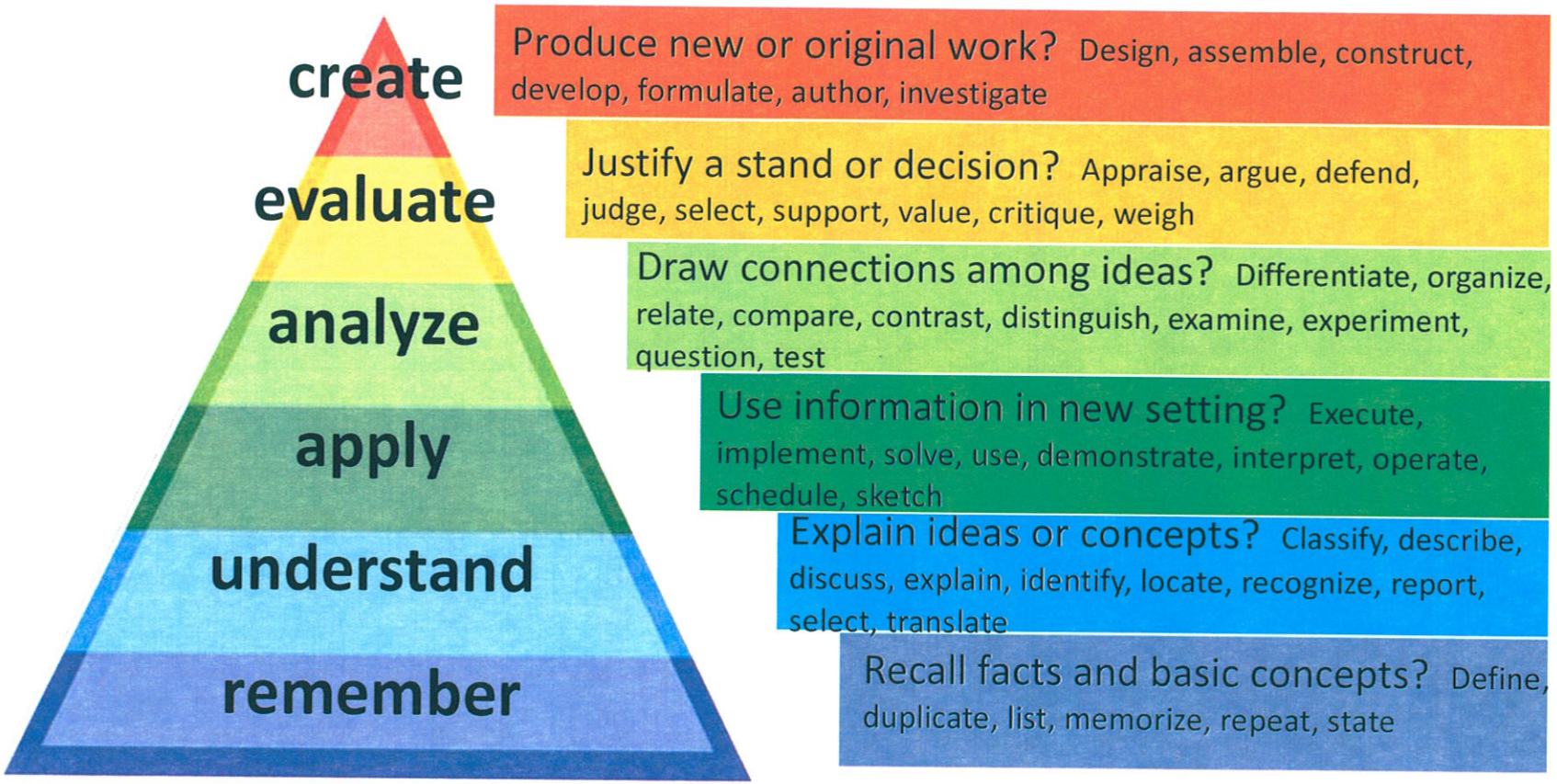
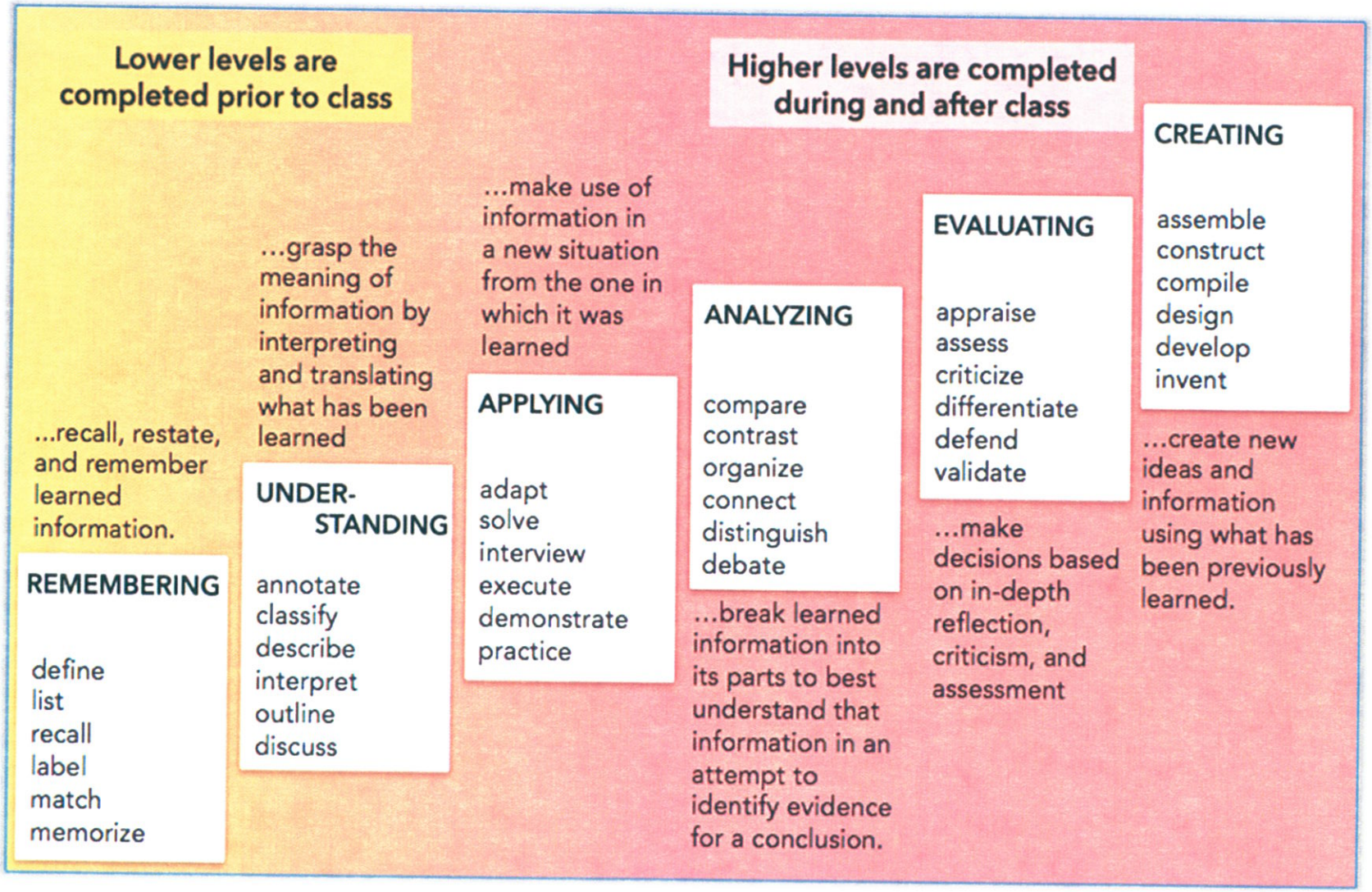
Bloom's (Revised) Taxonomy

Can the student ...



The learner will be able to...



Bloom's Taxonomy Action Verbs

Definitions	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Bloom's Definition	Remember previously learned information.	Demonstrate an understanding of the facts.	Apply knowledge to actual situations.	Break down objects or ideas into simpler parts and find evidence to support generalizations.	Compile component ideas into a new whole or propose alternative solutions.	Make and defend judgments based on internal evidence or external criteria.
Verbs	• Arrange • Define • Describe • Duplicate • Identify • Label • List • Match • Memorize • Name • Order • Outline • Recognize • Relate • Recall • Repeat • Reproduce • Select • State	• Classify • Convert • Defend • Describe • Discuss • Distinguish • Estimate • Explain • Express • Extend • Generalized • Give example(s) • Identify • Indicate • Infer • Locate • Paraphrase • Predict • Recognize • Rewrite • Review • Select • Summarize • Translate	• Apply • Change • Choose • Compute • Demonstrate • Discover • Dramatize • Employ • Illustrate • Interpret • Manipulate • Modify • Operate • Practice • Predict • Prepare • Produce • Relate • Schedule • Show • Sketch • Solve • Use • Write	• Analyze • Appraise • Breakdown • Calculate • Categorize • Compare • Contrast • Criticize • Diagram • Differentiate • Discriminate • Distinguish • Examine • Experiment • Identify • Illustrate • Infer • Model • Outline • Point out • Question • Relate • Select • Separate • Subdivide • Test	• Arrange • Assemble • Categorize • Collect • Combine • Comply • Compose • Construct • Create • Design • Develop • Devise • Explain • Formulate • Generate • Plan • Prepare • Rearrange • Reconstruct • Relate • Reorganize • Revise • Rewrite • Set up • Summarize • Synthesize • Tell • Write	• Appraise • Argue • Assess • Attach • Choose • Compare • Conclude • Contrast • Defend • Describe • Discriminate • Estimate • Evaluate • Explain • Judge • Justify • Interpret • Relate • Predict • Rate • Select • Summarize • Support • Value

Expanded Taxonomy of Learning

Taxonomy	Definition	Related LEARNING VERBS	What the Student Does	What the Teacher Does	Assessments
Remember	Recall specific bits of information	Tell, list, describe, name, repeat, remember, recall, identify, state, select, match, know, locate, report, recognize, observe, choose, who, what, where, when, cite, define, indicate, label, memorize, outline, record, relate, reproduce, underline	Responds Absorbs Remembers Recognizes	Directs Tells Shows Examines	Students recognize, recall or find information.
Understand	Construct meaning from information	Explain, restate, find, describe, review, relate, define, clarify, illustrate, diagram, outline, summarize, interpret, paraphrase, transform, compare similarities and differences, derive main idea, arrange, convert, defend, discuss, discuss, estimate, extend, generalize, give examples, locate, report, translate	Explains Translates Demonstrates Interprets Summarizes	Demonstrates Listens Questions Compares Examines	Students organize previously learned material, rephrase it, describe it in their own words, use it for making comparisons, change from one form of representation to another.
Apply	Use methods, concepts, principles, and theories in new situations	Apply, practice, employ, solve, use, demonstrate, illustrate, show, report, paint, draw, collect, dramatize, classify, put in order, change, compute, construct, interpret, investigate, manipulate, modify, operate, organize, predict, prepare, produce, schedule, sketch, translate	Solves novel problems Demonstrates Uses knowledge constructs	Shows Facilitates Observes Criticizes	Students use previously learned information in order to solve a problem or to complete familiar or unfamiliar tasks.
Analyze	Identify how parts relate to one another or to a larger structure/purpose	Analyze, dissect, detect, test, deconstruct, discriminate, distinguish, examine, focus, find coherence, survey, compare, contrast, classify, investigate, outline, separate, structure, categorize, solve, diagram, determine evidence and conclusions, appraise, break down, calculate, criticize, debate, experiment, identify, illustrate, infer, inspect, inventory, question, relate, select	Discusses Uncovers Lists Dissects Compares and contrasts	Probes Guides Observes Acts as a resource	Students will 1) identify reasons, causes, & motives; 2) consider available evidence to reach a conclusion, inference or generalization; 3) analyze a conclusion, inference or generalization to find supporting evidence.
Evaluate	Judge the value of something based on criteria, processes, or standards	Coordinate, judge, select/choose, decide, debate, evaluate, justify, recommend, verify, monitor, measure, the best way, what worked, what could have been different, what is your opinion, test, appraise, assess, compare, conclude, contrast, criticize, discriminate, estimate, explain, grade, interpret, rate, relate, revise, score, summarize, support, value	Judges Disputes Forms opinions	Accepts Lays bare the criteria Harmonizes	Students judge the merit and value of an idea, a solution to a problem, an aesthetic work, etc.
Create	Generate a coherent functional whole; recognize new patterns	Create, hypothesize, design, construct, invent, imagine, discover, present, deduce, induce, bring together, compose, pretend, predict, organize, plan, modify, improve, suppose, produce, set up, what if, propose, formulate, solve (more than one answer), arrange, assemble, categorize, collect, combine, devise, explain, generate, manage, perform, prepare, rearrange, reconstruct, relate, reorganize, revise, argue for	Generate Hypothesize Plan Design Produce Construct Argues	Reflects Extends Analyzes Evaluates	Students will 1) produce original work or communication; 2) make predictions; 3) solve problems; 4) invent, hypothesize, devise a procedure; argue for a position; present a work of art or music to be juried

Adapted from L. W. Anderson and D. R. Krathwohl (eds). *A Taxonomy for Learning, Teaching and Assessing* (based on Bloom's Taxonomy), *2001.*

Check-list for creating **class-scale** learning goals:

- ✓ Is goal expressed in terms of **what the student will achieve** or be able to do?
- ✓ Is the **Bloom's level** of the goal aligned with your actual expectations?
- ✓ Is the goal **well-defined?** Is it clear how you would measure achievement?
- ✓ Do chosen verbs have a **clear** meaning?
- ✓ Is **terminology familiar**/common? If not, is the terminology a goal?
- ✓ Is it **relevant and useful** to students? (e.g. connected to their everyday life OR does it represent a useful application of the ideas).

http://www.colorado.edu/sei/fac-resources/

Handelsman, Miller, and Pfund, Scientific Teaching, Freeman, 2007.

The Lexicon of Scientific Teaching

Active learning
A process in which students are actively engaged in learning. It may include inquiry-based learning, cooperative learning, or student-centered learning.

Active learning exercise
An activity that actively engages students.

Alignment
Ensuring that the activities and assessments are designed to help students meet learning goals.

Assessment
Tools for measuring progress toward and achievement of the learning goals.

Backward design
Designing instructional materials by first setting learning goals, then determining what outcomes would illustrate achievement of those goals, and then designing classroom activities so that students meet the goals.

Biology concept framework
A model that provides a hierarchy of biology concepts and content for an introductory biology course. (Similar models also exist in chemistry and physics.)

Bloom's taxonomy
A hierarchy of intellectual behaviors that are important to learning, categorized into six levels of cognition: knowledge, comprehension, application, analysis, synthesis, and evaluation.

Cognition
The mechanisms the brain uses to process knowledge and analyze information.

Constructivism
The theory developed by education philosopher David Ausubel proposing that people learn by constructing knowledge.

Cooperative learning
The process by which students work together to solve a common problem.

Diversity
The breadth of differences that make each student unique, each cohort of students unique, and each teaching experience unique. Diversity includes everything in the classroom: the students, the instructors, the content, the teaching methods, and the context.

EnGaugement
An activity that simultaneously *engages* students in learning and *gauges* their understanding.

Evaluation
The process of analyzing the results of assessment and determining whether the goals have been achieved.

Group learning
The process of students working in groups to solve a problem. (See also: *cooperative learning.*)

Inquiry-based learning
The process of engaging students in the process of exploration and asking and answering scientific questions to acquire new knowledge and skills.

Institutional transformation
The process of changing the culture and practices of a campus to reflect a commitment to key ideals.

Instructional materials
The sum of materials and information—documents, notes, Web-based tools, activities, and handouts—that an instructor uses for teaching.

Knowledge
The information, mental processes, and skills that students gain by learning.

Learning
The acquisition of knowledge and understanding, the development of skills, and the ensuing changes in affect or behavior.

Learning goals
What students will know, understand, and be able to do.

Learning outcomes
Specific, measureable learning goals.

Learning styles
Preferences, approaches, and skills in learning.

Metacognition
The process of setting challenging goals, identifying strategies to meet them, and monitoring progress toward them.

Misconception
Incorrect understanding of a concept or fact.

Nature of science
Representation of science as a process that includes analysis, collaboration, communication, experimentation, evaluation, inquiry, and knowledge.

Prior knowledge
Collective knowledge, skills, and worldviews that students bring to a class.

Reading assessment
An exercise in which students develop an activity to gauge whether their peers understand a reading assignment.

Rubric
A tool that provides explicit criteria by which the work (homework, exam, project, etc.) will be judged.

Scientific teaching
Teaching science in a way that (1) represents the nature of science as a dynamic, investigative process based on evidence, (2) engages a diversity of people in a collaborative process and (3) has clear learning goals in mind, uses methods and instructional materials designed to improve student learning, and evaluates the methods iteratively.

Teachable tidbit
Part of a teachable unit. Example: a brainstorming activity. (See also: *active learning exercise* and *enGaugement.*)

Teachable unit
Instructional materials with clear learning goals that are designed to engage students in learning, provide feedback to both students and instructors about learning, and provide other instructors with guidance in how to teach the materials. A comprehensive teachable unit includes explanations about how the materials enGauge a diversity of students and align with the goals.

Unconscious bias
The filters that we all apply unconsciously to situations and people, which can affect student learning and engagement in the classroom.