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

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[Printable version]   Full poster: www.ucl.ac.uk/~ucgbarg/tea/SLMS2014.pdf

ABSTRACT

CBM self-tests give students the opportunity to challenge their knowledge and to practice skills entirely in private. The element of Certainty-Based Marking (CBM) ensures that in order to get good marks the students must identify and distinguish answers that are uncertain from those that they can justify based on sound knowledge. They are rewarded for acknowledging uncertainty, and alerted to serious misconceptions (confident wrong answers).

Software for CBM self-tests was set up by me at UCL in 1994 with material contributed by several London medical schools under the banner 'LAPTTOP' (London Agreed Protocol for the Teaching and Testing of Physiology). This later became 'LAPT' with recruitment of other subject areas (www.ucl.ac.uk/lapt). CBM was introduced into Year 1,2 medical exams by David Bender from 2001-5 with clear enhancements of the reliability and validity of assessment and a clear vote of confidence from students (52%:30% in favour of keeping it in exams). In the last 10 years students at UCL & Imperial have initiated more than a million self-test CBM sessions, giving them access to >15,000 questions. Submission of results is voluntary, but in over 200,000 submitted sessions they have answered on average 51 questions getting 78% correct (61% correct at low confidence and 88% correct at high confidence).

UCL supports Moodle and not other self-test software. Though Moodle does now incorporate CBM, as a server-response tool it is it is intrinsically clumsy for self-tests, with less feedback to students, not private, and would require much work to transfer existing self-test material. I have therefore placed my own software (adapted for use outside UCL) at www.TMedwin.net where much of the prime medical material is now openly available with authors' permission. Past exam and clinical material (ca. 10,000 questions) is currently accessible on the old UCL software to staff only (for perusal), though with suitable authorisation it could be opened again for student use outside UCL or, if suitably supported, on UCL servers.

LAPT: CBM's home 1994 - 2014

Beginning in Physiology, for BSc & Medical teaching, LAPT (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.
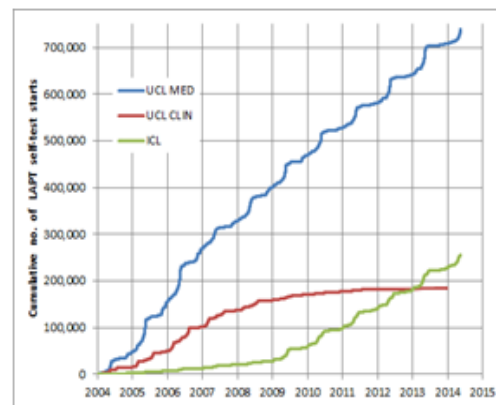

Since my retirement (2007) I have maintained LAPT for continuing use by students. Some current UCL staff may not be aware how much their students actually use LAPT, especially for revision. With no UCL technical support available for LAPT, I have set up enhanced software on my own external site (www.TMedwin.net) 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.

1

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.

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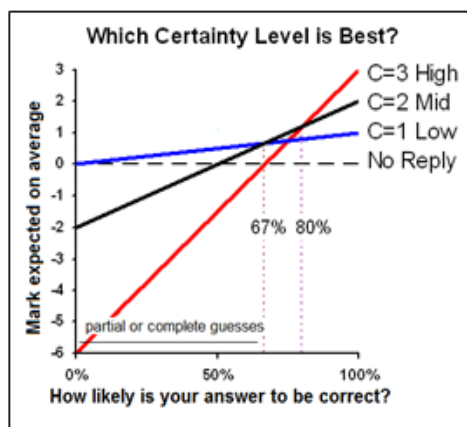
CBM approximates closely to proper measures of knowledge based on information theory. It enhances the statistical reliability and validity of exam data. Related techniques have been shown in psychological experiments to enhance learning and retention.

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

Sports Practice

* Assess = ad + sedere = to sit beside

Good features:
- Cooperation
- Hard
- Mistakes
- Find limits
- Push limits
- No teachers
- No record
- Fun

CBM Self-tests: what the marks tell you

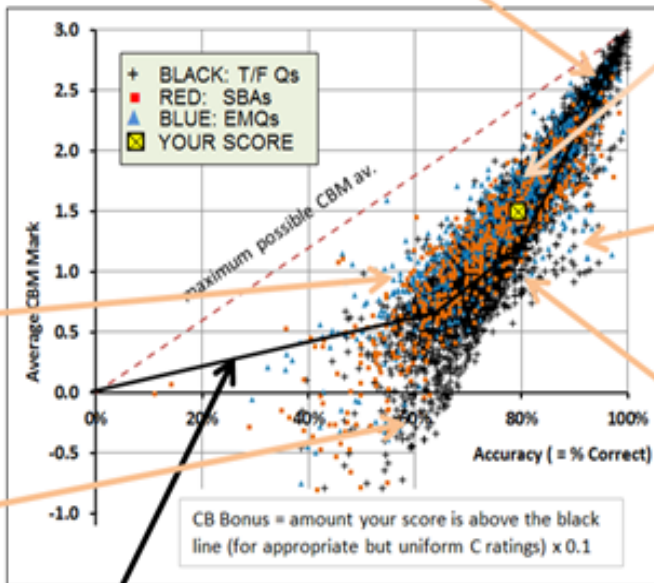**Very good, but may have repeated self-tests excessively**

Good insight into which knowledge is reliable

Underestimates knowledge, or not serious about CBM

Little knowledge but knows what s/he doesn't know

Knows quite a lot but doesn't know where shaky

Misconceptions or lack of awareness of ignorance

Legend:
+ BLACK: T/F Qs
■ RED: SBAs
▲ BLUE: EMQs
⊠ YOUR SCORE

Average CBM Mark (y-axis): -1.0, -0.5, 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0
Accuracy (= % Correct) (x-axis): 0%, 20%, 40%, 60%, 80%, 100%

maximum possible CBM av.

CB Bonus = amount your score is above the black line (for appropriate but uniform C ratings) x 0.1
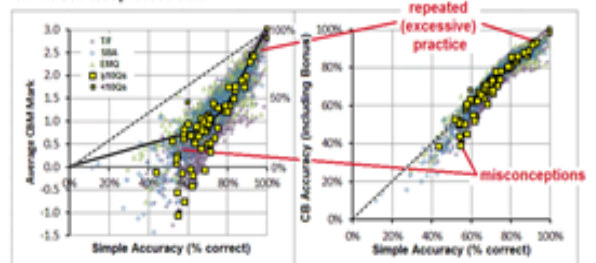
CBM mark if the same Certainty is expressed for all answers

NB The CBM mark (as a % of maximum) is always bound to be less than the % correct answers
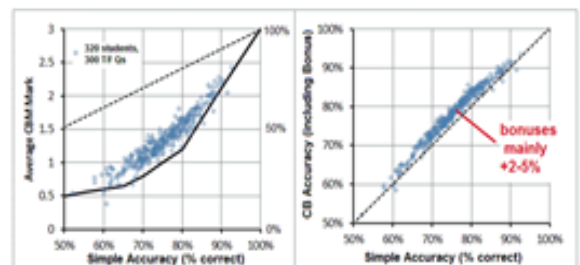
The CB Bonus Concept

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.

Online self-test practice data

repeated (excessive) practice

misconceptions

Average CBM Mark / CB Accuracy (including Bonus) vs Simple Accuracy (% correct)

Exam Data

120 students, 300 T/F Qs

bonuses mainly +2-5%

Average CBM Mark / CB Accuracy (including Bonus) vs Simple Accuracy (% correct)

3

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.

CBM in Exams

From 2001 David Bender employed CBM for 1st & 2nd 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 inreased 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.
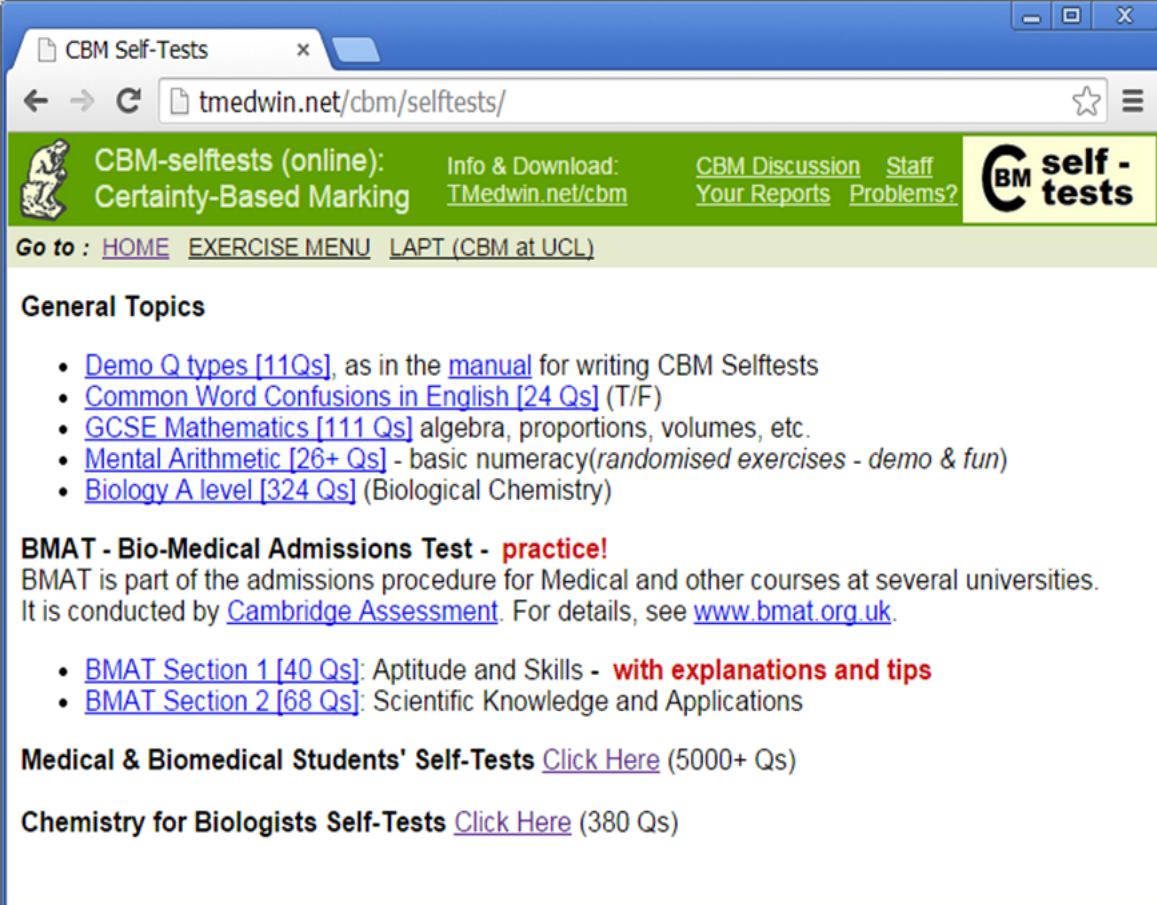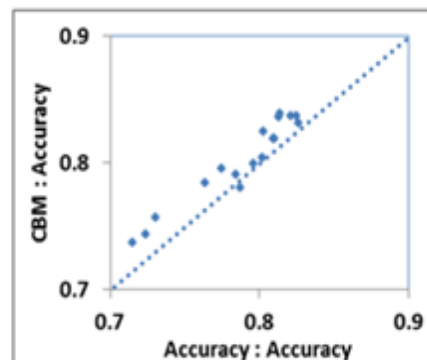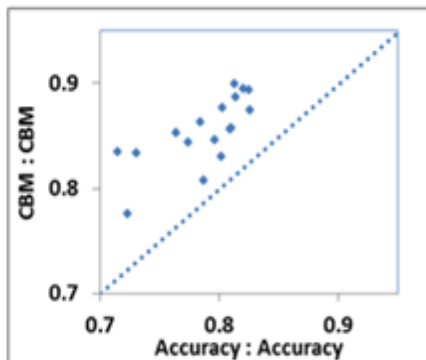

Data from 1000 random splits of 17 exams (250-300 T/F Qs) into equal subsets: Mean correlations (r) were calculated for rank orders based on the 2 subsets, using the indicated score types, and plotted for comparison.

↑ of reliability with CBM corresponds to that with a **62% ± 7% (sem)** ↑ of Q numbers
↑ of predictive power for accuracy corresponds to a **9.2% ± 1.5% (sem)** ↑ of Q numbers

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*

CBM Self-Tests

tmedwin.net/cbm/selftests/

CBM-selftests (online): Certainty-Based Marking
Info & Download: TMedwin.net/cbm
CBM Discussion   Staff
Your Reports   Problems?

CBM self-tests

Go to : HOME   EXERCISE MENU   LAPT (CBM at UCL)

General Topics

- Demo Q types [11Qs], as in the manual for writing CBM Selftests
- Common Word Confusions in English [24 Qs] (T/F)
- GCSE Mathematics [111 Qs] algebra, proportions, volumes, etc.
- Mental Arithmetic [26+ Qs] - basic numeracy(*randomised exercises - demo & fun*)
- Biology A level [324 Qs] (Biological Chemistry)

BMAT - Bio-Medical Admissions Test - practice!
BMAT is part of the admissions procedure for Medical and other courses at several universities. It is conducted by Cambridge Assessment. For details, see www.bmat.org.uk.

- BMAT Section 1 [40 Qs]: Aptitude and Skills - **with explanations and tips**
- BMAT Section 2 [68 Qs]: Scientific Knowledge and Applications

Medical & Biomedical Students' Self-Tests Click Here (5000+ Qs)

Chemistry for Biologists Self-Tests Click Here (380 Qs)

CBM SELFTESTS : tmedwin.net/cbm
EMAIL : a.gardner-medwin@ucl.ac.uk

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 PUBLICATIONS = www.ucl.ac.uk/~ucgbarg/tea
EMAIL = a.gardner-medwin@ucl.ac.uk
POSTER (Full size) = www.ucl.ac.uk/~ucgbarg/tea/SLMS2014.pdf