"How do you know your students are learning?"

As you enter, list on the board:
- the forms of student assessment you currently use.

Optional
- your goals for this session …

How do you know your students are learning?

Why does student engagement matter?

Adriana Signorini

Center for Research on Teaching Excellence

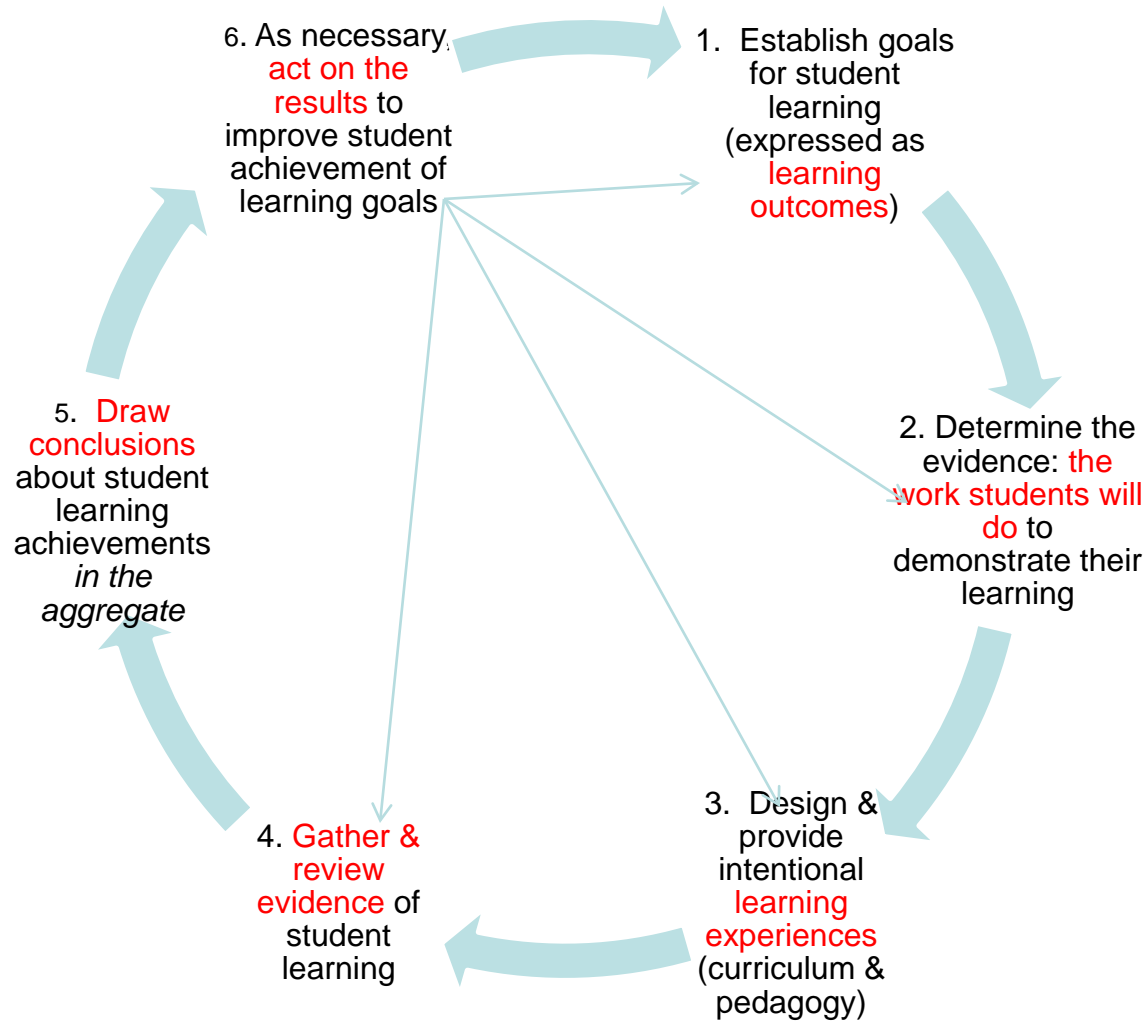Students Assessing Teaching and Learning

Learning Outcomes

By the end of this session, you'll be able to …

- Describe some elements of the learning cycle presented.

- List some classroom assessment tools which you are not using but could improve learning in your courses

- Identify the benefits of interactive-engagement and dare to give these activities a try.
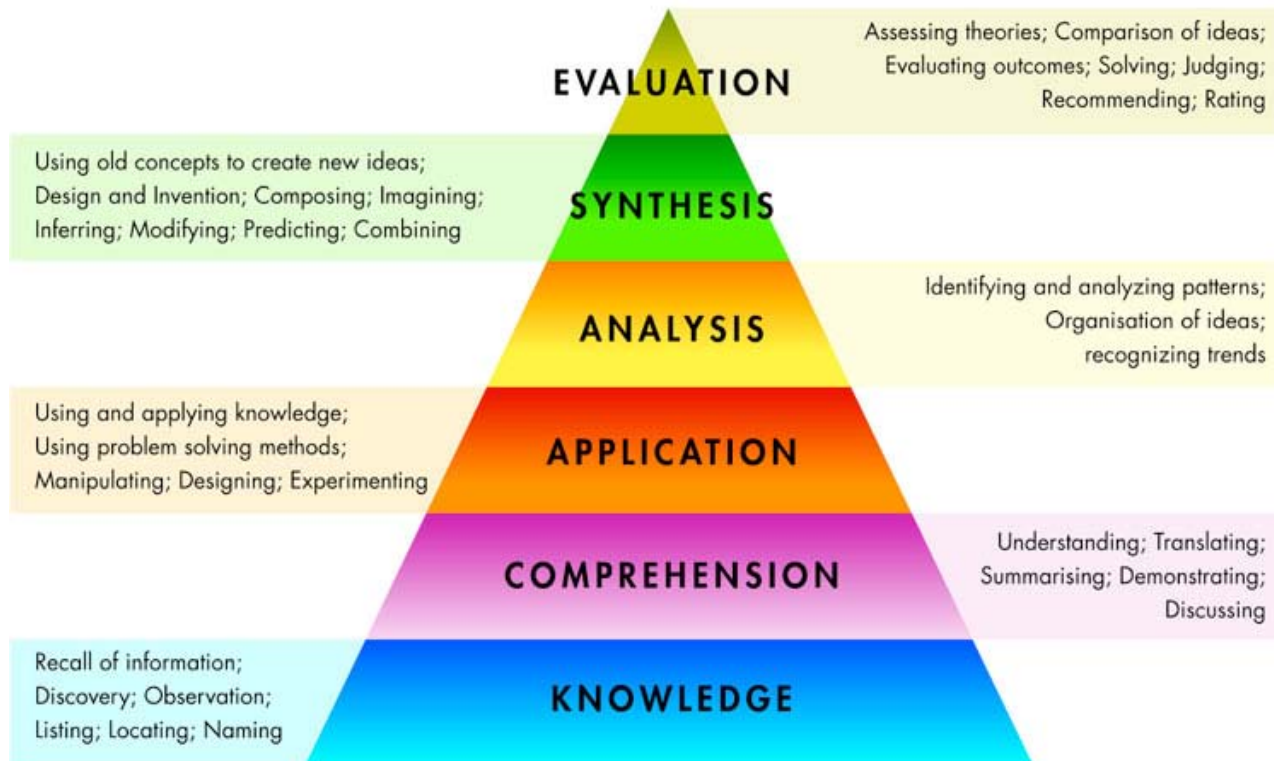
What is assessment (of student learning)?

6. As necessary, act on the results to improve student achievement of learning goals

1. Establish goals for student learning (expressed as learning outcomes)

2. Determine the evidence: the work students will do to demonstrate their learning

3. Design & provide intentional learning experiences (curriculum & pedagogy)

4. Gather & review evidence of student learning

5. Draw conclusions about student learning achievements *in the aggregate*

Hybrid of Suskie (2009) , the CIRTL Teaching-as-Research (TAR) framework, and Backward Design (McTighe &Williams, 1998)
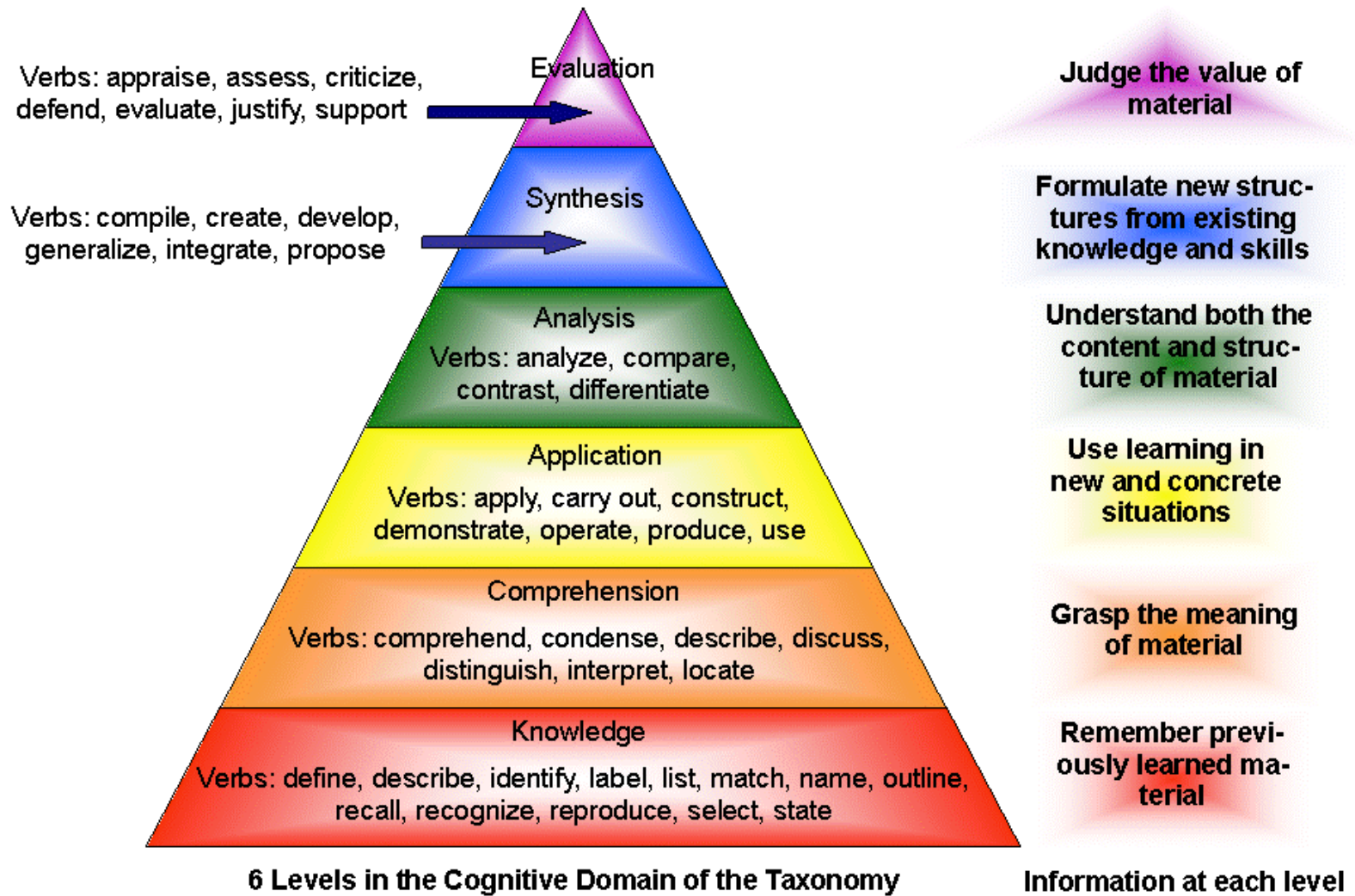
What are the class learning outcomes?

Statements that focus on the outcomes we expect of students
to do when they complete the course/ or class lesson

Bloom's Taxonomy

Verbs: appraise, assess, criticize, defend, evaluate, justify, support

Evaluation

Judge the value of material

Verbs: compile, create, develop, generalize, integrate, propose

Synthesis

Formulate new structures from existing knowledge and skills

Analysis
Verbs: analyze, compare, contrast, differentiate

Understand both the content and structure of material

Application
Verbs: apply, carry out, construct, demonstrate, operate, produce, use

Use learning in new and concrete situations

Comprehension
Verbs: comprehend, condense, describe, discuss, distinguish, interpret, locate

Grasp the meaning of material

Knowledge
Verbs: define, describe, identify, label, list, match, name, outline, recall, recognize, reproduce, select, state

Remember previously learned material

6 Levels in the Cognitive Domain of the Taxonomy

Information at each level

Verbs useful for stating learning outcomes

Action Words for Bloom's Taxonomy					
Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Create**
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	identify	manipulate	survey	grade	produce
discover	indicate	paint	advertise	measure	rearrange
duplicate	infer	prepare	appraise	predict	rewrite
enumerate	relate	produce	break down	rank	role-play
listen	restate	report	calculate	score	adapt
observe	select	teach	conclude	select	anticipate
omit	translate	act	correlate	test	arrange
read	ask	administer	criticize	argue	assemble
recite	cite	articulate	deduce	conclude	choose
record	discover	chart	devise	consider	collaborate
repeat	generalize	collect	diagram	critique	collect

Activity: Analyze a Learning Outcome (L.O.)

Choose one of the following two L.O.s:

1) Analyze it in relation the criteria for useful L.O.s.

2) Propose revisions as you feel appropriate.

3) Share your analysis with the rest.

L.O. 1:   At the conclusion of this course, students will understand basic statistical analysis.

L.O. 2:   At the conclusion of this course, students will be familiar with academic writing and speaking practices.

Checklist for creating learning outcomes:

☐Does the learning outcome identify what students will be able to do after the topic is covered?

☐Is it clear how you would test achievement of the learning outcome?

 ☐Do chosen verbs have a clear meaning?

 ☐Is the verb aligned with the level of cognitive understanding expected of students? Could you expect a higher level of understanding?

☐Is the terminology familiar/common? If not, is knowing the terminology a goal?

☐Is it possible to write the outcome so it is relevant and useful to students (e.g. connected to their everyday life, or does it represent a useful application of the ideas)?

Key Class Assessment Activities

Wk 1: Needs Assessment

Week 4 to 8: Mid-Course Feedback

Final Course Evaluation

Fall Semester
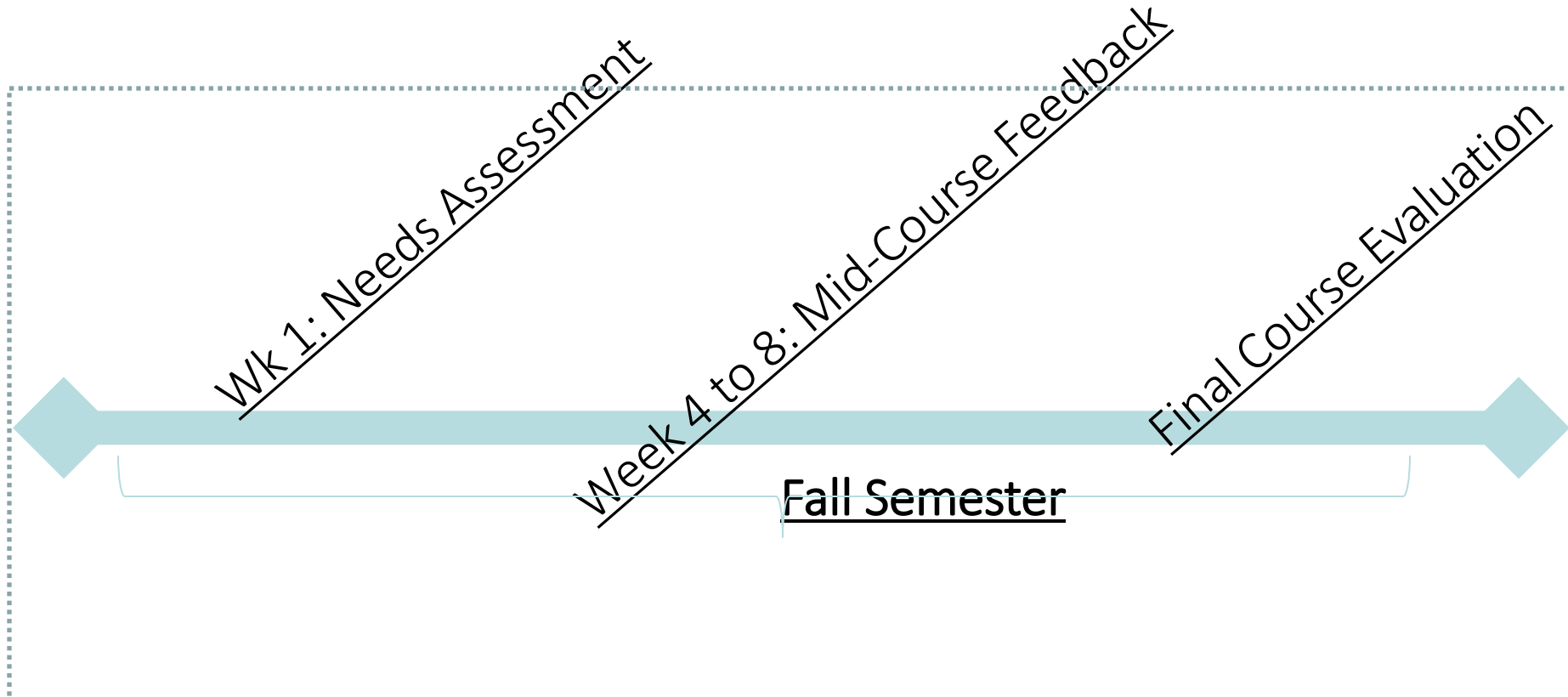
Needs Assessment

- Pre/ Post Test
- Entry Survey

Prior Knowledge

Attitudes

Values

Your class expectations:

OH, studying time, specific requirements, etc.

Campus Resources:

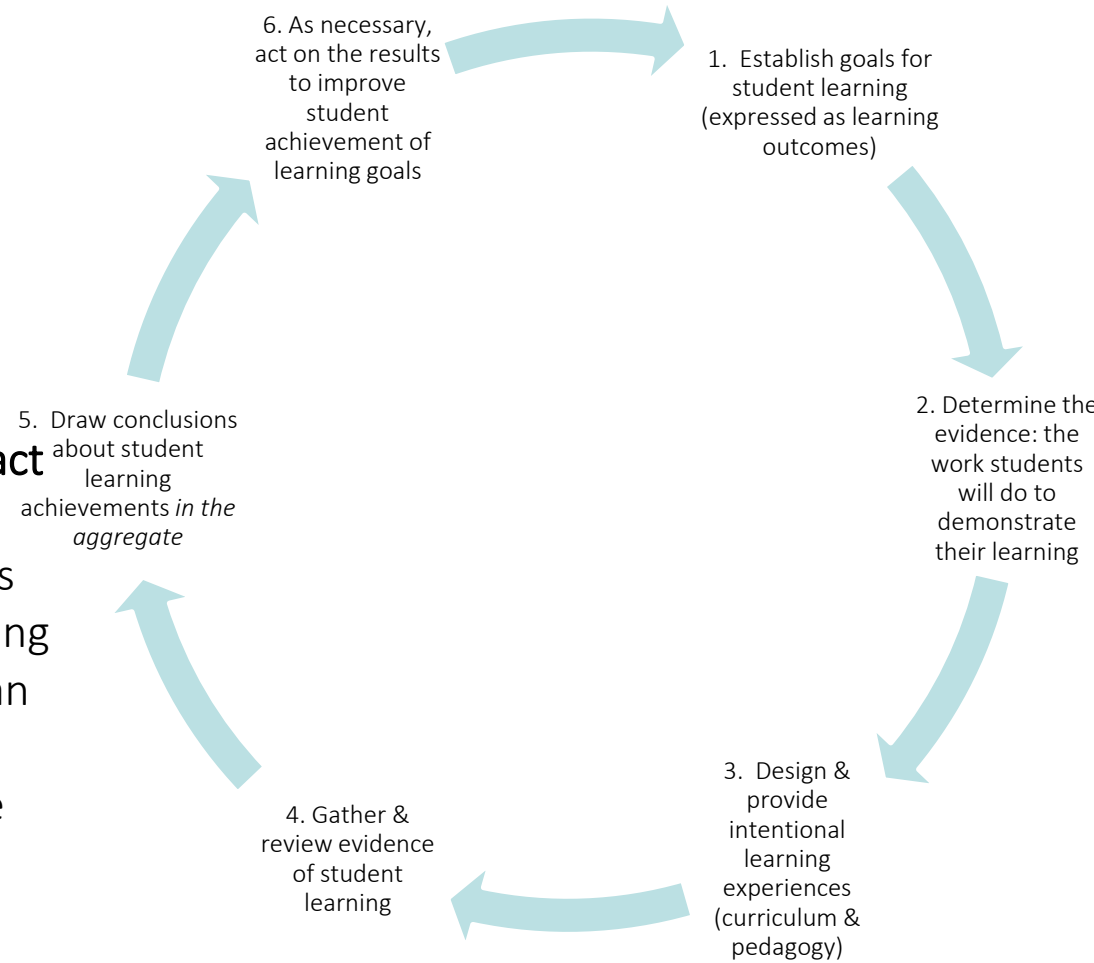Library/ Tutoring/ Mentoring/ STEM Center, etc.

Mid-Course Feedback

- It will benefit the same students who provide the feedback (Bullock, 2003).

- It provides opportunities for students to comment on specific behaviors or pedagogical strategies that are not covered by the standard end-of-semester evaluation questions.

- It provides the potential to improve end-of-semester evaluations and increase student exam performance (Overall and Marsh, 1979).

- Students respond positively when their comments result in changes to the course, leading to improved student attitudes about the class and/or instructor (Keutzer, 1993).
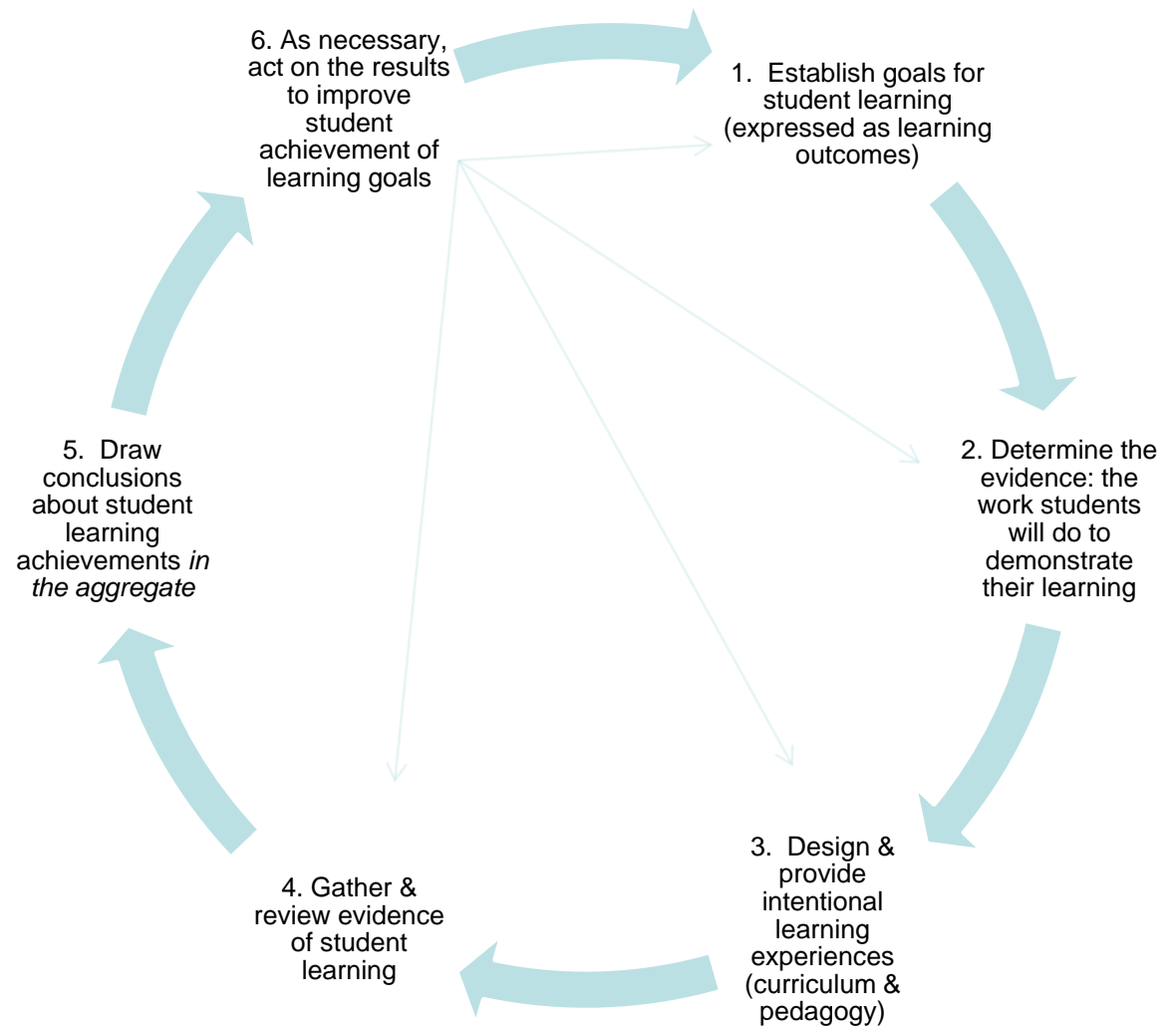
Assessment Process: An Example

1. **Outcome**: Write a technical report
2. **Evidence**: Technical reports
3. **Design**:
   - Write reports weekly guided by rubric.
   - Detailed feedback provided consistent with rubric.
   - Track students' use of feedback.

4.-6. Gather evidence, draw conclusions, act on results:
   - Mid-semester: examines students improvements, finds students using feedback are improving more than others.
   - Shares this with class to motivate use of feedback to improve.
   - Continues to provide detailed feedback through multiple avenues.

6. As necessary, act on the results to improve student achievement of learning goals

1. Establish goals for student learning (expressed as learning outcomes)

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Assessment as *planning* cycle

1. Setting goals
2. Developing strategies
3. Outlining tasks
4. Evaluating success

6. As necessary, act on the results to improve student achievement of learning goals

1. Establish goals for student learning (expressed as learning outcomes)

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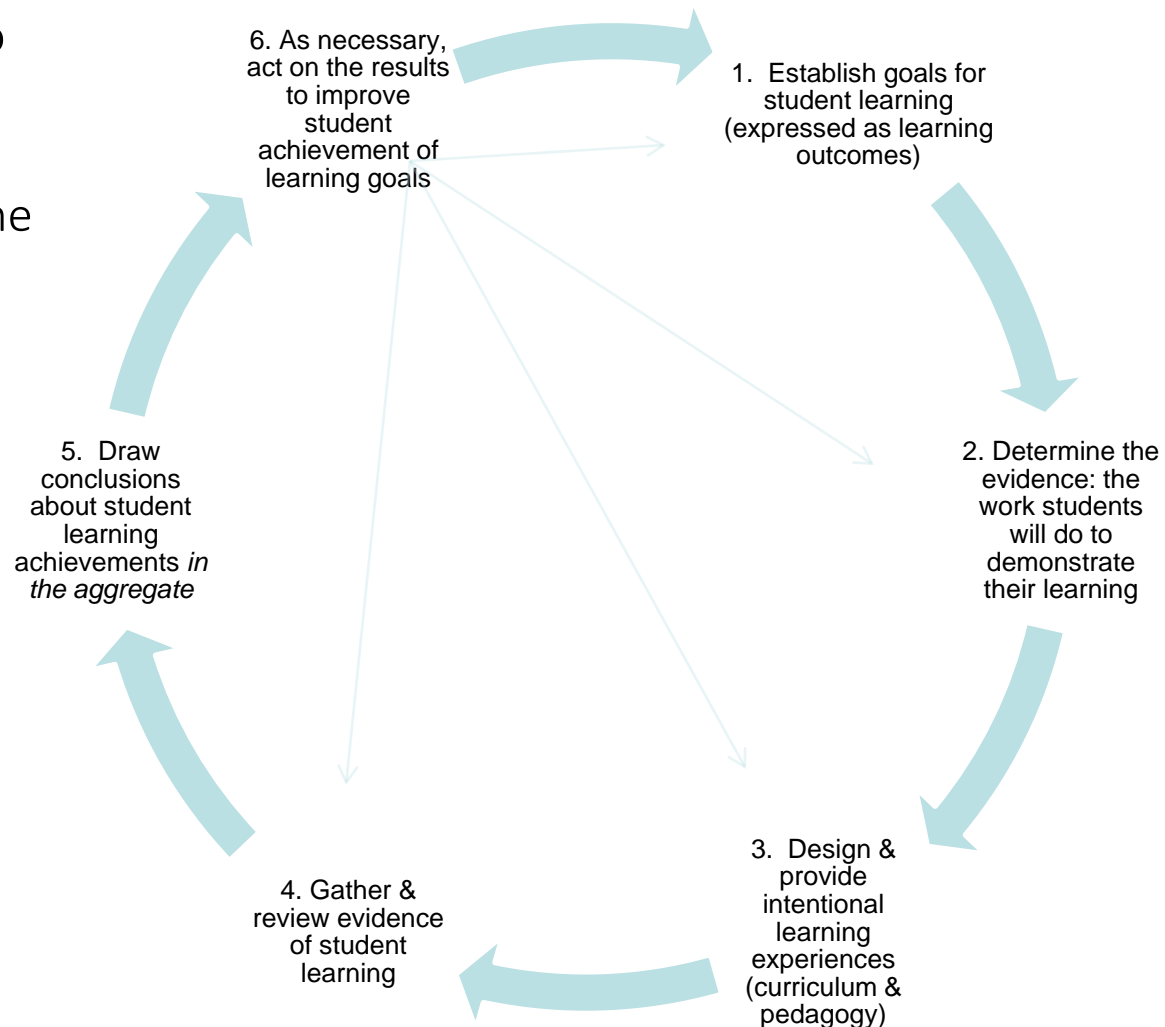
Assessment as *pedagogy*

Instructional activities selected to

- facilitate development of and

- to reveal (to the teacher and the students)

student learning in relation to instructional goals.

- ✓ Evidence of student learning is abundant.

- ✓ Harvest it intentionally and *strategically*.

6. As necessary, act on the results to improve student achievement of learning goals

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2. Determine the evidence: the work students will do to demonstrate their learning

3. Design & provide intentional learning experiences (curriculum & pedagogy)

4. Gather & review evidence of student learning

5. Draw conclusions about student learning achievements *in the aggregate*

Relationship of grading & assessment

Grading : Summarizes learning demonstrated by an *individual* student, with feedback providing insight into and supporting his/her *individual* learning
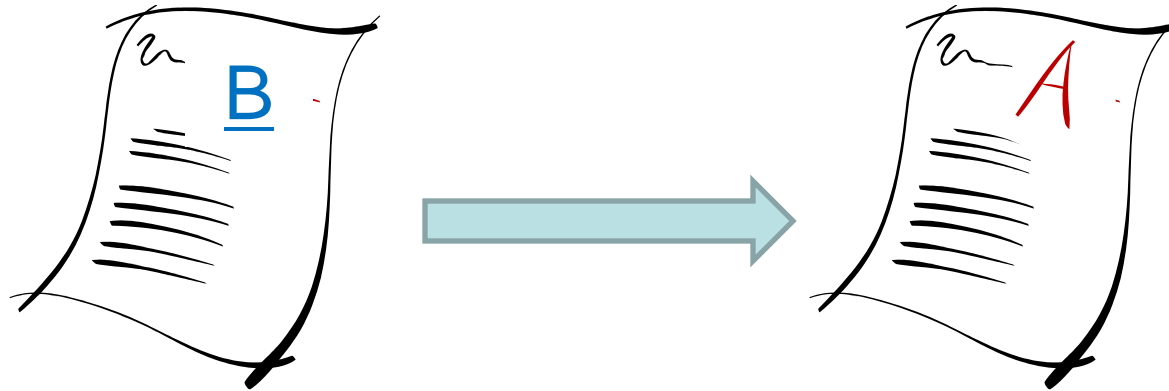
Relationship of grading & assessment

Assessment: Summarizes learning demonstrated by a *population* of students to provide insights into how well the <u>educational opportunity (class, course, program) is</u> serving students as a whole

Ex. *What might this tell us?*

<u>Results from a mid-semester research paper</u>

- <u>60% of students scored as proficient or better in use of citations and evidence in argument</u>

- 40% scored below proficient

B
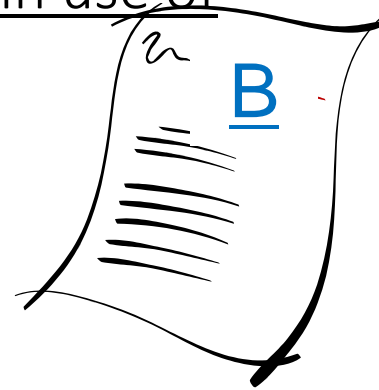
Assessment is "teaching to the test" (Suskie, 2009)

Requires

- Assessments that are designed to be worth teaching to

- Intended learning outcomes that are higher level

- Opportunities for practice with specific, targeted feedback to students on what doing well, and what to improve

Essentially assessment is a form of research

Assessment paradigm

- Outcome

- Instructional Activities/Curriculum

- Collect & analyze evidence of student learning. Draw conclusions, revise instruction or outcomes.

Research paradigm

Hypothesis: what students will be able to do

Experimental Design

Gather data and draw conclusions about hypothesis

Assessment is "action research" (Suskie, 2009)

Assessment as Action Research*

- Specific to local environment & student body

- Intended for local improvement

- Data/evidence are sufficiently valid and reliable so as to be "good enough," "trustworthy enough" to act on

Empirical Research

- Pursue generalizable results (theories)

- High quality design and data to meet test of peer review

*Suskie, 2009

Classroom Assessment Techniques (CATs)

- Minute Paper
- Chain Notes
- Memory Matrix
- Directed paraphrasing

- One sentence summary
- Exam Evaluations
- Application cards
- Student-generated test questions

Angelo, T.A. and Cross, K.P. (1993). *Classroom Assessment Technologies* (Second Edition). San Francisco: Jossey-Bass Publishers.

Large and Small Classes Assessment Tools

Creating: <u>Group work</u>

Evaluating: Debate

Analyzing : Clicker questions

Applying: Student Presentations – Pop quizzes

Understanding: Role playing / <u>Just- in- time teaching</u>

Remembering: Memory Matrix

The George Washington University: <u>http://tlc.provost.gwu.edu/classroom-assessment-techniques</u>

Challenges to Implementing Interactive Activities

- Students resistance to participation (e.g. stop coming to class, start discussing their weekend plans)

- Expectations of content coverage

- Lack of instruction/instructor time

- Class size, or room layout

- Influence on teaching evaluations

- Additional time for curriculum (re)design

Quantifying student behavioral engagement based on teaching practices in a large class

Results from a large introductory oceanography course:

Classroom observations were conducted during 27 lectures in a first year Oceanography course with an enrollment of 170 students and two course instructors. The observer sat in one of nine sections in the classroom, and obtained observations from each section at least three times in the semester. A total of 720 engagement observation points were recorded through the semester.

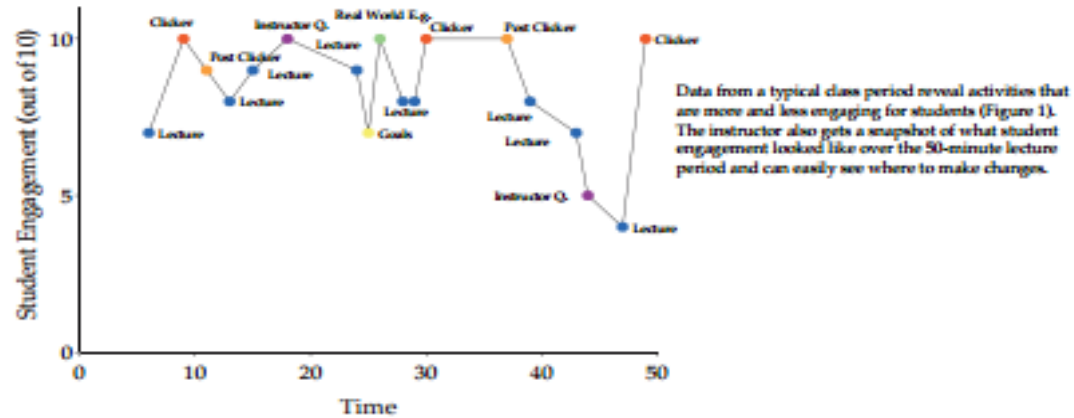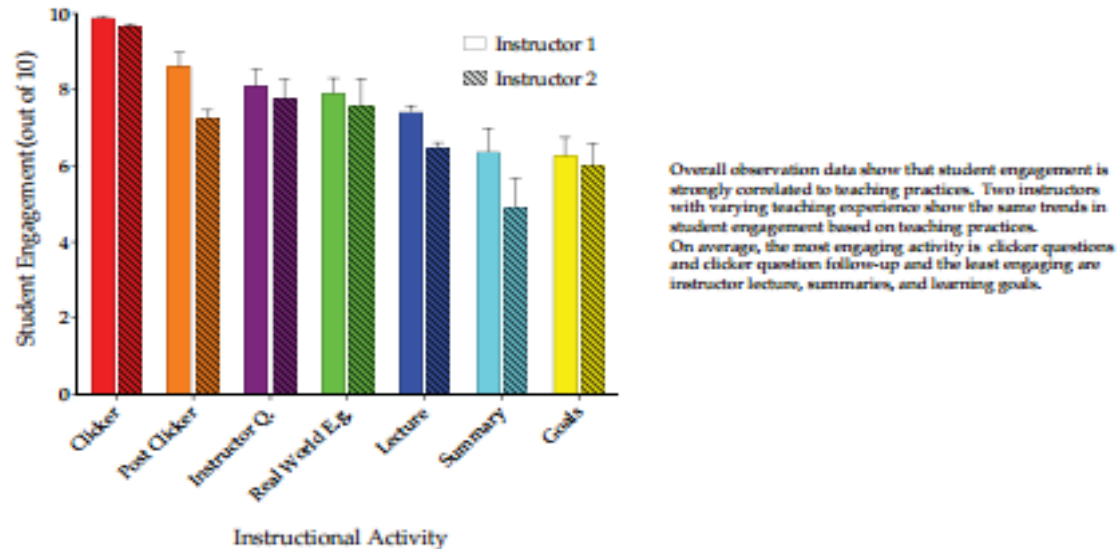**Figure 1: Student engagement over a lecture period based on teaching activities**

Data from a typical class period reveal activities that are more and less engaging for students (Figure 1). The instructor also gets a snapshot of what student engagement looked like over the 50-minute lecture period and can easily see where to make changes.

Figure 2: Student engagement based on instructional activity averaged over the semester for each instructor

Overall observation data show that student engagement is strongly correlated to teaching practices. Two instructors with varying teaching experience show the same trends in student engagement based on teaching practices. On average, the most engaging activity is clicker questions and clicker question follow-up and the least engaging are instructor lecture, summaries, and learning goals.

Quantifying student behavioral engagement based on teaching practices in a large class

TABLE 1

Descriptions of student in-class behaviors that indicate they are engaged.
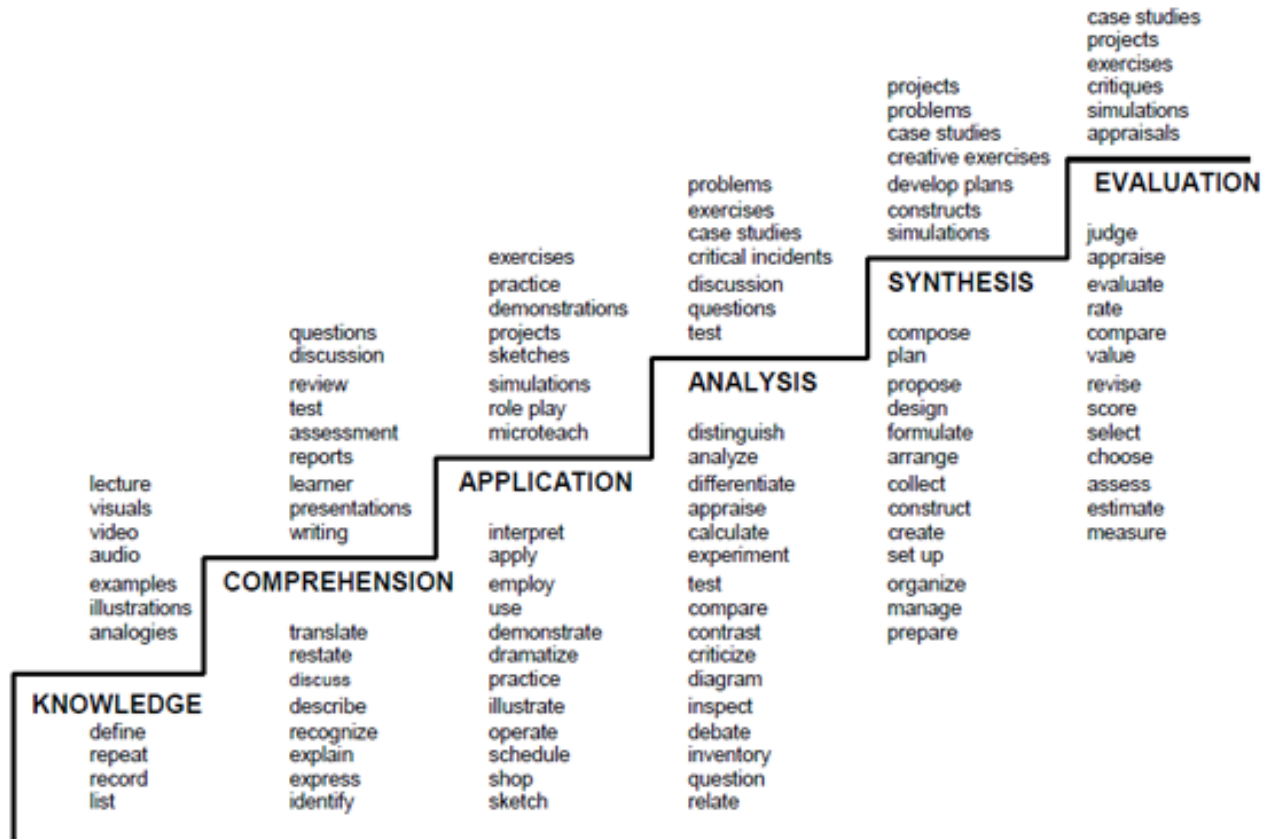
Engaged	
Listening	Student is listening to lecture. Eye contact is focused on the instructor or activity and the student makes appropriate facial expressions, gestures, and posture shifts (i.e., smiling, nodding in agreement, leaning forward).
Writing	Student is taking notes on in-class material, the timing of which relates to the instructor's presentation or statements.
Reading	Student is reading material related to class. Eye contact is focused on and following the material presented in lecture or preprinted notes. When a question is posed in class, the student flips through their notes or textbook.
Engaged computer use	Student is following along with lecture on computer or taking class notes in a word processor or on the presentation. Screen content matches lecture content.
Engaged student interaction	Student discussion relates to class material. Student verbal and nonverbal behavior indicates he or she is listening or explaining lecture content. Student is using hand gestures or pointing at notes or screen.
Engaged interaction with instructor	Student is asking or answering a question or participating in an in-class discussion.

TABLE 2

Descriptions of student in-class behaviors that indicate they are disengaged.

Disengaged	
Settling in/ packing up	Student is unpacking, downloading class material, organizing notes, finding a seat, or packing up and leaving classroom.
Unresponsive	Student is not responsive to lecture. Eyes are closed or not focused on instructor or lecture material. Student is slouched or sleeping, and student's facial expressions are unresponsive to instructor's cues.
Off-task	Student is working on homework or studying for another course, playing with phone, listening to music, or reading non-class-related material.
Disengaged computer use	Student is surfing web, playing game, chatting online, checking e-mail.
Disengaged student interaction	Student discussion does not relate to class material.
Distracted by another student	Student is observing other student(s) and is distracted by an off-task conversation or by another student's computer or phone.

Suggested Instructional Strategies for Use with Each Level of Bloom's Taxonomy

EVALUATION

case studies
projects
exercises
critiques
simulations
appraisals

judge
appraise
evaluate
rate
compare
value
revise
score
select
choose
assess
estimate
measure

SYNTHESIS

projects
problems
case studies
creative exercises
develop plans
constructs
simulations

compose
plan
propose
design
formulate
arrange
collect
construct
create
set up
organize
manage
prepare

ANALYSIS

problems
exercises
case studies
critical incidents
discussion
questions
test

distinguish
analyze
differentiate
appraise
calculate
experiment
test
compare
contrast
criticize
diagram
inspect
debate
inventory
question
relate

APPLICATION

exercises
practice
demonstrations
projects
sketches
simulations
role play
microteach

interpret
apply
employ
use
demonstrate
dramatize
practice
illustrate
operate
schedule
shop
sketch

COMPREHENSION

questions
discussion
review
test
assessment
reports
learner
presentations
writing

translate
restate
discuss
describe
recognize
explain
express
identify

KNOWLEDGE

lecture
visuals
video
audio
examples
illustrations
analogies

define
repeat
record
list

Learning Outcomes

By the end of this session, you'll be able to …

- Describe some elements of the learning cycle presented.

- List some classroom assessment tools which you are not using but could improve learning in your courses

- Identify the benefits of interactive-engagement and dare to give these activities a try.

Resources

- Assessment at UC Merced: http://assessment.ucmerced.edu/

This website provides assessment related information for academic and non-academic program on campus.

- Carl Wieman Science Education Initiative at the University of British Columbia: http://cwsei.ubc.ca/

Resources aim at improving undergraduate science education. Consider the following tools: Classroom Observation Protocol, Teaching Practices Inventory, Student Engagement Observation Protocol and Learning Attitudes about Science Surveys

- Writing Great Clicker Questions: Faculty Workshop cwsei.ubc.ca/resources/

- Resources by Discipline: University of Michigan, CRLT: http://www.crlt.umich.edu/tstrategies/disciplinaryresources

- CRTE: Teaching Resources: http://crte.ucmerced.edu/

- SATAL Program: Offer trained undergraduates who can assist you with data collection, analyzes and reporting.

Many thanks to….

- Laura Martin for sharing the assessment cycle slides

- Belinda Braunstein's feedback during presentation rehearsal.

25+ question stems framed around the early, non-revised Bloom's Taxonomy

CRITICAL THINKING SKILLS

1 **Knowledge** **Identification and recall of information**	define fill in the blank list identify	label locate match memorize	name recall spell	state tell underline
	Who _____? What _____? Where_____? When _____?		How _____? Describe _____. What is _____?	
2 **Comprehension** **Organization and selection of facts and ideas**	convert describe explain	interpret paraphrase put in order	restate retell in your own words rewrite	summarize trace translate
	Re-tell _____ in your own words. What is the main idea of _____?		What differences exist between _____? Can you write a brief outline?	
3 **Application** **Use of facts, rules, and principles**	apply compute conclude construct	demonstrate determine draw find out	give an example illustrate make operate	show solve state a rule or principle use
	How is _____ an example of _____? How is _____ related to _____? Why is _____ significant?		Do you know of another instance where _____? Could this have happened in _____?	
4 **Analysis** **Separating a whole into component parts**	analyze categorize classify compare	contrast debate deduct determine the factors	diagram differentiate dissect distinguish	examine infer specify
	What are the parts or features of _____? Classify _____ according to _____. Outline/diagram/web/map _____.		How does _____ compare/contrast with ___? What evidence can you present for _____?	
5 **Synthesis** **Combining ideas to form a new whole**	change combine compose construct create design	find an unusual way formulate generate invent originate plan	predict pretend produce rearrange reconstruct reorganize	revise suggest suppose visualize write
	What would you predict/infer from _____? What ideas can you add to _____? How would you create/design a new _____?		What solutions would you suggest for ___? What might happen if you combined _____ with _____?	
6 **Evaluation** **Developing opinions, judgements, or decisions**	appraise choose compare conclude	decide defend evaluate give your opinion	judge justify prioritize rank	rate select support value
	Do you agree that _____? Explain. What do you think about _____? What is most important?		Prioritize _____ according to _____? How would you decide about _____? What criteria would you use to assess ___?	

Knowledge
Recall /regurgitate facts without understanding. Exhibits previously learned material by recalling facts, terms, basic concepts and answers.

Comprehension
To show understanding finding information from the text. Demonstrating basic understanding of facts and ideas.

Application
To use in a new situation. Solving problems by applying acquired knowledge, facts, techniques and rules in a different way.

Analysis
To examine in detail. Examining and breaking information into parts by identifying motives or causes; making inferences and finding evidence to support generalisations.

Synthesis
To change or create into something new. Compiling information together in a different way by combining elements in a new pattern or proposing alternative solutions.

Evaluation
To justify. Presenting and defending opinions by making judgements about information, validity of ideas or quality of work based on a set of criteria.

Key words:

Knowledge			Comprehension			Application			Analysis			Synthesis			Evaluation		
Choose	Observe	Show	Ask	Extend	Outline	Act	Employ	Practice	Analyse	Examine	Prioritize	Adapt	Estimate	Plan	Agree	Disprove	Measure
Copy	Omit	Spell	Cite	Generalise	Predict	Administer	Experiment	Relate	Appraise	Find	Question	Add to	Experiment	Predict	Appraise	Dispute	Opinion
Define	Quote	State	Classify	Give exam-	Purpose	Apply	with	Represent	Arrange	Focus	Rank	Build	Extend	Produce	Argue	Effective	Perceive
Duplicate	Read	Tell	Compare	ples	Relate	Associate	Group	Select	Assumption	Function	Reason	Change	Formulate	Propose	Assess	Estimate	Persuade
Find	Recall	Trace	Contrast	Illustrate	Rephrase	Build	Identify	Show	Breakdown	Group	Relation-	Choose	Happen	Reframe	Award	Evaluate	Prioritise
How	Recite	What	Demon-	illustrate	Report	Calculate	Illustrate	Simulate	Categorise	Highlight	ships	Combine	Hypothesise	Revise	Bad	Explain	Prove
Identify	Recognise	When	strate	Indicate	Restate	Categorise	Interpret	Solve	Cause and	In-depth	Reorganise	Compile	Imagine	Rewrite	Choose	Give reasons	Rate
Label	Record	Where	Discuss	Infer	Review	Choose	Interview	Summarise	effect	discussion	Research	Compose	Improve	Simplify	Compare	Good	Recommend
List	Relate	Which	Estimate	Interpret	Show	Classify	Link	Teach	Choose	Inference	See	Construct	Innovate	Solve	Conclude	Grade	Rule on
Listen	Remember	Who	Explain	Match	Summarise	Connect	Make use of	Transfer	Classify	Inspect	Select	Convert	Integrate	Speculate	Consider	How do we	Select
Locate	Repeat	Why	Express	Observe	Translate	Construct	Manipulate	Translate	Differences	Investigate	Separate	Create	Invent	Substitute	Convince	know?	Support
Match	Reproduce	Write				Correlation	Model	Use	Discover	Isolate	Similar to	Delete	Make up	Suppose	Criteria	Importance	Test
Memorise	Retell					Demonstrate	Organise		Discriminate	List	Simplify	Design	Maximise	Tabulate	Criticise	Infer	Useful
Name	Select					Develop	Perform		Dissect	Motive	Survey	Develop	Minimise	Test	Debate	Influence	Validate
						Dramatise	Plan		Distinction	Omit	Take part in	Devise	Model	Theorise	Decide	Interpret	Value
									Distinguish	Order	Test for	Discover	Modify	Think	Deduct	Judge	Why
									Divide	Organise	Theme	Discuss	Original	Transform	Defend	Justify	
									Establish	Point out	Comparing	Elaborate	Originate	Visualise	Determine	Mark	

Actions / Outcomes:

Knowledge Actions	Outcomes	Comprehension Actions	Outcomes	Application Actions	Outcomes	Analysis Actions	Outcomes	Synthesis Actions	Outcomes	Evaluation Actions	Outcomes
Describing	Definition	Classifying	Collection	Carrying out	Demonstration	Attributing	Abstract	Constructing	Advertisement	Attributing	Abstract
Finding	Fact	Comparing	Examples	Executing	Diary	Deconstructing	Chart	Designing	Film	Checking	Chart
Identifying	Label	Exemplifying	Explanation	Implementing	Illustrations	Integrating	Checklist	Devising	Media product	Deconstructing	Checklist
Listing	List	Explaining	Label	Using	Interview	Organising	Database	Inventing	New game	Integrating	Database
Locating	Quiz	Inferring	List		Journal	Outlining	Graph	Making	Painting	Organising	Graph
Naming	Reproduction	Interpreting	Outline		Performance	Structuring	Mobile	Planning	Plan	Outlining	Mobile
Recognising	Test	Paraphrasing	Quiz		Presentation		Report	Producing	Project	Structuring	Report
Retrieving	Workbook	Summarising	Show and tell		Sculpture		Spread sheet		Song		Spread sheet
	Worksheet		Summary		Simulation		Survey		Story		Survey

Questions:

Knowledge
Can you list three ...?
Can you recall ...?
Can you select ...?
How did _____ happen?
How is ...?
How would you describe ...?
How would you explain ...?
How would you show ...?
What is ...?
When did ...?
When did _____ happen?
Where is . . . ?
Which one ...?
Who was ...?
Who were the main . . . ?
Why did ...?

Comprehension
Can you explain what is happening . . . what is meant . . . ?
How would you classify the type of ...?
How would you compare ...?contrast ...?
How would you rephrase the meaning ...?
How would you summarise ...?
What can you say about ...?
What facts or ideas show ...?
What is the main idea of ...?
Which is the best answer ...?
Which statements support ...?
Will you state or interpret in your own words ...?

Application
How would you use...?
What examples can you find to ...?
How would you solve _____ using what you have learned ...?
How would you organise _____ to show ...?
How would you show your understanding of ...?
What approach would you use to...?
How would you apply what you learned to develop ...?
What other way would you plan to ...?
What would result if ...?
Can you make use of the facts to ...?
What elements would you choose to change ...?
What facts would you select to show ...?
What questions would you ask in an interview with ...?

Analysis
What are the parts or features of ...?
How is _____ related to ...?
Why do you think ...?
What is the theme ...?
What motive is there ...?
Can you list the parts ...?
What inference can you make ...?
What conclusions can you draw ...?
How would you classify ...?
How would you categorise ...?
Can you identify the difference parts ...?
What evidence can you find ...?
What is the relationship between ...?
Can you make a distinction between ...?
What is the function of ...?
What ideas justify ...?

Synthesis
What changes would you make to solve...?
How would you improve ...?
What would happen if...?
Can you elaborate on the reason...?
Can you propose an alternative...?
Can you invent...?
How would you adapt _____ to create a different...?
How could you change (modify) the plot (plan)...?
What could be done to minimise (maximise)...?
What way would you design...?
Suppose you could _____ what would you do...?
How would you test...?
Can you formulate a theory for...?
Can you predict the outcome if...?
How would you estimate the results for...?
What facts can you compile...?
Can you construct a model that would change...?
Can you think of an original way for the ...?

Evaluation
Do you agree with the actions/outcomes...?
What is your opinion of...?
How would you prove/disprove...?
Can you assess the value/importance of...?
Would it be better if...?
Why did they (the character) choose...?
What would you recommend...?
How would you rate the...?
What would you cite to defend the actions...?
How would you evaluate ...?
How could you determine...?
What choice would you have made...?
What would you select...?
How would you prioritise...?
What judgement would you make about...?
Based on what you know, how would you explain...?
What information would you use to support the view...?
How would you justify...?
What data was used to make the conclusion...?

Bloom's Taxonomy:
Questions framed around Categories