<u>SSS1 Group E Meta-review</u>

Background
- Based on evaluation studies and established principles (Anderson et al., 1995), proposed design guidelines for metacognitive ITS.

Experiments
- Conducted a sequence of studies to iteratively design and improve Help-Tutor
1. Design help-seeking model
    - Review literature and use log-file analysis to identify types of help-seeking bugs
    - Log-file: off-line examination of step-by-step help-seeking in geometry ITS
        - e.g., student-tutor interactions
        - Identify metacognitive actions associated with productive domain learning
2. Evaluate model across domains and cohorts
    - Compared two groups using two ITS for two different topics
    - Metacognitive errors (and by extension, strategies) similar
3. Implement and pilot system
    - Small-scale pilot that shed insight on student behaviour
        - Focus on errors most highly (negatively) correlated with learning
            - Better model actions (e.g., accept rapid attempts if correct)
4. Evaluate system
    - (Roll et al., 2006) Sixty students in 2 high schools for 3 weeks
        - Improvement of help-seeking within system
            - e.g., Less likely to ask for bottom-out/last hint (46 vs., 72%)
        - But no transfer to pencil-and-paper evaluation or domain level learning.
    - (Roll et al., 2007) Eighty students for 2 months; under analysis

Principles
There is the existing Cognitive Tutors system, but no guidelines for metacognition. Therefore, authors put forward some new principles based on Anderson et al's principles.
- 3 groups/9 principles:
    - Group I - Goals: designing metacognitively appropriate learning objectives (what)
    New principle: declarative, procedural and dispositional goals
    - Group II - Instruction: designing instructional means, style, pedagogy (how)
    New principles: support metacognition for the whole process; communicate
goals; attach a price tag to metacognition error
    - Group III - Assessment: evaluating metacognitive ITS

Decision
- Neutral/Weak accept