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.

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

CBM in Moodle
UCL is wedded to Moodle. I have provided CBM 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 questions are not broken down for CBM: avoid them
- Format for many med. sci. Qs (Multiple T/F) suits CBM not Moodle.
- Moodle “grades” are confusing when applied to CBM performance.
- Moodle feedback lacks graphical sophistication provided in CBM.
- Response times can be slow on Moodle due to server action for each Q.
- CBM rewards are not provided for strictly private offline study.

CBM in Exams
From 2001, David Bondar employed CBM for 1st & 2nd year medical exams. Though highly successful, this was discontinued in 2006 along with other teaching methods, even in a survey students voted 52% to continue CBM in 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.

Why Certainty Based Marking?

LAPT: CBM’s home 1994 - 2011
Beginning in Physiology, for BiS & Medical teaching, LAPT (www.ucl.ac.uk/LAPT) spread at students’ request to Anatomy, Biochemistry etc., including past medical exams (available to all students in three days) as well as published and unpublished learning material.

A million sessions have been initiated (by UCL & UCL students since 2004). The medical school removed clinical skills test Qs on ‘T-F’ (now available only for staff purposes): Imperial usage has developed strongly since 2008.

Since my retirement (2007) I have maintained CBM for continuous 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.ucl.ac.uk) under continuing development, from where facilities are available to any institution, UCL-licensed 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/IMS for:
  • Comment storage
  • Options record submission & access
  • Access to restricted/updated test material
  • Staff: editing, analysis, comment interaction
  • Student [wiki] editing & creation of self-tests

Wisdom through the ages!

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

CBM Self-tests what the marks tell you

The CB Bonus Concept
Students can be inconformable with the fact that typically 80% accuracy in a test goes along with 30% of the maximum possible mark. This is simply because we never know exactly which answers will be right and wrong. The CB Bonus measure how much the student has done better (or worse) than if they judged their probability of being right wrong (“inconformally”). 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.

TGM: HOME PAGE: www.ucl.ac.uk/~ucgbarg EMAIL: a.gardner-medwin@ucl.ac.uk
CBM PUBLICATIONS: www.ucl.ac.uk/~ucgbarg/publish.htm
THIS POSTER ONLINE: www.ucl.ac.uk/~ucgbarg/teal/SLM252014.pdf
A4 PRINTABLE VERSION: www.ucl.ac.uk/~ucgbarg/teal/SLM252014_A4.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 avert 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 LAPT® (London Agreement Protocol for the Teaching and Testing of Physiology). This later became LAPT® with recruitment of other subject areas (www.ucalg.org). CBM was introduced into Year 1.2 medical exams by David Bondar from 2005-2015 - for clear enhancements on the reliability and validity of assessment and a higher rate of confidence from students (52-50% in favor of keeping it in exams). In the last 10 years students at UCL & Imperial have retrieved more than a million self-test CBM sessions, giving them access to >150,000 questions. Submission of results is voluntary, but in over 200,000 submitted sessions they have answered on average 51 questions getting 78% correct (81% correct at low confidence and 88% correct at high confidence).

UCL supports Moodle and other self-test software. Though Moodle does now incorporate CBM, as a server-response tool it is intrinsically clumsy for self-tests, with too much 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.biology.ucl.ac.uk where such of the prime medical material is now openly available with author permission. Paed exam and clinical material (ca. 10,000 questions) is currently accessible on the old UCL software to staff only (for personal), though with suitable authorisation it could be opened again for student use outside UCL, or if suitably supported, on UCL servers.

*CBM"=”Certainty Based Marking"; "VLE"=”Virtual Learning Environment”; "IMS"="IMS Learning Tools Interoperability Framework”

CBM Self-tests at UCL: The past and the future of LAPT
Tony Gardner-Medwin, Physiology (NPP): ucgbarg@ucl.ac.uk