Fostering metacognitive engagement with CBM for competence-based programs

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Prior thoughts, prior literature

What is CBM? (Leclercq, 1983; Gardner-Medwin, 2006)
◦ Confidence-based marking
◦ Certainty-based marking

By the turning of centuries we find an increasing number of ‘narrow-studies’ that report implementations of CBM with more or less respect of the original idea.

See for example studies at H.E.:
○ Law & Economics (Lotito et al. 2014, 2017)
○ Law (Wong & Rojas-Mora, 2020)
○ Engineering (Yuen-Reed & Reed, 2015)
○ Neuroscience (Barr & Burke, 2013)
○ Medicine (Schoendorfer & Emmett, 2012; Smrkolj et al. 2022)
○ Informatics (Cisar et al. 2009)

See e.g. studies at H.S.:
○ Mathematics (Foster, 2016)
○ Physics (Clark, 2020 (Doctoral Dissertation))

Context & Purpose

Master for Secondary Teacher Education as a valid context for CBM with formative purposes

- Big aim: *Lifelong Learning / SRL competence development*
- CBM algorithm on M.Ch.knowledge-tests as a means to challenge self-competence, provoke and foster SRL
- CBM offers controlled context for the training of risky professional decisions

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Score range for 10 items: 

\[-60, +30\]

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Why/How does CBM connect with SRL?

- Revision of self-competence / setting new expectations / learning goals
- Subjects’ confrontation with own knowledge
- Contrasting results with expectations
- Subjects’ confrontation with own self-competence

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Why/How does CBM connect with SRL?

- Why did I get such (positive/negative) result?
- What does it mean?
- Does it meet my personal expectations?
- How do I feel about it?
- What can I do now to maintain/improve such result?

Revision of self-competence / setting new expectations / learning goals
Subjects’ confrontation with own knowledge
Contrasting results with expectations
Subjects’ confrontation with own self-competence
Design: 12 weeks, 20 sessions

Control group NO CBM

Group **initial-final** intervention

Group **double rehearsal** intervention

Reactions to 1st CBM encounter

Individuals’ CBM scores + hits/errors ratio

Evaluation questionnaire

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Research questions

Is CBM an appropriate assessment instrument for Teacher Education?

How do prospective secondary teachers in different curricular areas react to CBM?

How do they evaluate the experience?
Participants

N = 275 students at Master for Secondary Teacher Education (Universidad de Barcelona)

\[ n = 125 \] voluntarily respond final evaluation questionnaire (45%)

Men 40% ; Women 60%

Graduates 74% ; Post-graduates 26%

Curricular area: Soc.Sci. 32% ; Nat.Sci. 30% ; other areas (Phys.Ed.; Voc.Ed.; Music; Arts) 38%

Non-working stud. 32% ; part-time working stud. 32% ; full-time working stud. 35%

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<th>Initial-final intervention group (n=183 // 80 → 43.7%)</th>
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<td>Men 39% ; Women 61%</td>
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<td>Graduates 72% ; Post-graduates 27%</td>
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<td>Curricular area: SS 21% ; NS 35% ; other areas 44%</td>
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<th>Double rehearsal intervention group (n = 92 // 45 → 48.9%)</th>
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Method

Data collection

Students’ demographic conditions:
1. Sex
2. Age (<25 / >25)
3. Prior education (bachelor/post-graduate (master/PhD)
4. Job situation (unemployed/part-time/full-time)

Students’ response attempts to CBM items within:
1. Initial-final intervention
2. Double rehearsal intervention

Final questionnaire on students’ evaluation of experience (scores 1-10)

Analysis

Contrast of hits/errors at initial and final test
Contrast of declared self-competence at initial and final test
Contrast of hits/errors ratio * declared self-competence at initial and final test

Initial questionnaire with first reactions to CBM

Descriptive analysis of final questionnaire, regarding demographic conditions * intervention
Some preliminary results: evaluation of the CBM-program

Overall positive evaluation of the CBM experience

- Women at MI show better evaluation $t (123) = 1.876, p = .03$; highest evaluation $M = 6.85 / SD = 2.38$

Students in the DR group reported a decreased difficulty in evaluating self-confidence by the end of the module and increased satisfaction with the CBM results, as a self-assessment opportunity

- Self-confidence evaluation (difficulty 1-10): MI> $M = 4.49 / SD = 2.54$; SI> $M = 5.43 / SD = 2.6$; $t (123) = 1.949, p = .026$; low-moderate effect size Hedges' $g = 0.364$
- Satisfaction with final learning results (satisfaction 1-10) MI> $M = 6.69 / SD = 2.22$; SI> $M = 5.85 / SD = 2.04$; $t (123) = 2.133, p = .017$; low-moderate effect size Hedges' $g = 0.398$

The experience with CBM reveals SRL-related actions as a primarily individual (intimate) activity, despite instructors’ efforts in provoking collaborative debate situations in class

- Item “CBM-tests were useful to contrast ideas with classmates”: SI> $M = 4.08 / SD = 2.58$; MI> $M = 3.89 / SD = 2.42$ [$p = 0.0001$]
- Item “CBM-tests were useful to contrast ideas with classmates”: Women> $M = 4.03 / SD = 2.55$; Men> $M = 4.16 / SD = 2.65$ --- [$p = 0.007$ for women]

Stress related to the CBM experience was higher for women than for men, particularly in the IF group

- Women SI> $M = 6.14 / SD = 2.75$; Women MI> $4.46 / SD = 2.72$ // Men SI> $M = 4.32 / SD = 3.28$; Men MI> $4.68 / SD = 2.5$ --- [$p = .018$]
Thank you! Time for questions!

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