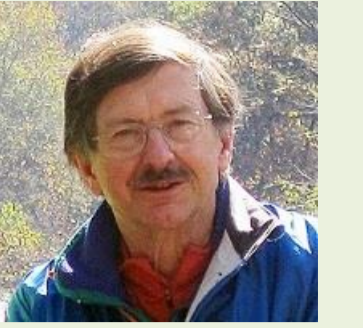


Enhancing Student Learning and Insight : using private self-tests with CBM

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- This poster is about **LEARNING**, not **TEACHING** or **ASSESSMENT**
- Certainty Based Marking (CBM) assigns marks or grades, but its main value is to encourage thinking and insight about the relationships between bits of knowledge, and to identify areas of strength and weakness.



Skills are learned through practice, challenge, mistakes, collaboration & pushing boundaries. Of course good teaching is important - but efficient learning is mostly private, student driven, away from teachers, without risk of humiliation.

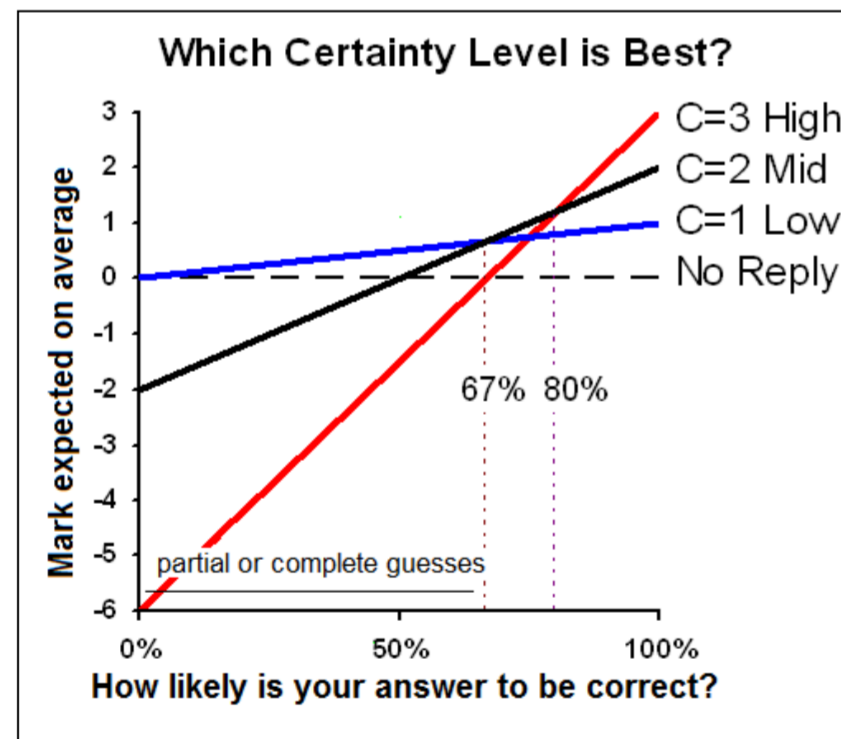


What is Certainty Based Marking (CBM) ?

For each question to be marked right or wrong, the student indicates both the answer and how sure they are that this is correct.

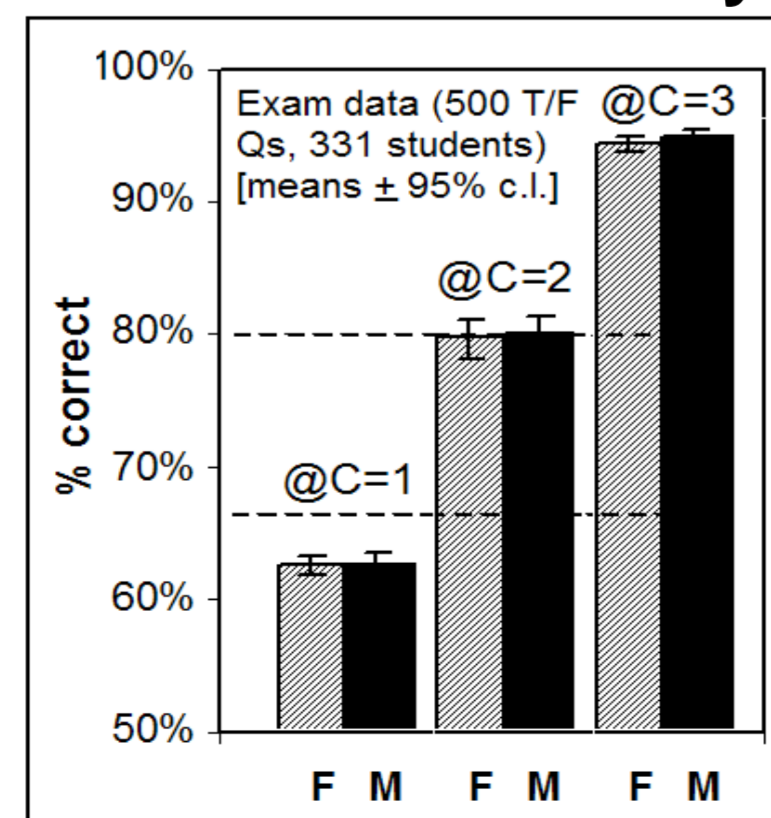
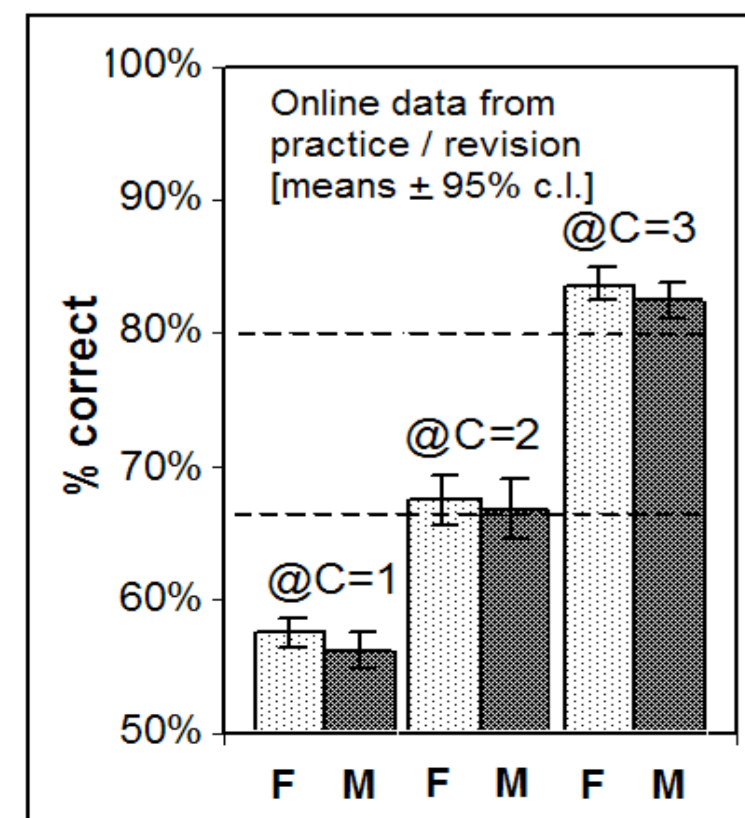
Degree of Certainty :	C=1 (low)	C=2 (mid)	C=3 (high)	No Reply
Mark if correct:	1	2	3	0
Penalty if wrong:	0	-2	-6	0
Probability Correct:	<67%	67-80%	>80%	-

I set this scheme up at UCL in '94 to reward students for distinguishing uncertain answers from reliable knowledge (initially in maths & basic science). It is obvious that C=3 is best if you are sure and C=1 if quite unsure. The graph shows the optimal probability ranges. You can never expect to gain by pretending to be more or less confident than you are, so students need to reflect how different aspects of knowledge or skill can justify or question an answer - not simply offering an initial idea. Misconceptions are strongly highlighted.

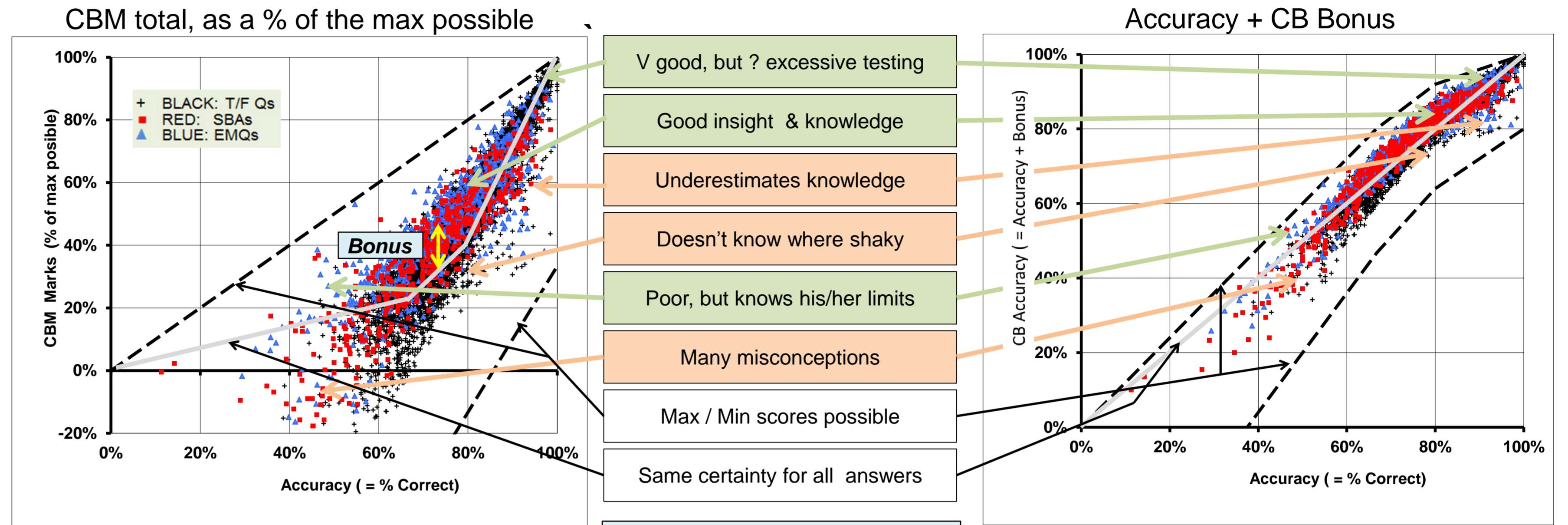


Several studies had already shown that confidence judgement can enhance learning and long-term retention. CBM is intuitively simple, and close to an ideal measure of knowledge based on information theory. By giving less weight to uncertain answers, it reduces the chance element in scores and increases statistical reliability.

How well do students discriminate reliability?



Presentation & Interpretation of CBM Scores – 2 schemes



Advantage: relates directly to the sum of marks given for answers. **Drawback:** typically, good students with 80% accuracy & good discrimination get only 50% of maximum CB marks – discouraging, and confusing to standard setters.

CB Bonus = (actual average CBM mark – average obtainable with uniform certainty) x 0.1 (a factor optimised for statistical reliability).
CB Accuracy = Accuracy + Bonus

Advantages: bonus explicitly rewards good discrimination; score is directly comparable with conventional accuracy; and always in range 0-100%. **Drawback:** non-linear relationship to individual mark totals.

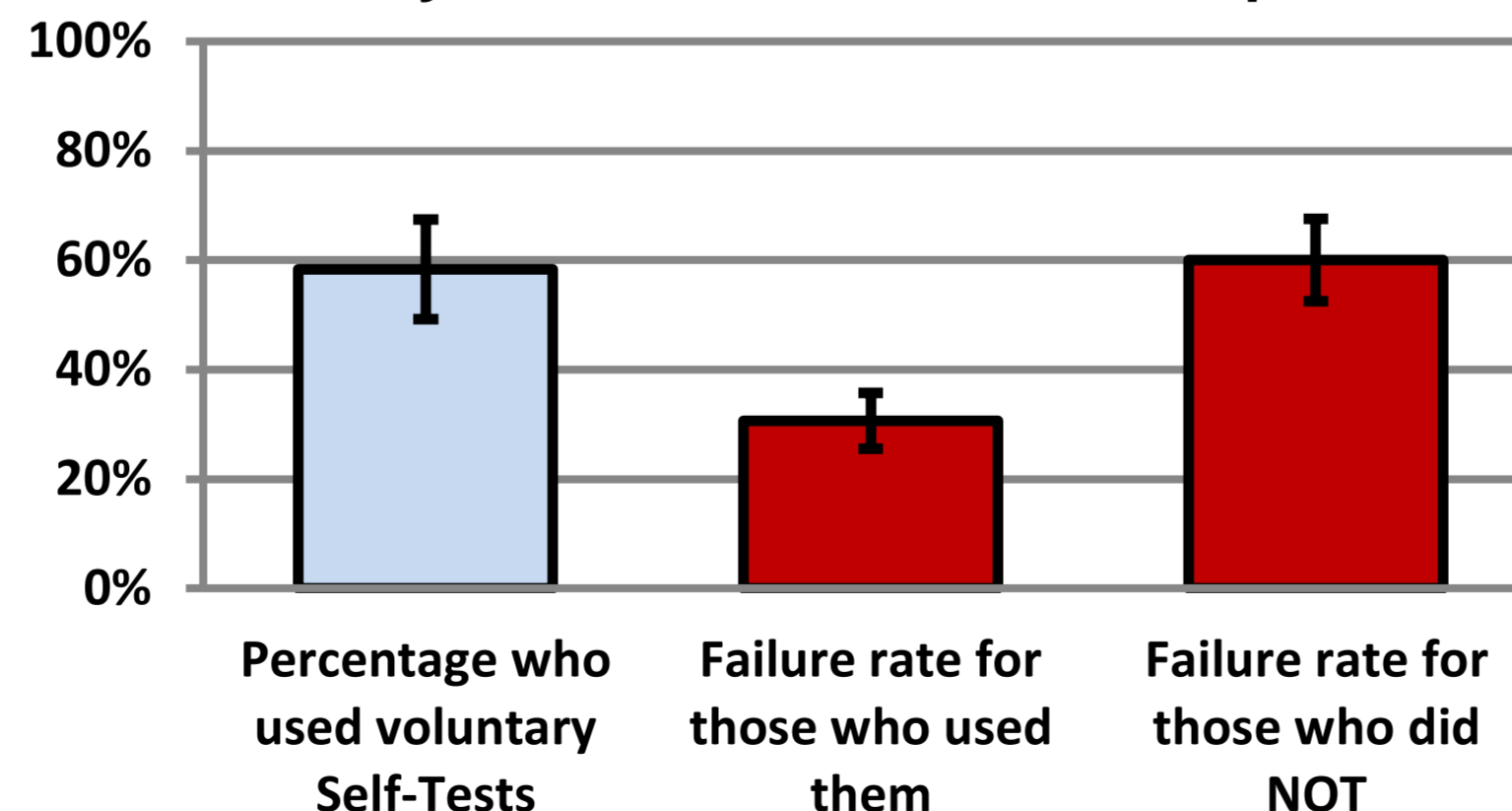
CBM software on the UCL site ('LAPT') - now moved to www.TMedwin.net/cbm/selftests for my retirement - follows years of use at several universities and for open private access. Current developments are improving institutional independence, VLE interfacing, mobile use, editing & commenting facilities. Moodle now has basic CBM functionality, though intrinsically somewhat clumsy for self-testing. **Please contact me if interested in CBM – usage, writing exercises, research or development.** tmedwin@tmedwin.net

- Learning without thought is labour lost.
- Real knowledge is to know the extent of one's ignorance.



Confucius

Voluntary self-tests in context, at Imperial



Results for 7 compulsory formative tests (Jan 2009-15, Yr 1) divided according to prior voluntary use of self-tests mainly drafted by students. Means ± SD, ca. 290 students each test.
 Data: N. Curtin, Imperial College School of Medicine

ABSTRACT

If you learn an instrument or a sport, you practise: you do this in private or with your peers, away from the eyes and ears of teachers. You learn through mistakes. You challenge yourself in areas where you know you risk mistakes, without the humiliation that you might anticipate if doing this along with a teacher. You do tests, but as learning tasks, in no way contributing to external assessment. Self-testing is fun!

We need to make this a part of academic study too: students need insight about which topics they have mastered and which not. They need to control the challenges they tackle, and they need freedom to make mistakes without humiliation. Certainty-based marking (CBM: www.tmedwin.net/cbm), with private self-tests, does this. CBM forces students to think about reasons for justification or uncertainty about each answer. It rewards acknowledgement of uncertainty and highlights confident errors (misconceptions). Students readily understand CBM – like a game in which you succeed through honesty and insight. Depending on certainty, you get 1,2 or 3 points if correct and 0,-2 or -6 if an answer is wrong. Students view this as fair and constructive, both in self-tests and exams. In exams, data shows substantial improvements in the statistical reliability and validity of overall scores.

Current work is shifting CBM from a focus at UCL and Imperial College (where over a million sessions have run in the last 10 years, with >15,000 questions) to be available as an independent tool in any institution, and for private use on personal devices or along with friends. Some elements of CBM have been incorporated into Moodle. Please contact me if interested in collaboration, trial, research or development.