Certainty Based Marking: Why, How & When?
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- A lucky guess is not knowledge. A firm misconception is worse than acknowledged ignorance. So why do we mark students as if these things weren’t true? Ideas, reservations?
- My motivations? Negative marking? What is knowledge?
- CBM: performance in self-tests & exams, CB ‘bonus’ concept
- Implementation: LAPT, MOODLE, private offline self-test modules

Publications, software, try-out, contact, etc:
www.ucl.ac.uk/lapt www.TMedwin.net/cbm (new modules)

IDEAS & RESERVATIONS
A lucky guess is not knowledge (T/F?)
- T, but a guess is actually usually informed by some knowledge

A confident misconception is worse than acknowledged ignorance (T/F):
- T – it can inhibit learning and can be dangerous, but NB misconceptions may reflect genuine knowledge about something related, e.g. “Australia’s capital is Auckland”.

We generally ignore these things (T/F):
- T, but some people think (incorrectly!) that negative marking helps by discouraging guessing, or they scale scores so guesses will on average give zero marks.

Why do we ignore them?:
- Conventional marking is simple – any problems will disappear with enough averaging
- Teachers don’t really want to discourage answers based on partial knowledge
- Many people dislike negative marking
- People may think that confidence judgements are something separate from knowledge, or not amenable to measurement

IDEAS & RESERVATIONS

Irrationality of fixed negative marking

T/F Qs

SBA 4 option Qs

Students who have the insight to identify which of their answers are unreliable may omit these (perhaps following misguided instruction)

The result is they will on average do worse than students without such insight. This is quite improper and such schemes should be illegal.

MY MOTIVATION

- To help free teachers for what they do best: stimulate interest, creativity, appreciation of deep relationships & corresponding assessments
- Use IT efficiently to supplement teacher activity not replace it
- Use meta-information that is so important in face-to-face assessment
- Encourage student self-tests: practice & challenge, as for sport or music
- Reward the habit of acknowledging uncertainty (in both essays & objective tests)
- Stimulate deeper reflection about Qs (often the same Qs as are already in use)
- Defeat the prejudice that computerised assessment is about rote learning
- Highlight misconceptions - when a student is confident of things that are wrong
- Help students identify weaknesses & strengths, and study accordingly
- Place students more in control of their learning strategy

How well do students discriminate reliability?
What is knowledge?
- knowledge
- uncertainty
- ignorance
- misconception
- delusion

Knowledge = justified true belief
Certainty = degree of belief
Justification requires understanding

Decreasing confidence in what is true,
Increasing confidence in what is false

What is understanding?

To understand = to link correctly the facts that bear on an issue.

(How you tell a student from a parrot!)

Nuggets of knowledge

Certainty - Degree of Belief

Networks of understanding

Evidence

Inference

Choice

Choice?

Certainty-Based Marking places greater demands on justification, thereby stimulating understanding

Private Self-Assessment: Why introduce this?
1. Need for effective tools to supplement staff-student contact time
2. It’s good to get students to control and drive their own learning
3. There’s increasing scope for self-assessment with IT

The romantic ideal
Assess = ab sedere = to sit beside

Sports Practice – a model for learning

Challenging
Cooperative
Fun

You learn from mistakes
You mark your boundaries
You push them Out of view of your coach

CBM Self-tests:
what the marks tell you

Very good, but may have repeated self-tests excessively

Good insight into what knowledge is reliable

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

Underestimates knowledge, or not serious about CBM

Knowing quite a bit but doesn’t know where shaky

CBM mark if you use the same C all the time

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

Performance in January Formative: first on-paper test in Med Sch

Students who did Self-tests

Students who did NOT do Self-tests

Results for Jan2012

- Students who did NOT do Self-tests are about twice as likely to fail as students who did Self tests.
- Pattern similar every year: Use is a good predictor of Formative performance

N.A. Curtin, Imperial College

CBM FEEDBACK EXAMPLES (on LAPT: Imperial Self-Test)

Presentation of CBM marks: introduction of a CB ‘bonus’ concept
CBM in Exams

- Standard setters get conventional accuracy (% correct) as well as CBM
- For the same accuracy, students gain if they correctly identify strengths and weaknesses
- CBM is a more soundly based measure of ignorance or knowledge
- CBM yields exam data with greater statistical reliability
- CBM is better than accuracy for predicting the accuracy on a separate set of Qs

Data from 1000 random splits of 17 exams (250-300 T/F Qs) into equal subsets. Correlations are between student rank order on each set, based on Accuracy or CBM. 

- ↑ of reliability with CBM was equivalent to a 62% x 7% (sem) ↑ of Q numbers
- ↑ of predictive power for accuracy was equivalent to a 2.2% x 1.5% (sem) ↑ of Q numbers

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CBM enhances reliability and validity of exam scores

- For prediction of CBM Accuracy on other questions
- For prediction of percent correct on other questions

Bonus Factor used to calculate CBM Accuracy

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Personal self-test software: download for private practice & learning. Loose linking to an institutional server, LMS

- Make Comments
- Optionally submit results
- Access server material
- Download material
- Get submitted reports
- View Comment Dialogues
- Server can provide extra restricted/formative test material & updates
- Access via VLE/VMS
- Staff editing, data analysis, comments/view/respond
- Student (wiki) editing & creation of self-tests

Info & Download: www.tmedwin.net/cbm

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CBM IMPLEMENTATION

SELF-TESTS
- LAPT (London Agreed Protocol for Teaching)
- Links from LMS/VLE (BlackBoard at Imperial, Moodle at UCL etc.) to LAPT
- New Self-Test standalone software at TMedwin.net/cbm
- Version for server installation nearing completion
- Moodle CBM core code: now well implemented in Moodle 2.6
- Requires code patches (TMedwin.net/cbm) in Moodle 1.9-2.5

SECURE EXAMS
- Moodle 1.9 -2.6
- Optical Mark Reader Sheets (Speedwell)
- (LAPT & Self-Test modules are designed for fast local feedback and voluntary submission, not secure server-based marking & data collection)

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SUMMARY

www.TMedwin.net/cbm / www.ucl.ac.uk/lapt

CBM makes Sense!
- Is easily implemented
- Doesn’t require writing special questions
- Always motivates students to identify & acknowledge uncertainty

SELF-TESTS
- ↑ reflection & cross-linking of Info
- ↑ realism about uncertainty
- Highlights misconceptions
- Challenge and practice in private
- Offline & online implementation

EXAMS
- ↑ psychometric reliability
- ↑ psychometric validity
- ↑ number of questions required
- Familiar standard-setting info retained
- Students understand & value CBM

Contributors to the project, over many years:
- David Bender, Nancy Curtin, Chris Dean, Mike Gahan, Kim Issett, UCL & Imperial students
- Earlier pioneers of work on confidence assessment & learning:
  - Andrew Ahlgren, Jim Bruno, Robert Ebel, Jack Good, Kate Heiner, Darwin Hunt, Dieudonné Leclercq, Emir Shuford

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"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" Rumsfeld

"It's not ignorance does so much damage; - it's knownin' so deemed much that ain't so." attr. Dilings

"A lucky guess is not knowledge. A firm misconception is worse than acknowledged ignorance. So why do we mark students as if these things weren't true?" TGM