

# CBM self-tests at UCL: The past and the future of LAPT

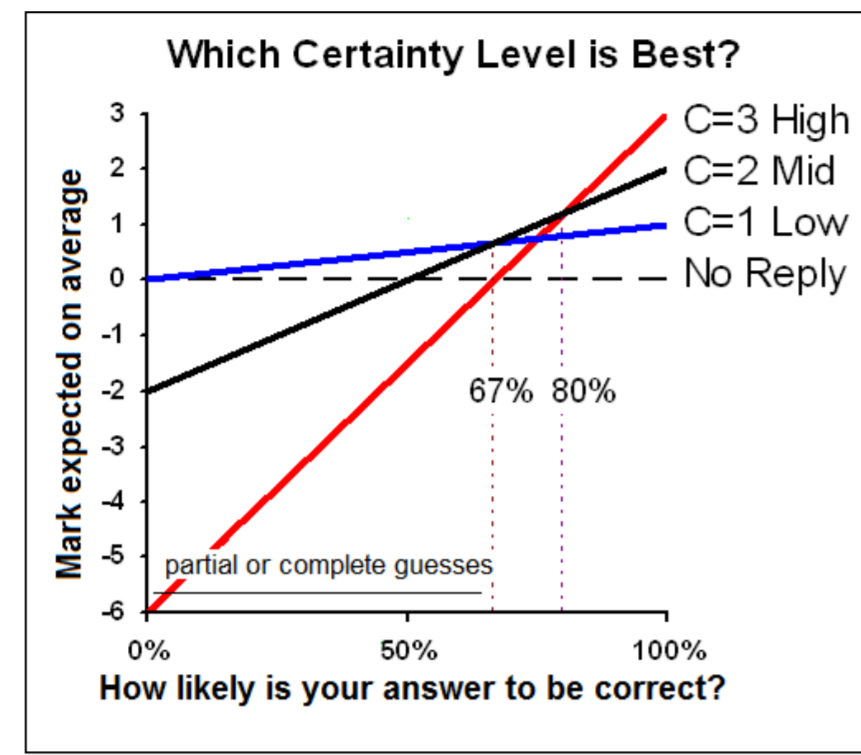
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## Why Certainty Based Marking ?

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%	-

CBM was devised and introduced at UCL in 1994 to reward students for distinguishing answers that are either uncertain or reliably justified. This helps them think from different perspectives and bring together knowledge and skills. It rewards insight about relationships, highlights misconceptions (confident errors), and helps students to direct their study efficiently.

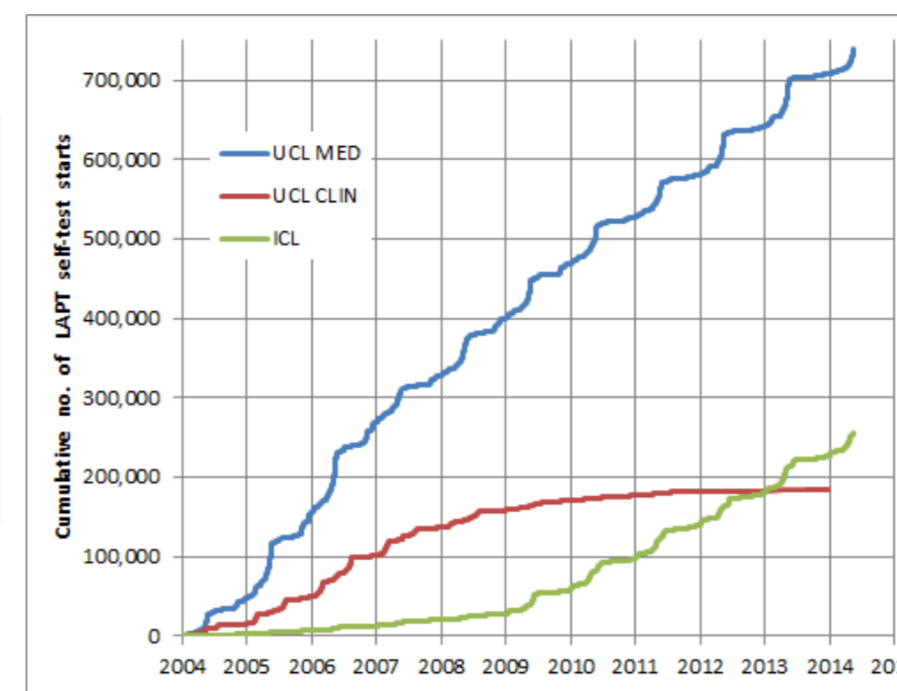


CBM approximates closely to proper measures of knowledge based on information theory. It enhances the statistical reliability and validity of exam data. Related techniques have been shown in psychological experiments to enhance learning and retention.

## LAPT: CBM's home 1994 - 2014

Beginning in Physiology, for BSc & Medical teaching, LAPT ([www.ucl.ac.uk/LAPT](http://www.ucl.ac.uk/LAPT)) spread at students' request to Anatomy, Biochemistry etc., including past medical exams (available to students in those days) as well as published and unpublished learning material.

A million sessions have been initiated by UCL & ICL students since 2004. The medical school removed clinical selftests ca.'09-'11 (now available only for staff perusal). Imperial usage has developed strongly since 2008.



Since my retirement (2007) I have maintained LAPT for continuing use by students. Some current UCL staff may not be aware how much their students actually use LAPT, especially for revision. With no UCL technical support available for LAPT, I have set up enhanced software on my own external site ([www.TMedwin.net](http://www.TMedwin.net)) under continuing development, from where facilities are available to any institution. UCL-copyright exam and clinical material is currently available on the old site restricted to UCL staff for appraisal, but could be freed for students if requested and supported.

## NEW Personal CBM Self-test software (work in progress):

- Downloadable for private practice & learning
- Adaptable for institutional themes and needs
- Loosely linked to an institutional server, VLE/LMS for:
  - Comment storage
  - Optional record submission & access
  - Access to restricted/updated test material
  - Staff editing, analysis, comment interaction
  - Student (wiki) editing & creation of self-tests

I welcome contact from anyone interested in sharing academic or technical development of this project

## Why Private Self-Tests ?

- To supplement staff-student interaction
- To help students drive their own learning
- Students want privacy: they don't believe it if you say mistakes won't be held against them

### Models for Assessment\*, Practice & Learning

#### Elements:

- Thinking
- Challenging
- Practising
- Correcting
- Floundering
- Selecting
- Discussing
- Enjoying

#### Music practice



\* Assess = ad + sedere = to sit beside

#### Sports Practice



#### Good features:

- Cooperation
- Hard
- Mistakes
- Find limits
- Push limits
- No teachers
- No record
- Fun

## CBM in Moodle

UCL is wedded to Moodle. I have provided Moodle code for CBM since 2007 – though not installed at UCL. Basic CBM is now written into core Moodle code (v. 2.6+), though with limited functionality. Beware:

- Proper display requires settings and code not implemented at UCL
  - Multiple response Qs are not broken down for CBM: avoid them
  - Format for many med. sci. Qs (Multiple T/F) suits LAPT not Moodle
  - Moodle "grades" are confusing when applied to CBM performance
  - Moodle feedback lacks graphical sophistication provided in LAPT
  - Moodle lacks an efficient comment system for improving selftest Qs
  - Response times can be slow on Moodle due to server action for each Q
  - Moodle cannot be downloaded for strictly private offline study
- Moodle is well suited for online summative CBM exams, though optical mark reader technology with CBM (Speedwell) may be more secure.

## Wisdom through the ages !

"When you know a thing, to hold that you know it, when you do not know a thing, to allow that you do not know it – this is knowledge." Confucius

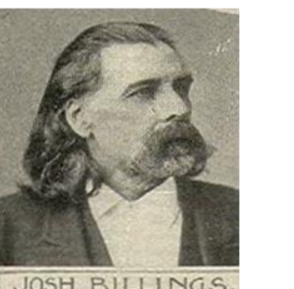


"... there are known knowns;  
... there are known unknowns;  
... But there are also unknown unknowns"

Donald Rumsfeld



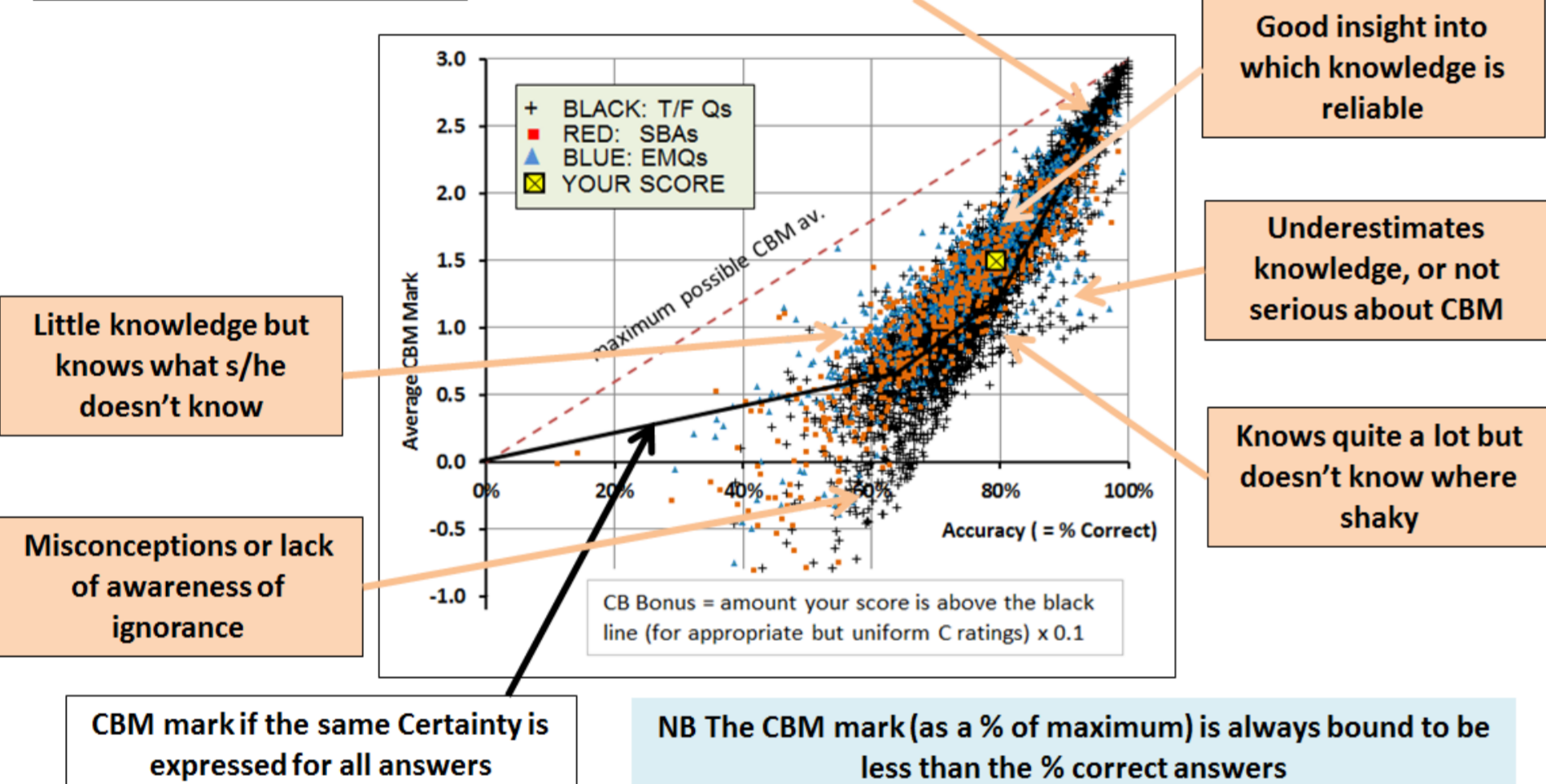
"It's not ignorance does so much damage;  
- it's knowin' so derned much that ain't so."  
attr.: Josh Billings



"A lucky guess is not knowledge.  
Misconceptions are worse than acknowledged ignorance.  
Why treat students as if these things weren't true?" TG-M

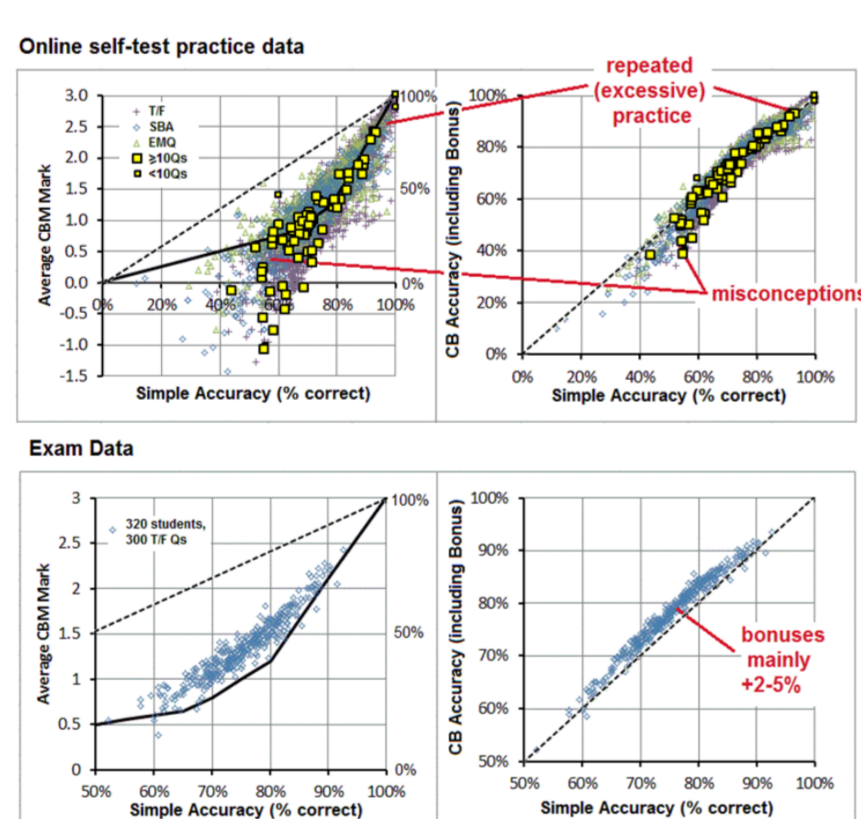
## CBM Self-tests: what the marks tell you

Very good, but may have repeated self-tests excessively



## The CB Bonus Concept

Students can be uncomfortable with the fact that typically 80% accuracy in a test goes along with 50% of the maximum possible mark. This is simply because we never know exactly which answers will be right and wrong. The **CB Bonus** measures how much the student has done better (or worse) than if they judged their probability of being right uniformly for all Qs. This is added to conventional accuracy, giving a measure more readily understood, more readily used in standard setting, and almost equally effective at enhancing statistical reliability of scores.



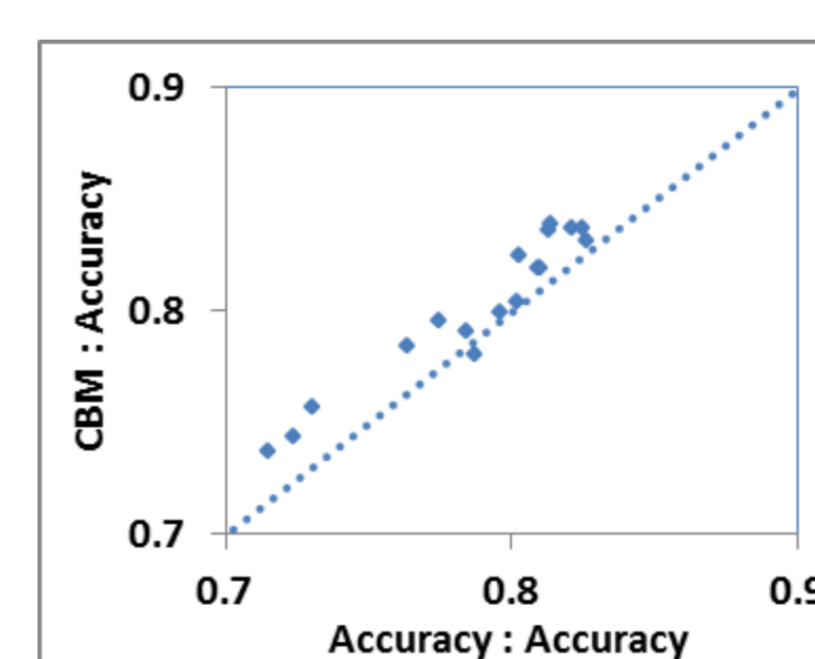
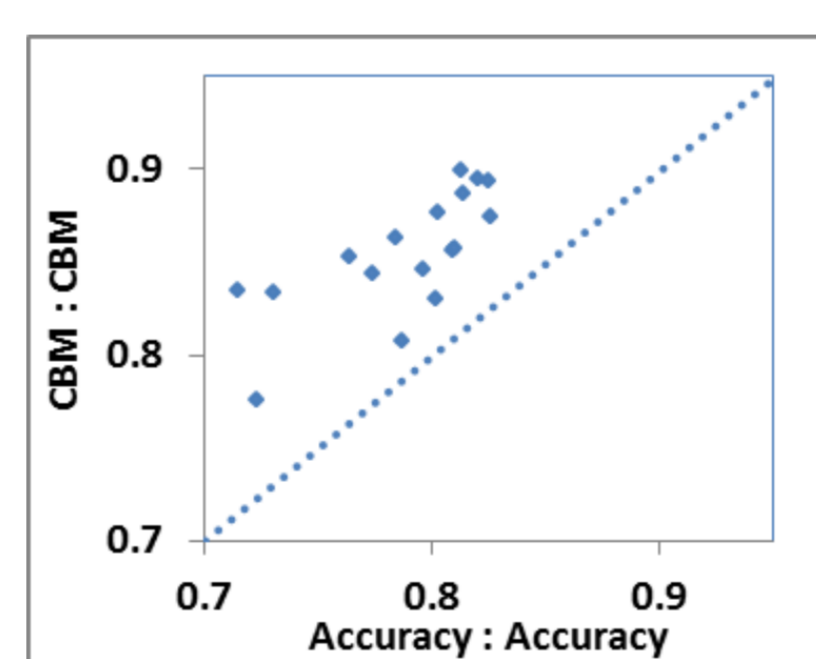
## CBM in Exams

From 2001 David Bender employed CBM for 1<sup>st</sup> & 2<sup>nd</sup> year medical exams. Though highly successful, this was discontinued in 2006 along with other changes in medical exams, even though in a survey students had voted 52% : 30% to continue with CBM in Years 1,2.

Exams with CBM retain all the information available with conventional objective marking, and the data showed CBM marks to have two clear characteristics:

- substantially increased statistical reliability
- enhanced prediction of conventional accuracy

The reasons are clear: CBM motivates students to identify uncertain answers, which are weighted less, thus reducing random variance.



Data from 1000 random splits of 17 exams (250-300 T/F Qs) into equal subsets: Mean correlations (r) were calculated for rank orders based on the 2 subsets, using the indicated score types, and plotted for comparison.

- ↑ of reliability with CBM corresponds to that with a  $62\% \pm 7\%$  (sem) ↑ of Q numbers
- ↑ of predictive power for accuracy corresponds to a  $9.2\% \pm 1.5\%$  (sem) ↑ of Q numbers

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