

How good are students at thinking about their thinking?

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Rationale

Metacognition – thinking about your own thinking or learning – is a psychological trait that is linked both to academic success and to using learning in real-life contexts (Bransford *et al.*, 2000). This suggests it is very important for students in professional programmes like engineering education.

So, how strong are engineering students in metacognition?

This question is hard to answer in the francophone world. While self-report questionnaires (like the Metacognitive Awareness Inventory (MAI) (Schraw and Dennison, 1994) are available in English, a validated French translation was not available.

This study translated the MAI into French and assessed its:

- Reliability (using Cronbach's alpha)
- Predictive validity (by assessing if those who scored high on the MAI were more successful in an objective test of metacognition – the Cognitive Reflection Test (CRT) developed by Shane Frederick (2005) at MIT.

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Method

The Metacognitive Awareness Inventory (MAI) and the Cognitive Reflection Test (CRT) were translated into French.

Students Judgment of Knowing (JoK) for the CRT were also assessed.

The tests were administered to second-year Computer Science students in Spring 2014, yielding 164 usable responses.



Metacognition, thinking about your own thinking

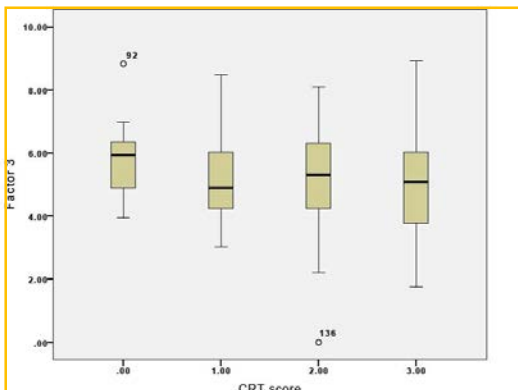
Results

How strong are engineering students in metacognition? Only 39.6% of students had an optimal score on the CRT. The remaining 60.4% responded intuitively to one or more questions and did not check all answers carefully. For comparison, Frederick (2005) found just 17% of his US sample had an optimal score on the CRT, ranging from a high of 48% in MIT to a low of 5% in University of Toledo.

Students Judgement of Knowing (i.e., their own rating as to whether they have been successful on a specific task) was quite accurate however, with a strong correlation between Judgement of Knowing and success on CRT ($r = .88$).

Is the French language MAI a good measure of metacognition? The French translation of the MAI scales were found to be broadly reliable with alpha scores larger than .7 for Factor 3 (Monitoring of own learning) and Factor 5 (Self evaluation of learning), and near the .7 mark for Factor 1 (Planning for learning), Factor 2 (Information management) and Factor 4 (Debugging of problems in learning).

However, the MAI was a very poor predictor of success on the CRT (correlations between MAI sub-scales and CRT score ranged from $r = -.131$ to $-.049$; in other words, effectively zero).



This box plot shows no relationship between the MAI sub scale "self-monitoring" and the objective CRT test.

Implications

- Students seem to be good at some aspects of metacognition, such as knowing when they have succeeded in a cognitive task.
- A majority of students appear weak on monitoring and checking what they are doing when working on such tasks.
- Although many students appear weak at monitoring their work, they are not particularly aware of this weakness.

More about this study

This study was completed by EPFL Master students as part of a Social and Human Science course called *How People Learn II*. We would like to thank Jean-Cédric Chappelier, Anastasia Ailamaki and Nicolas Macris from EPFL for letting us give our questionnaires to their classes and for the interest they had towards our research.

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