

EFFECTIVE QUESTIONING: the cognitive complexity of questions



What kind of thinking do you want your students to be doing: recalling fundamentals facts, relating one idea to another, applying what they know to a new situation? Be aware that more complex questions—such as those that generate discussion—require more complex thinking. To get students talking to one another, ask questions that challenge students to do more than remember facts. For best results, ask questions that build upon students’ prior knowledge and that are in line with the expectations of the course (particularly graded assignments).

Notice that for any course content you can ask questions at any level of complexity:

EXAMPLE from a history class
Course content on the 4th amendment

EXAMPLE from a biology class
Course content on DNA and genes

EXAMPLE from a math class
Course content on a definition of a derivative

increasing complexity

LEARNING TASK	EXAMPLE from a history class <i>Course content on the 4th amendment</i>	EXAMPLE from a biology class <i>Course content on DNA and genes</i>	EXAMPLE from a math class <i>Course content on a definition of a derivative</i>
Remember: Recall fundamental knowledge – concrete facts, dates, definitions, etc.	When was the 4th Amendment ratified?	What is DNA?	What is the difference-quotient definition of the derivative?
Comprehend/Understand: Give the meaning and/or significance of facts, events, and so forth. Be able to explain or summarize them.	What is the meaning of the 4th Amendment?	Explain the role of DNA in protein synthesis.	What does the derivative represent with respect to the graph of the original function?
Apply: Use your understanding of a subject to address a new situation.	What sorts of realities may have gone into drafting the 4th Amendment?	What would happen if a point mutation turned an amino acid codon into a stop codon?	Find the equation of the tangent line to the graph of $f(x) = x^2$, at the point $(1, f(1))$
Analyze: Compare one subject’s parts, characteristics, overall meaning, and so forth, with another’s.	What may be some common issues between Amendments 3, 4, and 5?	Why does it matter that DNA is antiparallel?	What does each term in the difference-quotient definition of the derivative represent graphically?
Evaluate: Critique or judge a subject, based on its own attributes, and on the ways in which it compares with other subjects.	Which Amendment is most relevant to modern society?	Develop an argument against splicing insecticidal genes into the corn genome.	Why is the derivative also said to represent “instantaneous rate of change” and how does this definition compare with the “slope of a tangent line” definition?
Create: Design or invent a new model, scenario, or project based on the subject you’ve learned.	Argue for or against warrantless wiretapping, based on the 4th Amendment.	Propose a single-gene splice that would create an interesting fish for the pet trade.	The commonly used difference-quotient definition is not unique. Give another representation for the notion of the derivative, then sketch and label on a graph.

Getting students to generate the questions

Introduce students to the practice of self-quizzing, or generating questions of their own and then answering those questions, as a way of practicing before a test. This is a very effective study technique

When there's a lot of information to be learned, it's natural to focus on questions at the most fundamental level (remembering). However, college-level exams generally include questions at a variety of levels, so be sure to prepare and challenge your students to write—and respond to—questions that require more complex thinking.

LEARNING TASK	Typical words in the question	Questions with your class content
Remember: Recall fundamental knowledge – concrete facts, dates, definitions, etc.	define, identify, label, match, name, recall, recognize, sort	
Comprehend/Understand: Give the meaning and/or significance of facts, events, and so forth. Be able to explain or summarize them.	discuss, explain, generalize, give examples, interpret, restate, summarize	
Apply: Use your understanding of a subject to address a new situation.	apply, demonstrate, hypothesize, imitate, predict, relate, show, solve, use	
Analyze: Compare one subject's parts, characteristics, overall meaning, and so forth, with another's.	analyze, break down, contrast, discriminate, outline	
Evaluate: Critique or judge a subject, based on its own attributes, and on the ways in which it compares with other subjects.	argue, assess, compare, decide, evaluate, persuade, rate, support, verify	
Create: Design or invent a new model, scenario, or project based on the subject you've learned.	adapt, combine, compose, design, imagine, plan, synthesize, transform	