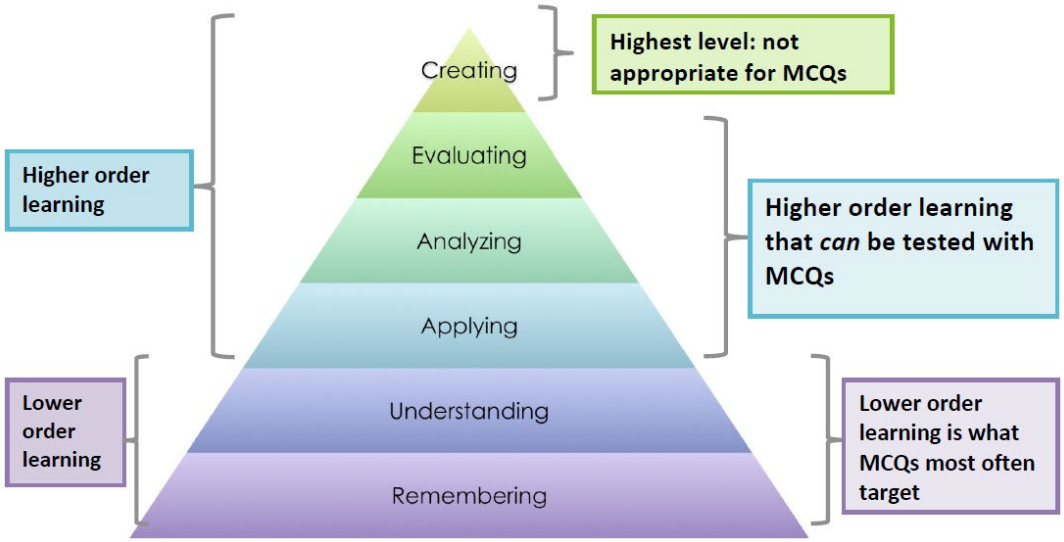
Creating HOT MC questions handout

This handout was created for the Week of Education workshop about HOT MC questions. Vlas, May 2025. Teaching Academy / CELT
Link: Higher order MC questions | Assessment support



Source image: Handout: Levels of Learning & Bloom's Taxonomy. T&L services, McGill University. Based on the revision version of Bloom's Taxonomy by Anderson, L. W. and Krathwohl, D. R., et al (Eds..) (2001)

What makes a question HOT?

A HOT (Higher Order Thinking) question targets the higher levels of the revised version of Bloom's Taxonomy. It requires students to engage in more complex cognitive processes. It requires, among others, to think critically and deeply, to make connections between ideas, justify their reasoning, solve problems, and synthesize information.

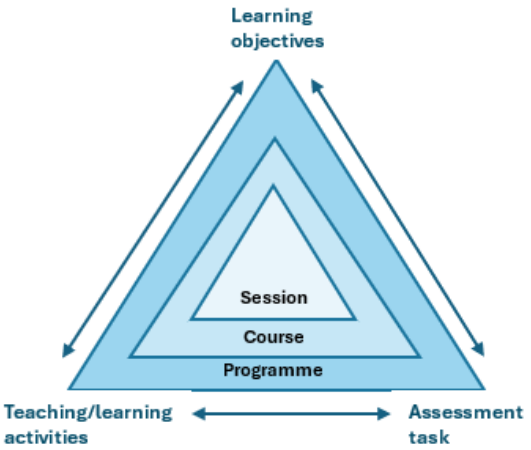
It is not the aim with HOT questions to make questions artificially difficult. What is asked for should be aligned with the learning objectives and required Bloom level.
Lower order learning also remains important. In general, a question on "apply" or higher level, assumes that students remember and understand the learned information. It can foster this. Nevertheless, there can be reasons and it can be of value to check explicitly whether the knowledge is remembered and understood.

Level	Definition / *Example*
Remembering	Recalling or recognizing facts, terms, basic concepts, or answers without necessarily understanding what they mean. *What are the three main components of a well-structured multiple-choice question?*
Understanding	Grasping the meaning of information by interpreting, explaining, summarizing, classifying, or comparing it. *Which of the following is an example of a poorly written distractor for a MC question?*
Applying	Using knowledge, methods, or concepts in new situations or concrete tasks to solve problems or complete actions. *Assume students learned the following: [….]. What would be a suitable question on Bloom's apply level?*
Analyzing	Breaking down information into parts to understand how they relate to one another and to an overall structure or purpose. Also: Interpreting data, charts, cases. Identifying motives, causes, or patterns. *Identify the part of this MC question that may introduce bias or confusion.*
Evaluating	Making judgments based on criteria and standards through checking, critiquing, or defending ideas or decisions. *You are reviewing a peer's exam. Justify whether the questions appropriately measures application of the theory.*
Creating	Putting elements together to form a new coherent or functional whole (synthesizing). Generating, or producing something (product, idea, intervention). Creating something original. *Develop a set of case-based MC questions for your own course topic that targets higher-order thinking.*

TIPS for creating HOT MC questions
Use suitable verbs, aligned with your learning objectives. See for a nice overview of useful nouns: Cognitive Demand
Pay attention to the distractors. Make them plausible, so a high level of discriminating judgement is required. NB. Don't try to 'trick' your students or provide purposeful misleading information!
Bury the verb. Example: Instead of "*Describe ….. "* Ask: "*Select the best description for …* ".
Use "Why," "How," "Which", or "What If" in the Stem. These kinds of words force reasoning beyond recall. Example: *How can using ambiguous wording in MC questions negatively impact assessment quality?*
Instead of defining something ask for identifying or analyzing. Example: Instead of asking *What are the common symptoms of flu*. Provide a description of symptoms and ask whether this may be a case of flu. Or based on the case, the question may be: *What is more likely: It's a*
Ask for interpretation of visuals (charts, graphs etc.) to draw conclusions or make predictions. NB. You can ask more than one question related to a visual or case. Students have to read the case or interpret the graph just once, which will limit the cognitive overload.
Uses examples, scenarios or cases – students apply, analyze, evaluate.
Application with additional actions. An additional action (e.g. calculation on scrap paper or using a computer program) is required to arrive at the correct answer.
Require the use of multiple facts and multiple level thinking. Knowledge has to be applied logically and systematically to a problem for the answer. For instance show a graph with a very skewed distribution and ask: *Why is it likely that the median (y) will be between the mode (z)*
Ask for comparison, judgment, prioritization. E.g. provide a situation and/or approaches and ask for a judgement: *What is the most appropriate…. Which …. provides the most insight into ….*
* TIP: *AI might provide inspiration and suggestions.*

Good to keep in mind some general principles for good quality written exams!

- ✓ Criteria for all good quality exams: validity, reliability and transparency + alignment between learning objectives, assessment tasks and teaching/learning activities (constructive alignment, Biggs 1999).
- ✓ Inform and prepare students for the kind of questions they will get.
- ✓ A good division of questions based on among others the weight of the learning objectives and representativity (Tip: create a test specification table as blueprint).
- ✓ Guidelines for assembling the exam (e.g. the number of questions or order).
- ✓ Guidelines for scoring and grading (point distribution, taking the guessing factor into account).
- ✓ General guidelines for good quality closed (MC) questions. Avoid preventable mistakes!
- ✓ Conduct a test analysis afterwards (before grading). This provides a lot of evaluative information about: the quality of the exam and each question // mistakes made in drafting the question // common mis-conceptions (input for next year's teaching) // effectivity of teaching activities.



Used and useful resources:

General about MC questions

- UT Assessment support (toolbox) / Constructing questions.
- Elaborate and insightful manuals: Is this a trick question? A short guide to Writing effective test questions. (Ben Clay, Kansas Curriculum Center) // Preparing effective essay questions. A self-directed workbook for educators. (C.M. Reiner, T.W. Bothell, R.R. Sudweeks, B. Wood, 2002 New Forums Press) // Writing good multiple-choice exams. Handbook by Dawn M. Zimmaro (University of Texas).

Overview of different kind of question types and tips

- Exam Questions: Types, Characteristics, and Suggestions | Centre for Teaching Excellence | University of Waterloo // More than multiple choice: all question types at a glance // Use of different closed question types - Optimum Assessment // Ho To Write Better Tests.doc

Higher order thinking questions

- A Model of Learning Objectives. Bloom versus knowledge dimensions. IOWA State University.
- Writing higher order multiple choice question. Brame. C (202). Vanderbilt University Center for Teaching.
- Writing Multiple-Choice Questions for Higher-level Thinking. Blog by Mike Dickinson in Learning Guild.
- Constructing Multiple-Choice Items to Measure Higher-Order Thinking. Darina Scully, Dublin City University. In Practical Assessment, Research & Evaluation, vol. 22, nr 4, 2017.

Stimulating higher order thinking skills in general

- Benefits of Nurturing Higher Order Thinking Skills | Structural Learning

For support

The **Teaching Academy of BMS** provides BMS staff support in the field of education.
If you are a teacher and have questions related to your module/course design or assessment, feel free to contact the educational specialists.
The Teaching Academy offers workshops on educational themes on request for the programmes.

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The **Centre of Expertise in Learning and Teaching (CELT)** at the University of Twente provides support and advice to all members of the university community in the area of teaching and assessment. In the area of Assessment, we offer:

- University Examination Qualification (UEQ/BKE) course, also part of the UTQ trajectory
- Workshops on assessment themes on request of programmes. For instance: Workshop: Out-of-the-box Assessment
- Senior University Examination Trajectory
- Introduction course for new Examination Board members (see Course finder for new dates)
- Resources: Utwente: Testing & Assessment Support Site with among others: Toolbox Assessment and attention for trending topics, e.g. Effective and efficient assessment, Alternative assessments.
- Resource Hub - AI in education (including AI & Assessment)

For topics related to digital tools, contact the e-learning specialist at your faculty or an expert from TELT | Technology Enhanced Learning & Teaching . For administering a test digitally, you can inform yourself about the practical issues via: Digital exams (utwente.nl).