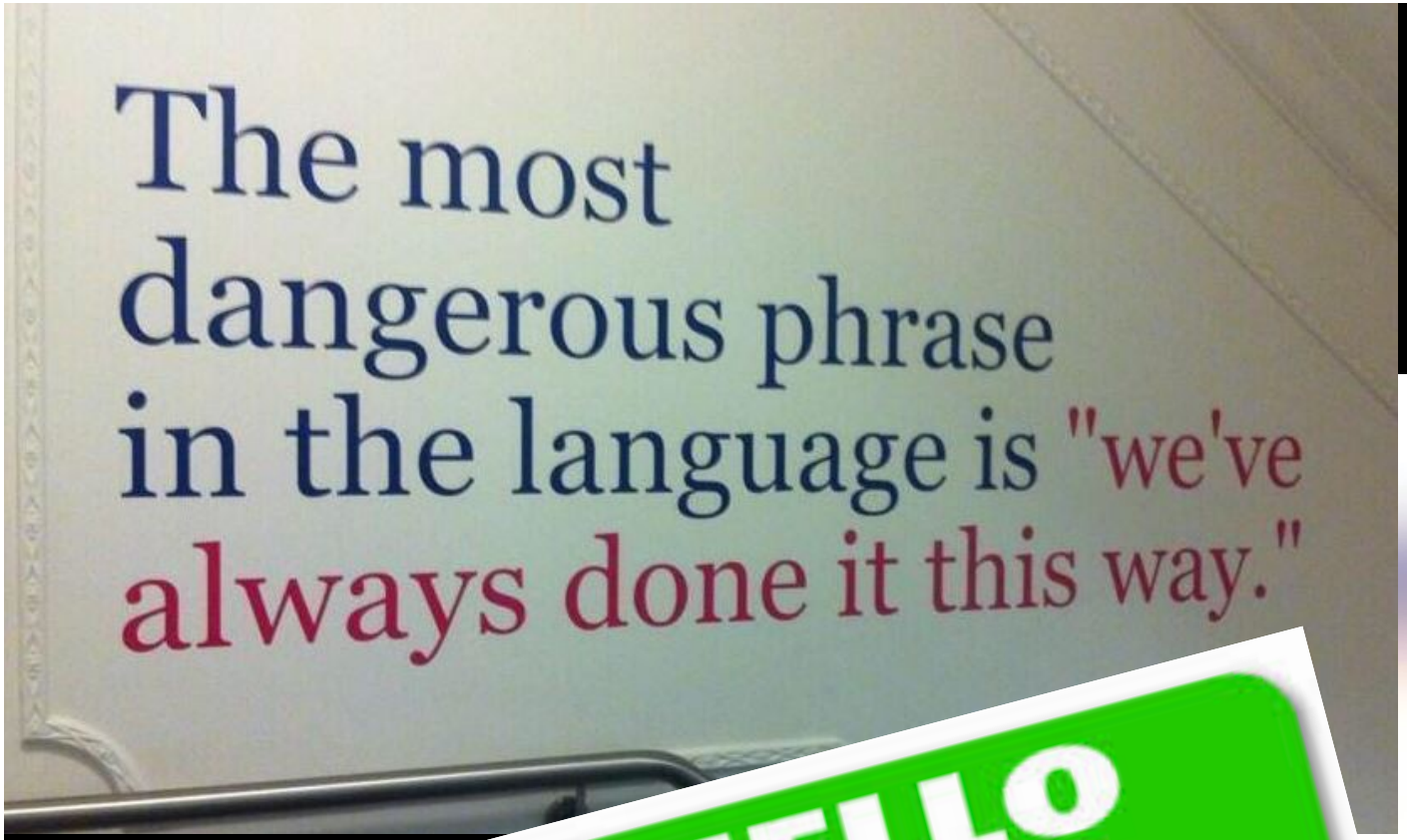
A: Myth of content mastery of the top ten percent

Remember that
the 6 most expensive
words in business are:

"We've always done it
that way."

Catherine DeVrye

Former IBM executive



Remember that
the 6 most expensive
words in business are:

"We've always done it
that way."

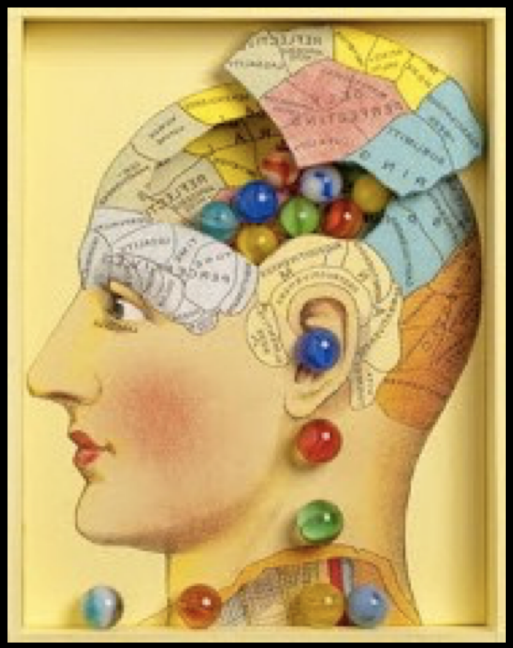
Catherine DeVrye

Former IBM executive

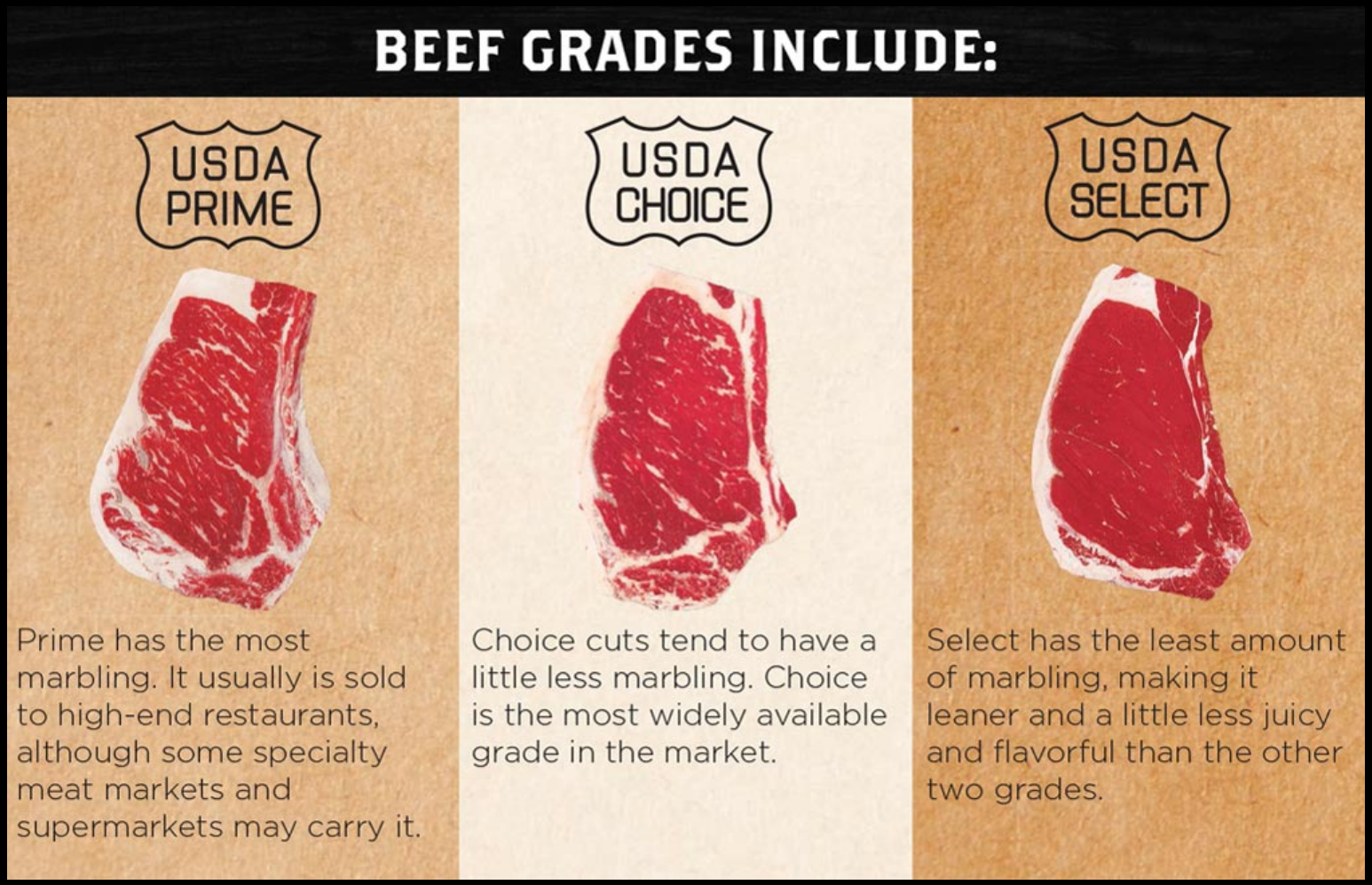
Philosophy

- Students should understand my expectations
- I want all students to earn an A (fairly and without grade inflation)
- Grades should be based on a standard that can easily be explained & documented

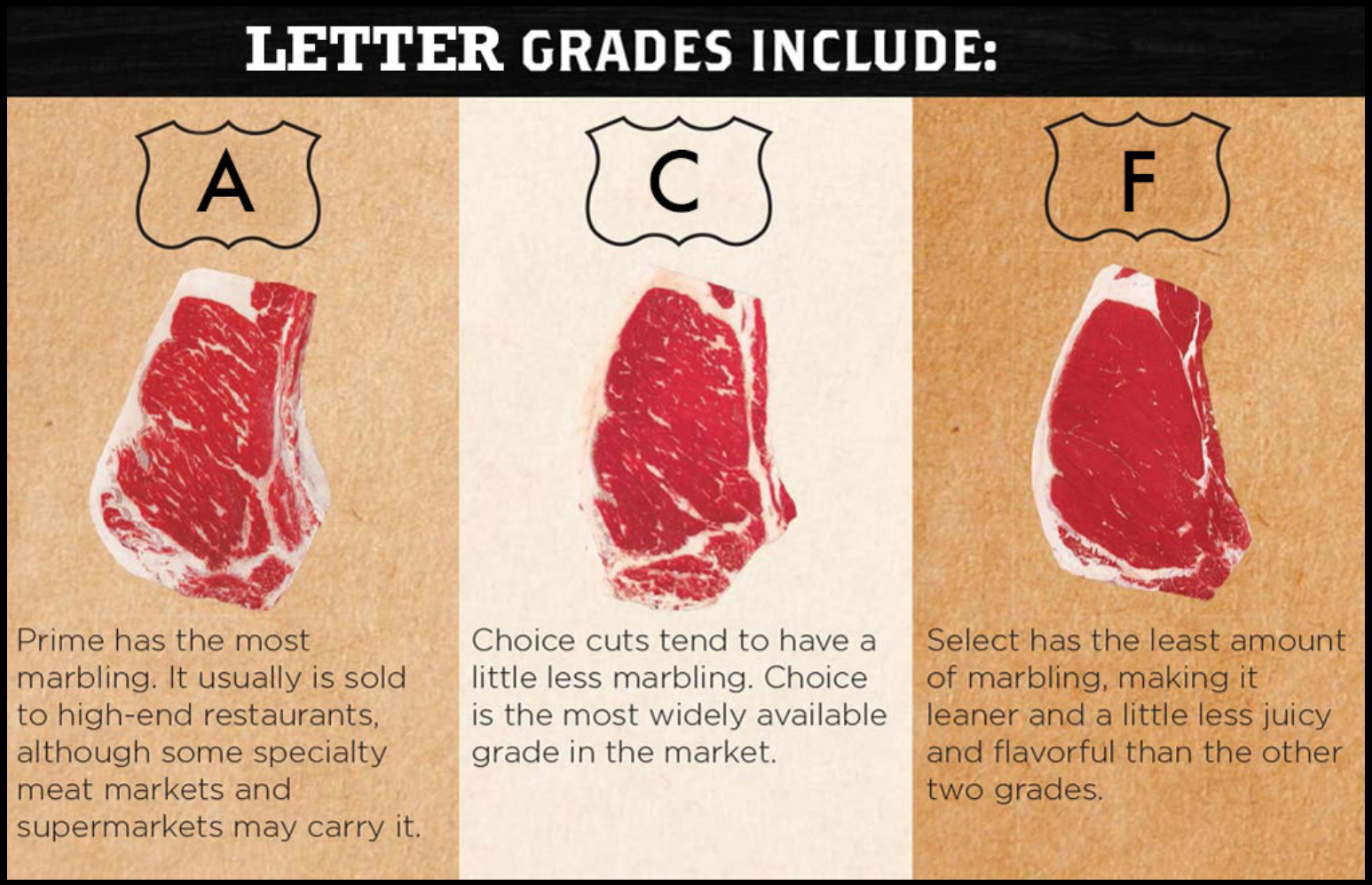
Evaluating Students



Grading Rubrics



Grading Rubrics



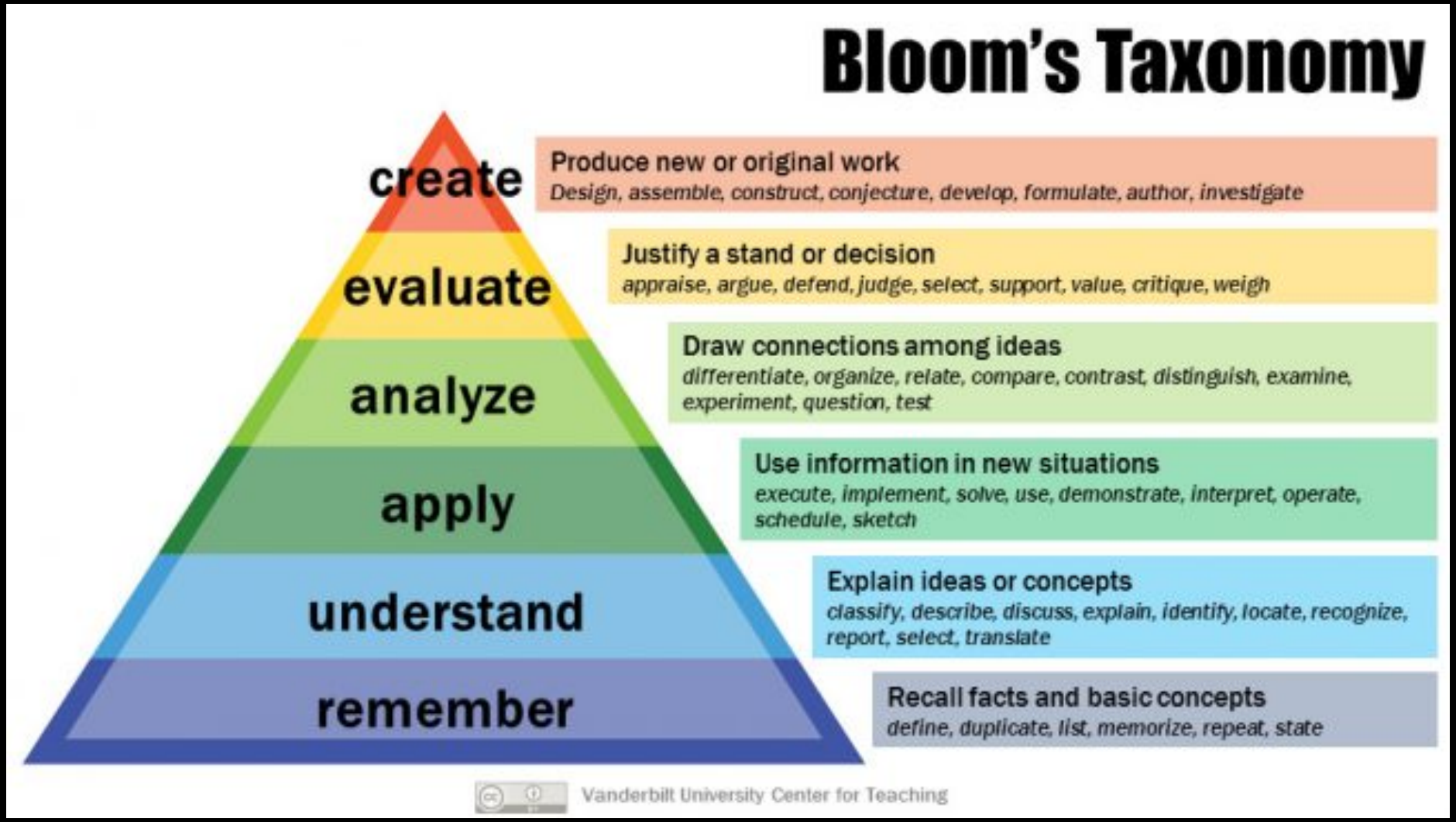
Disruptions

- Letter grade rubric
  - Aligned with Bloom's taxonomy
- Backward course design
  1. Outcomes
  2. Student knowledge survey (tasks aligned to outcomes)
  3. Assessment items distributed evenly across Bloom's taxonomy

Approach

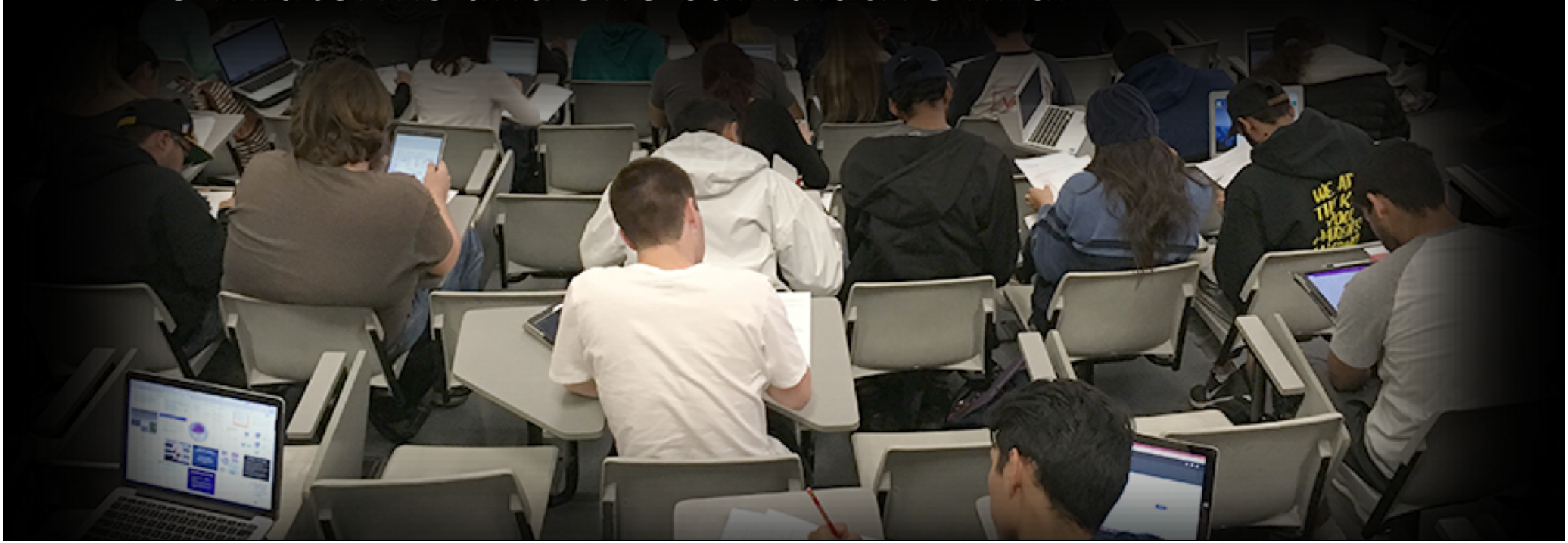
- Create assessments that provide a balance of Bloom's level questions
- Give students advance and explicit notice about what skills/abilities they'll be assessed on
  - Backward Design
  - Student Knowledge Survey

Why Bloom's?


Bloom's Taxonomy
create
Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate
evaluate
Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh
analyze
Draw connections among ideas
differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test
apply
Use information in new situations
execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch
understand
Explain ideas or concepts
classify, describe, discuss, explain, identify, locate, recognize, report, select, translate
remember
Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state
Vanderbilt University Center for Teaching

Implementation

- BIOL 102
- Required upper-division genetics for biology majors
- Enrollment ~75
- 3 midterms and one cumulative final



Implementation

- Backward design
  1. Objectives and outcomes translated to tasks
  2. Assessments created
  3. Instruction
- Letter grade schema aligned to Bloom's
- Tasks aligned to Bloom's
- Ensure assessments have equal numbers of points per Bloom's level

Implementation

- Backward design
  1. Objectives and outcomes translated to tasks
  2. Assessments created
  3. Instruction
- Letter grade schema aligned to Bloom's
- Tasks aligned to Bloom's
- Ensure assessments have equal numbers of points per Bloom's level

Student Knowledge Survey

- Content-based questions
- Students only self-rate their confidence in their ability to answer each question

Example

Course	Original
Goal	Appreciate how simple statistical tests are used in genetics
Outcome	Test hypotheses using statistics
Skill (for Knowledge Survey)	–

Example

Course	Original	Redesign
Goal	Appreciate how simple statistical tests are used in genetics	Analyze data and perform quantitative reasoning
Outcome	Test hypotheses using statistics	Apply simple statistical tests to the analysis of data
Skill (for Knowledge Survey)	–	?

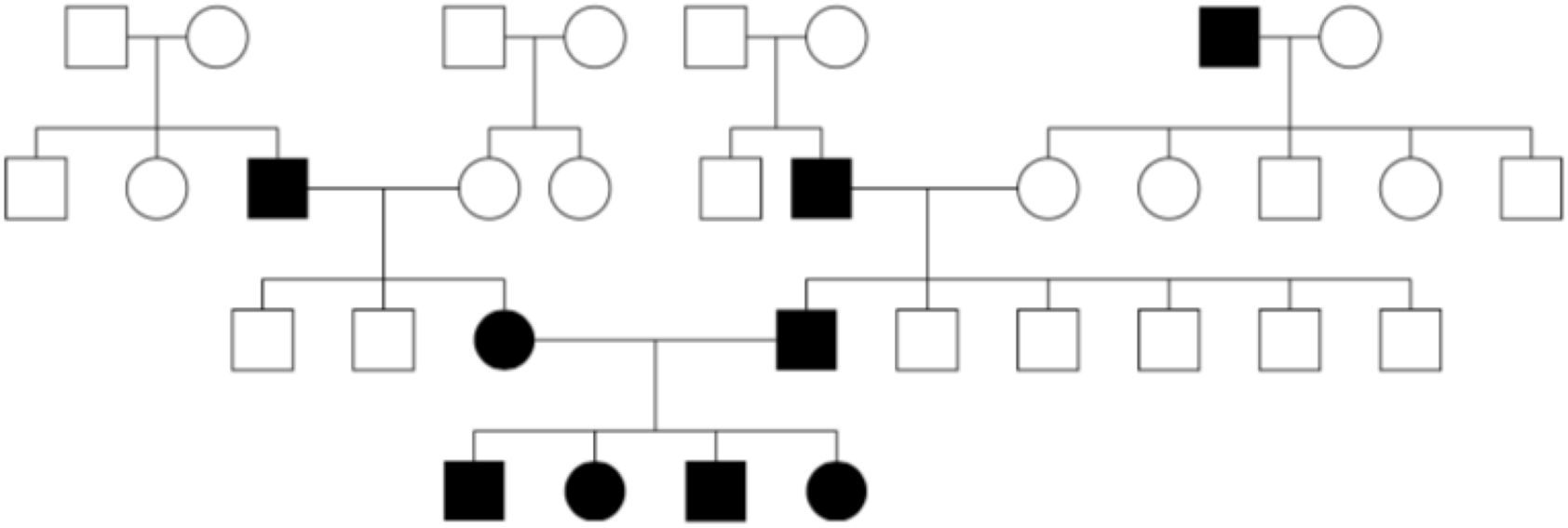
What do you imagine the skill will look like?

Example

Course	Original	Redesign
Goal	Appreciate how simple statistical tests are used in genetics	Analyze data and perform quantitative reasoning
Outcome	Test hypotheses using statistics	Apply simple statistical tests to the analysis of data
Skill (for Knowledge Survey)	–	evaluate pedigree data using a chi-square test

What do you imagine the assessment item will look like?

7 (15 pt) Write a list of all possible inheritance patterns, and then cross out as many as possible for the pedigree below. Of the remaining possible inheritance patterns, which is the most likely? Note: if there are carriers in the pedigree, they are not shown as half-filled symbols.



Student Knowledge Survey

Comparison of pre/post KS *could* be used to

- assess student learning (summative)
- provide instructors feedback about content/topics/skills that might require additional focus in future classes

Potential benefits

- Provides a study guide (& makes it really easy to write exams!)
- Sets expectations
- Enhance sense of self-efficacy, a mindset shift that could improve academic performance particularly in underrepresented groups

Implementation

- Backward design
  1. Objectives and outcomes translated to tasks
  2. Assessments created
  3. Instruction
- Letter grade schema aligned to Bloom's
- Tasks aligned to Bloom's
- Ensure assessments have equal numbers of points per Bloom's level

Grades : Bloom's

Uses the full dynamic range of a 0-100% scale

Bloom's Taxonomy		Ross' Point & Grade Alignment			Your Job
		% of Points	Letter grade	Example activities	
6	Create	>=80%	Accomplished	criticize, defend, interpret, justify, recommend, construct, invent, modify, design	ensure equal points available on assessments
5	Evaluate				
4	Analyze	>=60%	Burgeoning	compare, contrast, rank, generalize, relate	
3	Apply	>=40%	Competent	choose, use, solve, predict, calculate	
2	Understand	>=20%	Developing	explain, summarize, describe, diagram	
1	Remember	<20%	Foundational	define, label, identify, locate, select	

Implementation

- Backward design
  - Objectives and outcomes translated to tasks
  - Assessments created
  - Instruction
- Letter grade schema aligned to Bloom's
- Tasks aligned to Bloom's
- Ensure assessments have equal numbers of points per Bloom's level

The Process (an example)

1. Outcome

Apply, analyze and evaluate the causes of, and evidence for, genetic variation

2. Task

Predict the impact of changing temperature on DNA structure

3. Assessment

3 (1 pt) Which of the following four DNA strands will form the fewest hydrogen bonds with its complementary strand?

a) AGCTAGCATCAGCTACGACTACGACGAC
b) TCGACTACGATCTATCATCTATCAGCTA
c) GCGCGATCAGCACTACTCGCGATACCGG
d) GCATATCTATCTATATATACTCAAAAAA

4. Bloom's Level

2 (Understand)

Implementation

- Backward design
  - Objectives and outcomes translated to tasks
  - Assessments created
  - Instruction
- Letter grade schema aligned to Bloom's
- Tasks aligned to Bloom's
- Ensure assessments have equal numbers of points per Bloom's level

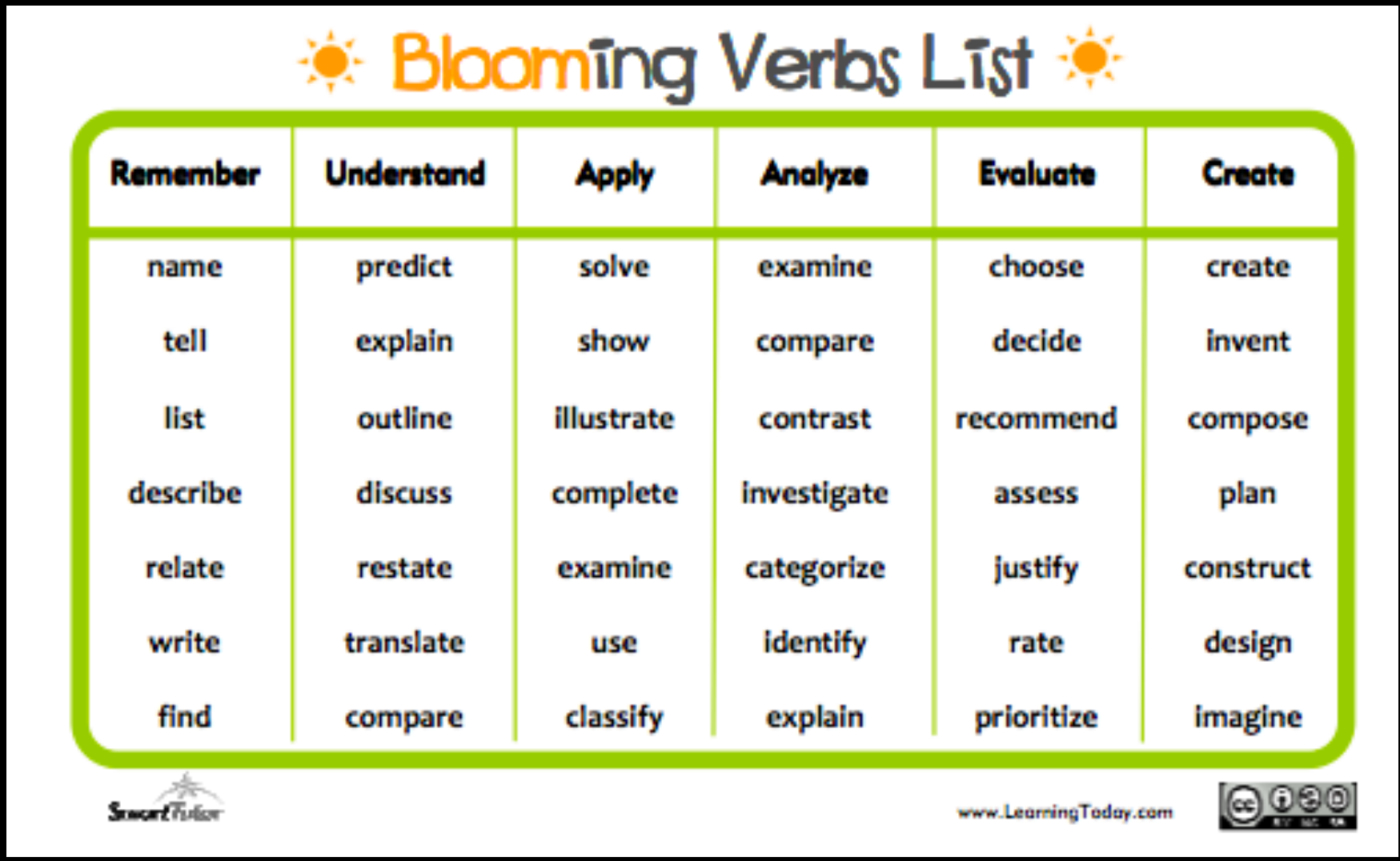
Q	Bloom's	Points	Task
1	1	2	Arrange nucleotides by chemical structure and hydrogen-bonding capability
2	3	1	Apply knowledge of the chemical structure of nucleotides to explain DNA polarity notation
3	4	1	Predict the impact of changing temperature on DNA structure
4	3	2	Classify the structures and components of chromosomes
5	2	3	Classify the structures and components of chromosomes
6	3	2	Classify the structures and components of chromosomes
7	3	2	Compare a karyogram and a karyotype to identify discrepancies
8	1	1	Locate the DNA sequence of a gene
9	4	1	Predict the frequency of a given nucleotide sequence in a genome
10	1	2	Identify restriction endonuclease sites in a DNA sequence
11	1	1	Identify the outcomes of various treatments/processes on nucleotide identity
12	2	3	Classify types of DNA sequences differences as indels or microsatellites, using appropriate notation
13	5	4	Create a numbered DNA alignment and consensus sequence when provided individual sequences from multiple genes or species
14	2	3	Distinguish a genotype from a haplotype; homozygosity from heterozygosity; allele from gene
15	3	2	Calculate the probability that one crime suspect's DNA sample matches a forensic DNA sample found at a crime scene
		30	

	Bloom's	% of Points	% of Qs	Letter Grade	% of Students
	1 (remember)	20%	27%	F	5%
	2 (understand)	30%	20%	D	11%
	3 (apply)	30%	33%	C	22%
	4 (analyze)	7%	13%	B	42%
	5+6 (evaluate, create)	13%	7%	A	19%

Redesigned Syllabus

What has changed?

Application to all disciplines



Blooming Verbs List

Remember	Understand	Apply	Analyze	Evaluate	Create
name	predict	solve	examine	choose	create
tell	explain	show	compare	decide	invent
list	outline	illustrate	contrast	recommend	compose
describe	discuss	complete	investigate	assess	plan
relate	restate	examine	categorize	justify	construct
write	translate	use	identify	rate	design
find	compare	classify	explain	prioritize	imagine

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Your turn!

Pros & Cons

Why take the time to do this?

- Students
  - Transparency; expectation-setting; “fairness”
- Faculty
  - “What’s going to be on the test?”
  - Evidence of capability; recommendation letter writing

socrative.com

- Student login
- Room name: myth

References

- Wiggins and McTighe (1998) “What is backward design?” in Understanding by Design (7–19). Merrill Prentice Hall.
- Dweck C. (2006) Mindset: The New Psychology of Success. Random House ISBN 1400062756
- Bowers, Brandon and Hill (2005) “The Use of a Knowledge Survey as an Indicator of Student Learning in an Introductory Biology Course.” *Cell Biol. Ed*. **4**:311-322.
- Ballen *et al*. (2017) “Enhancing Diversity in Undergraduate Science: Self-Efficacy Drives Performance Gains with Active Learning.” *CBE LSE* **16**:1-6.