

ONE MARK FOR CHOICE AND TWO FOR JOURNEY TO CHOICE: ENHANCING FAIRNESS WITH MCQS

Anne D’Arcy-Warmington
Curtin College Perth Western Australia (Australia)

Abstract

An assessment involving Multiple Choice Questions (MCQ) from an educator’s point of view is easy to administer, no examiner bias and reduced marking time. One pedagogical failing of MCQ questions is the inability to detect whether the student has guessed the answer or eliminated incorrect answers between the students who have genuine knowledge and can distinguish correctly between the given options. This creates a dilemma for educators regarding the validity of the assessment. In an 'all-or-nothing' model, there is no middle ground: a student who knows the material but makes a slip-up is treated the same as a student who knows nothing at all. There are many ways to change the standard MCQ format. For educators to better measure what a student knows, negative marking prevents guessing, whereas weighted marks give credit for near-miss answers that show some understanding. While these two specific modified forms have pros and cons, students seem to like weighted marks because they reward what they know (Schneid et al., 2025). But there is a downside: it adds extra pressure and forces students to play a 'strategy game,' which can be hard for those who are already struggling with the material. To try to address these issues, a modified format was trialled in a Foundation Mathematics course for Health Sciences. Each question was allocated three marks: one for the correct choice and two for relevant supporting work. This approach, supported by a detailed marking guide, transforms 'assumed knowledge' into 'concrete evidence', ensuring the marking scheme reflects what the student is truly thinking and understanding. This trimester, the model is being trialled in a Foundation Statistics course. The presentation will include practical examples of the marking guides used. I invite conference attendees to share their own experiences and suggestions, to help evolve this novel assessment into an assessment tool that works across different disciplines.

Keywords: *Multiple choice questions, procedural, conceptual, fairness.*

1. Introduction

It is easy to see the attraction of multiple-choice questions (MCQs) for educators in assessments as a trifecta of “Administration Utopia”! Educators will quote that there is an ease of administration of assessment, with the elimination of marker bias and either zero or substantially reduced marking time. Efficiency of time and resources is very welcoming but should not be the main aim of any assessment but rather is the assessment really serving the purpose of revealing concrete evidence of student conceptual knowledge. Accepting a student's final answer selection in MCQs without acknowledging the statistical or mathematical journey taken may mask the extent of actual subject knowledge of the student. This creates a dilemma regarding construct validity: is the mark a true indication of statistical or mathematical competence or the ability of a good strategic plan of guessing correctly.

In an 'all-or-nothing' model, there is no middle ground: a student who knows the material but makes a slip-up is treated the same as a student who knows nothing at all. There are many ways to change the standard MCQ format. For educators to better measure what a student really knows, negative marking deters guessing to an extent, whereas weighted marks give credit for near-miss answers that show some understanding of the topic (Bush, 2001). While these two specific modified forms have pros and cons, students seem to like weighted marks because they reward what they know (Schneid et al., 2025). But there is a downside: it adds extra pressure and forces students to play a 'strategy game,' which can be hard for those who are already struggling. To try to address these issues, a modified format was trialled in a Foundation Mathematics course for Health Sciences. Each question was allocated three marks: one for the correct choice and two for relevant supporting work. This approach, supported by a detailed marking guide, transforms 'assumed knowledge' into 'concrete evidence', ensuring the marking scheme reflects what the student is truly thinking and understanding. It is hoped that this will be able to differentiate between

completely incorrect reasoning, guessing, nearly correct through to a correctly ‘thought through’ answer (Abu-Ghazalah, Dubins, & Poon, 2023).

2. Methodology and implementation

The marking guide followed frequently in MCQs is an all-or-nothing approach of zero or one mark. As outlined previously, other approaches include negative marking and weighted marking are utilised but still the question (which may apply to other formats of written tests) “are we measuring knowledge or test-taking skill? The proposed new format of MCQs hopes to merge quantitative efficiency with a qualitative insight into the journey to the selected answer. The aim of this modified format is to keep the procedure straightforward and simple for the student while offering educators deeper insight into their understanding.

2.1. The marking scheme

The marks are distributed in the following fashion for each question:

- One Mark for the choice: Awarded for the correct selection of the options available;
- Two Marks for the relevant work: Awarded for the journey showing when appropriate, procedural steps, justification and calculations or formulae.

The decision to award up to three marks for each multiple-choice question serves three pedagogical purposes.

First, it lowers the students' cognitive load by keeping the testing format familiar and intuitive.

Second, it differentiates between “basic” and “thorough” understanding by awarding two marks for the supporting calculations.

Third, it ensures a fairer distribution of final grades; guessing alone cannot obtain a passing mark of 50%, whereas students demonstrating basic knowledge can receive up to 66% of the total score.

2.1.1. Cognitive load reduction. The format has the familiarity of both multiple-choice and short answer; all the thought processes may be concentrated on the answer rather than any complicated marking scheme.

2.1.2. “Basic” versus “thorough” knowledge. The distinction between 'basic' and 'thorough' knowledge is comparable to reading only the opening paragraph of a story versus engaging with the entire narrative. This shows whether the student knows the complete solution or just knows the first line or initial formula. The mark, here, reflects concrete knowledge rather than assumed knowledge in the usual multiple-choice format.

2.1.3. Fairness and transparency. The mark appears to reflect the true measurement of knowledge rather than a reflection of strategic test-taking or random luck.

This modified format was developed to help both student and educator learn the “correctness” of the answer. Students who just guess are capped at a maximum of 33% (1 out of 3 marks), so they can no longer accidentally pass a test through pure luck! In contrast, a student who makes a minor calculator or rounding error is protected from failing completely, their procedural work guarantees them 66% of the question's value. This open approach changes the test from a stressful “trap” into a fair way to show what a student can do.

2.2. The implementation with practical examples and marking guides

This new format was first tried out in a Foundation Mathematics course for Health Sciences with the topic of Shape and Measurement. Students in this course often experience high levels of math anxiety so the old “all-or-nothing” MCQs just made this worse and failed to show what these students really knew. Giving students marks for their working out acted like a safety net. It allowed them to focus on doing the mathematics instead of stressing over a single right or wrong answer. It is hoped to trial this format in next trimester's foundation statistics course. Statistics brings its own challenges with the pathway to the final answer being one that can take many twists and turns. The difference between Mathematics and Statistics may be described as such in mathematics, you are looking to the next line and the final solution, whereas statistics looks at what you have been given to advance to the next line. Statistics relies so much on looking at the data you are given in the correct context before you can even decide how to move forward, the “journey” to the answer is everything. The steps a student takes to get there are often much more important than the final number they calculate.

Specific examples of how this works in practice will be discussed in more detail during the conference presentation, but for now, we can look at two general cases to see how the marking guidance operates.

Example One: A Basic Question (Testing Procedures)

In a triangle **ABC**, **A = 35°** **B = 75°** and **b = 13 cm**, using the Sine Rule $\frac{a}{\sin(A)} = \frac{b}{\sin(B)}$.

The length of **side a** in centimetres is

- a) 18.4 cm
- b) 12.2 cm
- c) 24.5 cm
- d) 9.2 cm
- e) None of the above

The Marking Guide:

(The Journey):

1 Mark for a proper attempt at the algebraic rearrangement of the Sine Rule formula for side a.

1 Mark for correctly substituting the values and calculating the result (including a quick check that the calculator is set to degrees, not radians!).

(The Choice):

1 Mark for selecting the correct option on the test sheet.

Pedagogical Insight: To get to the final choice, a student must know the rules of algebra to rearrange the formula, substitute the numbers into the correct places, and use their calculator correctly.

Example Two: An advanced question

In a triangle with sides **a, b and c**, if **$a^2 = b^2 + c^2$** , then the angle facing **side a** is

- a) Acute Angle
- b) Right Angle
- c) More information required
- d) Obtuse Angle
- e) None of the above

Marking guide

1 mark for knowing the labelling of sides in a triangle.

1 mark for correct answer

The Marking Guide:

(The Journey):

1 mark: For recognising Pythagoras Theorem and the required right angle.

1 Mark: For knowing how sides are labelled in a triangle (recognising that the longest side, a, is opposite the largest angle).

(The Choice):

1 Mark for selecting the correct option on the test sheet.

Pedagogical Insight: This question doesn't require any complicated calculations, but it requires conceptual understanding. A student can't just guess their way through this without knowing how triangle geometry works. The two "journey" marks reward them for showing they understand the underlying knowledge, not just how to punch numbers into a calculator.

3. Discussion and conclusion

The idea for the modified form of the multiple-choice question was designed for the purpose of introducing fairness and transparency for both students and educators. For the struggling student who has been working hard to understand concepts, there is, now, some reward for being able to display previously invisible knowledge in the usual multiple-choice format. This reduces stress and anxiety, both educator and student can acknowledge where conceptual knowledge starts to stray away from the correct path. The students can learn the next stage of learning and the educator can adjust lecture notes in real time in this area (Biggs, & Collis, 1982).

The awarding of two marks for relevant working moves the focus away from just a performance mark from a correct answer to a mastery of the concept by demonstrating the process. There is a safety net which recognises the procedural error from the conceptual misunderstanding. The student is demonstrating what knowledge they know rather than worry whether the answer is correct or not. To quote Bolton et al (2024) who has used a two-tier method for Multiple choice questions examinations though the emphasis is “to acquire more information about a student's understanding by also eliciting explanations for why the wrong answers are wrong”. This has many benefits but may be harder conceptually for students learning foundation statistics to comprehend and explain. This avenue may be explored in the future for certain questions.

This assessment design does reintroduce, to a degree, some manual marking which may lead to marker bias. A collaboration between markers to create a simple marking scheme with the allocation of marks is all that is needed to reduce the grading time. The time to grade did not increase enormously here is where experience of the educator helps.

I look forward to sharing of knowledge at the conference with great discussion on how to improve this assessment design,

References

- Abu-Ghazalah, R. M., Dubins, D. N., & Poon, G. M. K. (2023). Dissecting knowledge, guessing, and blunder in multiple choice assessments. *Applied measurement in education*, 36(1), 80–98.
- Biggs J.B., & Collis K.F. (1982). *Evaluating the Quality of Learning: The SOLO Taxonomy*. New York: Academic Press.
- Bolton, P., Lehr, L., Simha, R., & Lawson, M. (2024, June). *The justification effect on two-tier multiple-choice exams* [Paper presentation]. 2024 ASEE Annual Conference & Exposition, Portland, OR, United States. doi.org
- Bush, M. (2001). A multiple-choice test that rewards partial knowledge. *Journal of Further and Higher education*, 25(2), 157-163.
- Schneid, S. D., Armour, C., & Brandl, K. (2025). Beyond right or wrong: How partial credit scoring on multiple-choice questions improves student performance and assessment perceptions. *British journal of clinical pharmacology*, 10.1002/bcp.70127. Advance online publication. <https://doi.org/10.1002/bcp.70127>