

Working with multiple-choice questions

Editors are most likely to encounter multiple-choice questions (MCQs) in educational or academic resources, such as textbooks and online courses. They are also a common method for eliciting consumers' opinions in market research, but this fact sheet focuses on how MCQs can assess students' knowledge and understanding.

The purpose of MCQs

A good MCQ objectively measures the knowledge of a respondent (a 'student' for the purposes of this fact sheet). MCQs can assess various levels of learning, from basic recall of facts to application, analysis and some types of evaluation. As they are limited by the answers provided, they are not suitable for assessing certain higher-level skills such as demonstrating creativity, formulating arguments or developing a hypothesis.

Writing an effective MCQ is difficult and requires specialist skills. Authors with extensive subject knowledge or teaching experience are often asked to write MCQs but are rarely given specific guidance on how to do it. As a result, development editors and copyeditors may need to check MCQs for sense. Editors should not rewrite weak MCQs unless they have been briefed to do so. Instead, they should mark up any issues as an author or publisher query.

This fact sheet outlines some of the common problems that writers and editors of MCQs might encounter.

The structure of an MCQ

MCQs consist of a standalone question (the stem), with several possible answers. The correct answer (the key) is listed among three or four wrong answers (distractors). Students have to choose one or more answers from the options given. For example:

- ✓ What noise does a cat make? [stem]
 - a. Woof [distractor]
 - b. Moo [distractor]
 - c. Meow [key]
 - d. Baa [distractor]

The question must make sense

Questions must be pitched appropriately for the student.

There should be no irrelevant and confusing information

Usually, the aim is to find out what students know, not how well they can read or understand long words, so questions and answers should be concise and unambiguous so that they assess knowledge, not literacy skills. Writers should also be careful not to give away the correct answer in the stem:

- ✗ Pet cats may be kept inside or outside or be able to move freely between the house and garden. Sometimes neighbouring cats can enter the house but owners can allow only their cat to come in by installing a special microchip-controlled cat flap. How?
 - ✓ What type of cat flap prevents neighbouring cats from entering the house?

The stem should be self-contained

Ideally, the stem should make sense without the answers. This means the student doesn't have to spend time deciphering what the question means:

- ✗ My cat is:
 - a. black and white [key]
- ✓ What colour is my cat?
 - a. Black and white [key]

Avoid colloquialisms and unnecessarily complex language

If the question aims to identify whether students know a particular technical term, the structure of the question should make that intention clear:

- ✓ A cat is a digitigrade. What does this mean?
 - a. It has a different number of toes on its front and back paws
 - b. It walks on its toes [key]
 - c. It goes out at dawn and dusk
 - d. It has claws

Consider whether negatively worded questions will be understood

Choosing the 'odd one out' enables students to demonstrate the relationship between facts or ideas. Such questions are often phrased negatively:

Which of the following is NOT something a cat likes to eat?

A cat likes to eat all of the following EXCEPT:

Some people think this type of question is confusing, while others think it makes students read the question more carefully. Take into account the level of readership and the purpose of the question when considering whether it should be rewritten. If the negative word is retained, it should be made obvious, for example capitalised or formatted in bold.

Try to retain objectivity

Questions should not ask 'What would you do?', as the student could defend any answer with 'Well, I would do that!'. Similarly, avoid anything that could be seen as subjective or relative:

- ✗ Why are cats so cute?
- ✗ Why do cats love fish?
- ✗ Why does my cat only jump on my desk when I'm on a video call?

On a related note, it is best not to ask for the meaning of initialisms or acronyms (initialisms that are pronounced as a word). Not only could a student argue that a collection of letters could stand for anything, but it is also hard to write realistic distractors for a specific acronym.

- ✗ What does RSPCA stand for?
 - a. Really Special People's Cat Association
 - b. Royal Society for the Protection of Cats and Animals
 - c. Royal Society for the Prevention of Cruelty to Animals [key]
 - d. Running Short of Possible Cat Answers

Questions should be suitable for the MCQ format

But it is also important not to be too specific. Avoid yes/no and true/false-type questions as they limit the distractors:

- ✗ Are whiskers a type of hair?
 - a. Yes
 - b. No
 - c. Sometimes
 - d. Meaningless fourth distractor

A meaningful test must have plausible distractors

Distractors should not be too obviously wrong

If the correct answer can be easily guessed without any background knowledge, the question has failed in its purpose of assessing knowledge:

- ✗ What is the common name for the species *felis catus*?
 - a. Cat
 - b. Cactus
 - c. Elephant
 - d. Human

If it is too hard to think of wrong answers, perhaps it's the wrong question. Try asking it in a way that allows each distractor to be worth considering. They could be frequent misconceptions, commonly asked questions or other related concepts that the student might know. Technical terms applied in the wrong context might also make for credible distractors. For example:

- ✓ What is the Latin term for the domestic cat?
 - a. *Felidae* [Latin term for the family 'cat']
 - b. *Felis catus* [key]
 - c. *Panthera* [the genus of cats that roar]
 - d. *Felis silvestris* [European wild cat]

Consider the grammatical structure

All the answer options should have a similar sentence structure that follows on logically from the question – grammatical errors may unintentionally draw attention to the wrong (or right) answers. This is the same principle as wording bullet lists to follow the sentences or phrases that introduce them.

- ✗ Cats are crepuscular because they:
 - a. they like to knead your lap with their paws
 - b. of their rough tongues
 - c. are more active at dawn and dusk [key]
 - d. prefers to go out during the day

Answer options should be presented consistently

The correct answer should not be obvious by being longer or shorter or phrased differently than the distractors.

- ✗ Where does a cat most like to be stroked?
 - a. On its back
 - b. Around its face, ears, chin and at the base of its tail, where its scent glands are [key]
 - c. On its tummy
 - d. On its paws

Avoid 'All of the above' and 'None of the above'

Students only need to realise that more than one answer could be right to reasonably guess that 'All of the above' is the correct answer:

- X** What is a cat's favourite pastime?
- a. Sleeping
 - b. Being stroked
 - c. Sitting on laps
 - d. All of the above

With this example, it could also be argued that 'favourite' implies a single pastime that the cat enjoys more than any other. 'All of the above', therefore, is doubly confusing.

'None of the above' is similarly meaningless, as it does not identify whether the student knows the correct answer.

Eliminate ambiguity

This is the opposite problem to having distractors that are too obvious. A student may find that more than one option could be correct, but 'it depends' is not normally a valid MCQ answer. Consider asking the question the other way round, by switching the key with the stem.

- X** What is bunting?
- a. Cats exhibiting random bursts of energy
 - b. A songbird of the finch family [key?]
 - c. Cats rubbing their heads on objects to scent-mark them [key?]
 - d. Decorative coloured flags or pennants [key?]
- ✓** What is the term used for cats rubbing their heads on objects to scent-mark them?
- a. The zoomies
 - b. Enrichment
 - c. Bunting [key]
 - d. Kneading

As with questions, answers should be clear and precise, avoiding qualifiers such as 'some' or 'usually'.

If authors have been briefed to ask for the 'best' answer rather than the 'correct' answer, they could ask a more specific question which tests a higher level of understanding.

Answers in the form of numbers could also introduce ambiguity. If the question asks how many legs a cat has, remember that, because cats have four legs, it follows that they have one, two and three legs (and some cats do only have three legs).

Check the bigger picture

As with any edited text, make a style note of any unusual or potentially inconsistent aspects of the MCQ – the use of numbers, units and punctuation, for example.

Ensure the placement of the key changes throughout the test, to avoid any patterns. If the test is delivered online or via software, the position of the answers can usually be randomised each time it is administered.

In textbooks, check that the MCQs can be answered from the content provided in the chapter or section in which they appear. Ensure it is clear what learning objectives, topics or concepts are being tested, particularly if the MCQs are included for revision purposes. Consider, too, whether an MCQ format is suitable for assessing everything that needs to be assessed.

Finally, it is useful to carry out a final check on the test as a whole to make sure that none of the questions inadvertently provide the answers to other questions.

Assessments using Bloom's Taxonomy

Originally developed by educational psychologist Benjamin Bloom in the 1950s, Bloom's Taxonomy provides a framework for developing students' critical thinking skills.

Different skills are represented as a hierarchy or pyramid. Recalling information ('Remember') is classified as the most basic skill and is placed at the bottom. As students learn more about a topic, they move up through the levels until they can use their knowledge to develop new material or concepts ('Create').

The required level of thinking is indicated by 'command words'. For example, questions that use words such as 'state' test students' ability to remember basic concepts. Exams often start with this type of question and become progressively more complex until students are asked to 'evaluate' or 'formulate' a hypothesis or argument. Some command words may be used for more than one level but in general they help to establish whether students' knowledge meets the required learning objectives.

Well-written MCQs should be able to test all levels up to 'Evaluate'.

Table 1: Bloom's Taxonomy: Levels and associated command words

LEVEL	What the student can do	Examples of associated command words
CREATE	Use information to make something new	assemble, construct, design, develop, formulate, investigate, plan
EVALUATE	Synthesise information and use it to make a decision	appraise, argue, critique, defend, justify, select
ANALYSE	Connect ideas and concepts	compare, contrast, distinguish, differentiate, examine
APPLY	Use information in new contexts	demonstrate, implement, interpret, solve, use
UNDERSTAND	Be able to explain the meaning of something	classify, describe, discuss, explain, identify, summarise
REMEMBER	Recall basic facts and concepts	list, define, match, select, state

Further information

CIEP resources

Editing textbooks: CIEP guide to be published spring 2023

Editing into plain English: <https://www.ciep.uk/resources/guides/#EPL>

Good practice for author queries: <https://www.ciep.uk/resources/factsheets/#AUQ>

Other resources

Many educational establishments provide guidance on designing assessments for their staff. Comprehensive examples include those from:

- University of Manchester (UK):
<https://www.elearning.fse.manchester.ac.uk/fseta/writing-multiple-choice-questions-a-handly-guide>
- Vanderbilt University (USA):
<https://cft.vanderbilt.edu/guides-sub-pages/writing-good-multiple-choice-test-questions>

Bloom's Taxonomy is a framework for supporting learning and assessment:
<https://tophat.com/blog/blooms-taxonomy>

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