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CAMBRIDGE Mathematics ESPRESSO

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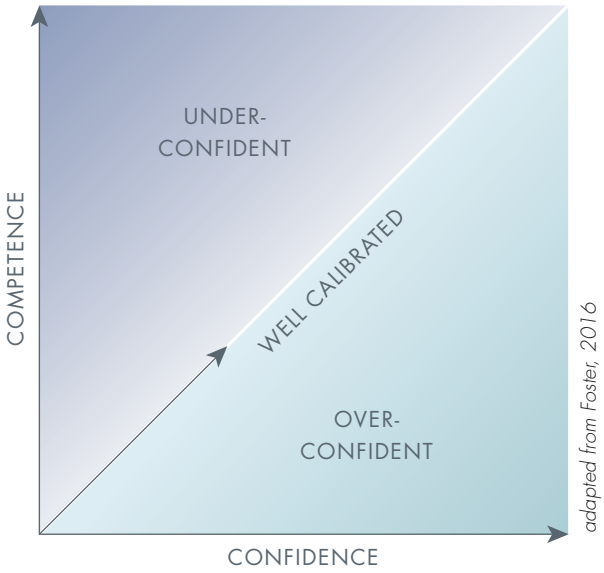
TALKING POINT:

HOW DOES ASSESSING CONFIDENCE AFFECT LEARNING AND TESTING IN MATHEMATICS?

'Well-calibrated pupils, whose confidence closely matches their competence, would be located near to the diagonal line in Fig.1, with over-confident and under-confident pupils taking positions on either side. Viewed in this way, traditional assessments which measure only competence give a partial and perhaps misleading picture.'

(Foster, 2016)



1

Pupils need confidence in their answers as well as competence in order to achieve procedural fluency in mathematics (Kyriacou, 2005). Pupils need an accurate sense of their own reliability, and teachers need to know the difference between guessing, misconceptions and misunderstandings (Foster, 2016). Without confidence assessment in testing, pupils are incentivised to guess answers or to game the system (Adams & Ewen, 2009) as educational testing systems are usually designed so that any answer is better than none (Foster, 2016). Without testing for confidence, teachers are restricted to a one-dimensional view of knowledge that doesn't distinguish between correct answers (could be guesswork or based on misconceptions) and performance (Bruno, 1993).

IMPLICATIONS: Both pupils themselves and their teachers need to understand how confident they are in their own understanding as part of the learning process. Current testing procedures do not generally incorporate confidence information which may mask guessing and misconceptions behind correct answers.

2

In simple multiple-choice testing, high question-based confidence levels have been linked to greater retention (Hassman, Hunt & Dybeck 2003). Putting a self-assessment value on a question improves performance (Koivula, Hassmen & Hunt, 2001) and the effect is stronger when the self-assessment happens after the text answer is given rather than before (Hunt, 2003). Assessing confidence in multiple-choice testing may encourage learners to consider rejection of incorrect answers in a way that aids understanding of the topic (Bjork et al, 2016.)

IMPLICATIONS: Include confidence assessment measures on multiple-choice tests to improve performance and focus on confidence as a way to aid retention.

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3

An epistemetric model (in this case knowledge + confidence) allows pupils to give information about their confidence on each specific answer on a test which captures important information for progress in learning (Hunt, 2003). One such two-dimensional model is Bruno's Information Reference Testing (Bruno, 1993), later changed to Confidence-Based Testing, which uses computers to administer and analyse learning using answers and confidence assessments combined. Test models may also award positive or negative marks, weighted by confidence assessments, to incentivise honest judgement (Foster, 2016).

IMPLICATIONS: Capturing confidence levels on assessments (perhaps through technology) can help improve the quality of teaching and learning in mathematics. Weighting tests by confidence markers can incentivise self-judgement of knowledge.

4

Most people tend to overestimate their own abilities, but this effect is more pronounced amongst those with the least skills – the Dunning-Kruger Effect (Dunning & Kruger, 2008). Public assessment of confidence (e.g. hands up or display of red, amber green cards) can lead to pupils saying they understand when they don't (Hannula 2003) because of embarrassment or status-raising. Asking for explanations or justifications can be useful, but may be time-consuming and can be rote-learned (Kent & Foster, 2015). There is a tendency amongst males to overestimate and females to underestimate when giving confidence assessments, although females are generally more accurate overall (Hassman, Hunt & Dybeck 2003). Asking students to give private confidence assessments appears to reduce some gender differences in performance (Koivula, Hassmen & Hunt, 2001).

IMPLICATIONS: Assessing confidence publicly can lead to inaccurate or unhelpful results; privately may be more effective. Asking pupils to assess their own confidence may help to reduce gender typing.

'When you know a thing, to recognise that you know it, and when you do not know a thing, to recognise that you do not know it. That is knowledge.'

– Confucius

'Poor performers grossly overestimate their performances because their incompetence deprives them of the skills needed to recognise their deficits'

– Dunning/Kruger

'Knowledge has many dimensions and the importance of confidence in one's knowledge state cannot be overlooked'

– Darwin Hunt

'Poor self-assessment of comprehension is a widespread phenomenon among college students'

– Linda Baker

IN SUMMARY

- Confidence assessments can help both teachers and pupils in the learning process
- Giving a confidence rating on individual questions can aid retention and improve performance, as well as incentivising knowing-not-guessing
- The current evidence that confidence assessments are effective is mostly limited to multiple-choice tests
- Confidence assessments are most effective when completed privately

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