UNDERSTANDING TESTING
What, how, and why you should test

The purpose of training is to provide learners with the necessary skills to do their jobs. We assess our learners to validate that learning has occurred as a result of training - not previous knowledge, guessing, or poor question construction. In order to achieve that validation, we need to construct effective test questions.

This requires an understanding of how people learn, and how to write test questions which are complex enough to accurately test the learning objective that was trained.

LEARNING HAS LEVELS OF DEPTH

Not all tasks that we train are equal. Some tasks are simple and only require basic memory to recall a simple fact. Other tasks are complex and require deep levels of cognitive thinking to complete the task accurately.

One prominent model for categorizing the levels of cognitive thinking is **Bloom's Taxonomy**. Bloom labelled these categories "cognitive levels" (also sometimes referred to as "learning levels"). Every task we train and every learning objective we address falls into one of these cognitive levels.

Tasks at the lower levels - Knowledge and Comprehension - require very basic mental functions to achieve. As cognitive levels get higher, the more they require mastery of the lower levels to achieve success. A task at the highest cognitive level (Evaluation) requires mastery of all the lower levels.

BENJAMIN BLOOM
BLOOM'S TAXONOMY
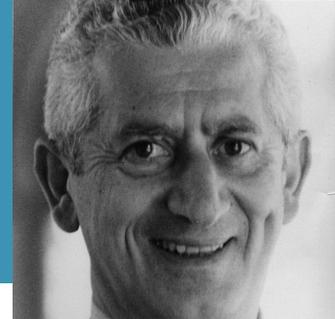
Dr. Bloom and a team of researchers defined the taxonomy for the cognitive domain in 1956 in order to promote higher forms of thinking like analysis and evaluation, rather than just rote memorization.

Changes in technology and advances in behavioral research led researchers to revise and expand Bloom's Taxonomy in the 1990s. *For clarity's sake, this document focuses on the original cognitive domain model.*

Level	Description
EVALUATION	Presenting and defending opinions by making judgments about information; validating ideas or quality of work based on a set of criteria.
SYNTHESIS	Compiling information together in a different way by combining elements in a new pattern of proposing alternate solutions.
ANALYSIS	Examine and break information into parts by identifying motives or causes; making inferences in finding evidence to support generalizations.
APPLICATION	Solving problems by applying acquired knowledge, facts, techniques, and rules in a different way.
COMPREHENSION	Organizing, comparing, giving descriptions, and stating main ideas.
KNOWLEDGE	Recalling facts, terms, simple concepts, and answers.

MATCHING THE QUESTION TO THE COGNITIVE LEVEL OF THE LEARNING OBJECTIVE

When writing test questions, it is critical to make sure the question is testing at the same cognitive level as the learning objective. Learning objectives that require higher cognitive levels to complete need to test that complexity. By only asking questions about the lower cognitive levels, we have no way of knowing if the learner learned *all* of the information at the lower cognitive levels, or if they can then build upon those lower levels to successfully complete the learning objective.

While the lower cognitive levels support higher levels of thinking, if we only tests we cannot rely on only testing those lower levels we do not create an accurate picture of learning. It is the equivalent of teaching someone to bake a cake, but only testing them on how to crack an egg and measure out dry ingredients.

More importantly, recent changes to the Department of Justice guidelines for testing in regulatory/compliance environments no longer allow test writers to write simple questions the fall well below the cognitive level of the learning objective.

Here are some common scenarios that occur when the test question does not test the same cognitive level as the learning objective:

Question is testing at a **LOWER** cognitive level than the learning objective	Question is testing at **THE SAME** cognitive level as the learning objective	Question is testing at a **HIGHER** cognitive level than the learning objective
Question results will likely indicate the question was "TOO EASY".	**Question results will likely be good.**	**Question results will likely indicate the question was "TOO HARD".**
This is the most common error when writing test questions.	Results will likely provide good insight into the level of learning transfer that has occurred because of training.	Because the question requires the learner to perform more complex thinking that they have been trained for (or were led to believe was necessary), scores on this question will likely be consistently higher than expected.
Because the question is only testing a small, less-complex portion of what is expected of the learner, scores on this question will likely be consistently higher than expected.		

MAPPING FROM LEARNING OBJECTIVE TO QUESTION

Documents later in this tool kit will help you learn how to identify the cognitive level of your learning objective, and provide insight into how to write an appropriate question for that cognitive level.

Here is an overview of what that process looks like:

If the LEARNING OBJECTIVE wants the learner to do something like this...	...then the COGNITIVE LEVEL is likely...	...so a good QUESTION STEM might start with:
• Make complex judgments • Identify quality of solution through multiple inputs • Defend a subjective opinion	**EVALUATION**	• Prove... Disprove... • How would one evaluate...? • How would one determine...? • How would one explain...?
• Create something new from many elements • Design an answer to a unique scenario	**SYNTHESIS**	• Given the toolset, design a... • How would you improve...? • Given the entities unique situation, how would you...?
• Break a complex scenario down into its component actions • Identify how individual elements affect an outcome when multiple elements are present • Identify cause and effect between different elements	**ANALYSIS**	• How is _____ related to...? • What conclusions can you draw...? • How would you categorize...? • What is the relationship between...
• Organize a series of steps to perform a task • Build a new model from a number of elements • Solve a problem using multiple sources of information	**APPLICATION**	• Apply the concept to... • What steps would one apply to...? • What elements would one choose to change...?
• Compare between multiple things • Contrast different elements • Summarize a number of facts • Classify a series of facts	**COMPREHENSION**	• Classify the type of... • Compare... Contrast... • What facts or ideas show...? • What is the main idea of...? • Which statements support...?
• Define a term • Label parts of something • Recall a fact • Identify something from a group	**KNOWLEDGE**	• What is...? • Where is...? • Why did ...? • Can you select...?