



MULTIPLE CHOICE

Can you really use multiple-choice questions to assess programming and computational thinking?



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Do teachers ask questions just for fun? Or do they ask questions to find out what their students know and do not know? Multiple-choice questions (MCQs) offer the advantage of being quick to mark, and have the potential for gamification. How can MCQs be used to assess programming concepts and computational thinking?

Question design

All MCQs should be based on sensible design criteria. You can find lots of advice, based on very good research, about designing MCQs. They have been used for summative

assessment in the context of medicine for many years. However, teachers tend to use them more formatively: to identify what needs to be taught or reviewed, and to help students improve. The box on the left lists some top tips for MCQ writing.

Distractors and challenges

The importance of good distractors should not be underestimated. Trying to predict what a student does not know can be challenging. When choosing the alternative incorrect responses to an MCQ, consider the types of misconceptions you have identified among your students. For example, if a student uses a box analogy for a variable, they may believe it can hold two values at the same time. A distractor that expresses that understanding would help identify students who need additional help before moving on. You should also consider common errors in processes. A student with a misconception about indexing may always be out by one, so a response incorporating this misunderstanding would also make a good distractor.

It's not difficult to write an MCQ that assesses the students' ability to recall a fact. It's much more challenging, but not impossible, to write MCQs that assess application, analysis, or creation. With application, a question could be confined to a single step in a multi-step processes. Analysis can be assessed by asking 'what if' type questions where students predict what will happen next. An even more challenging assessment of analytical skills is to define a requirement, such as an output, and ask the student to select which program solution meets that requirement. Certainly, MCQs don't lend themselves to the creation of program solutions. However, they can be used in ordering exercises, where students must choose the correct sequence of

Identify what happens when the green flag is pressed and the sprite is not touching Sprite 1.

A Shows
B Shows and stops all scripts
C Hides and stops all scripts
D Hides

This question demonstrates assessment of tracing and predicting

Here are four instructions.

- line 000 000 000 ;
- background yellow ;
- stroke green ;
- line 000 000 000 ;

Here is an output.

Identify the ordering which will produce the output.

A 3, 1, 2, 4
B 2, 3, 4, 1
C 4, 2, 3, 1
D 1, 2, 3, 4

This question shows how ordering can be used to assess the skill of sequencing

TOP TIPS FOR MCQ DESIGN

- Assess one, and only one, objective
- Provide four response options
- Provide one, and only one, clearly correct response
- Do not use 'none of the above' or 'all of the above'
- Use distractors based on misconceptions and common errors
- Make all distractors plausible
- Give necessary and clear context first, if required; then, separately, ask the question
- Use images as appropriate to support context, or as alternative responses
- Short sentences are easier to understand
- Make all response options grammatically parallel
- Make all response options of a similar length

instructions to meet a requirement. Slightly simpler would be asking a question that just required the identification of a single instruction to fill a gap.

Getting started

Writing questions with a colleague is an excellent way to get started with writing MCQs. Receiving feedback on questions is the best way to improve them. As time goes on, remember to go back and review your questions. If one distractor is never being selected, you're missing an opportunity to test a true misconception.

One of the easiest and simplest ways to get started with MCQs is to join a group and share your work. Project Quantum is a joint project to crowdsource MCQ computing questions. You can find more information by visiting helloworld.cc/2eN44Vr. (Hw)