Affect and metacognition: Why their interactions are important for SRL

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This presentation focuses on metacognition and affect and their interaction in the context of SRL.

Most of the models of SRL emphasize the role of various components of SRL independently one from another.

Emotions are considered in relation to motivation and goal attainment and independently from metacognition which is linked to the regulation of cognitive processing.

However, there is evidence suggesting that SRL as an integrated process builds on interactions between motivation, affect, and metacognition.
In what follows I shall present

1. The Metacognitive and Affective model of SRL (MASRL) that posits interactions between motivation, affect, and metacognition

2. Evidence on interactions of affect and metacognition: Effects of affect on metacognition, and vice versa

3. Evidence on interactions of motivation, emotions, and metacognition with emphasis on achievement and epistemic emotions

4. Discuss the implications for educational practice
**Definitional issues: Metacognition**

*Metacognition* is defined as

- Cognition about cognition (Flavell, 1979)
- Model of cognition (Nelson, 1996)

**Facets of metacognition:**

- Metacognitive skills (e.g., planning)
- Metacognitive knowledge (persons, tasks, strategies, goals)
- Metacognitive experiences (feelings, judgments)
Definitional issues: Affect

Affect

Generic term denoting experiential states characterized by positive or negative valence. It encompasses:

- emotions
- moods
- feelings
- self-esteem
- attitudes
- passions
Emotions are responses to external or mental events that involve (Frijda, 1986)

- Evaluative appraisals
- An expressive component (e.g., face muscles or body posture)
- Autonomic/physiological changes
- Action readiness
**Emotions**

- **Achievement emotions**
  - They are experienced in competence-relevant activities or performance outcomes. They comprise:
    - Task-related emotions (e.g., interest)
    - Prospective outcome emotions (e.g., joy)
    - Activity-related (e.g., boredom)
    - Retrospective outcome-related (e.g., pride)

- **Epistemic emotions**
  - They are knowledge-related (e.g., curiosity, surprise, confusion)
The metacognitive and Affective model of SRL (MASRL)

Person level

Task x Person level

Cognition  Metacognition and Affect  Self-regulation of affect/effort

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Note: ME = metacognitive experiences; MK = metacognitive knowledge; MS = metacognitive skills

Metacognition in the form of *metacognitive feelings* arises from internal processes that inform us on features of cognitive processing (e.g., fluency, correctness of response, error commission).

Similarly, emotions arise from internal processes that inform us on the importance of objects or states for the self and whether action needs to be undertaken.

Both of them are based on non-sensory internal processes and are both represented in consciousness in a “feeling” state.

Feelings have a pleasant/unpleasant valence but lack other aspects of emotions.
Affect and metacognition: Neuro-physiological evidence

- Emotions and metacognition share brain mechanisms such as the anterior cingulate cortex (ACC) and the orbital-frontal cortex that have to do with feelings and conscious experience.

- ACC is related to the “aha experience”, tip-of-the-tongue states, judgments of learning (JOL), feeling of difficulty, and the recognition that a high-confidence answer was incorrect (hypercorrection effect).

- Physiological evidence from event-related potentials (ERPs) also shows that error-related negativity and correct-related negativity are involved in the monitoring of error commission and correct action, but also in the encoding of perceived emotional significance of actions. This evaluative process is automatic.
At a cognitive level, similar factors, such as **processing fluency**, influence both affect and metacognition.

Fluency is associated with positive affect whereas disfluency with negative affect.

Furthermore, fluency is a cue for metacognitive feelings such as feeling of familiarity and feeling of difficulty.

Fluency also contributes to emotions such as interest. However, changes of interest are influenced by both fluency and perceived difficulty, that is, the combined effect of affect and metacognition.
Cognitive states such as *interruption of processing* give rise to *surprise* (when the interruption is unexpected) and *feeling of difficulty*, because interruptions give rise to effortful revision processes.

*Insufficient knowledge* on a topic of interest or inability to access knowledge impacts emotions such as *curiosity* and metacognitive feelings such as *confidence* or *TOT*.

*Conflict* among knowledge states or response tendencies gives rise to *confusion* and feeling of difficulty as well as awareness of increased effort exertion.
There are also effects of affect on metacognitive experiences.

*Negative mood* or affect increases the self-reported feeling of difficulty and effort. *Positive mood*, on the other hand, is associated with awareness of increased effort expenditure.

Depressed mood decreases confidence that one can achieve one’s goal whereas positive mood increases confidence on one’s thought.

However, the effects of affect on ME are evidenced when the task is demanding. It seems that negative mood functions as information that the task is difficult and more effort is needed. Positive affect, on the other hand, functions as resource for effort exertion.
**Effects of affect on metacognition**

- **Stimulus emotionality.** Affectively charged stimuli are judged as easier to remember.

- **Remembered utility.** It is a measure of experienced pleasure or pain associated with a past experience. It influences prospective choice to repeat or avoid similar situations in the future.

- **Effort-related unpleasant physiological responses.** They are encoded in metacognitive knowledge about effort. Students have two distinct sets of beliefs:
  
  1. (a) Effort and persistence are effective
  2. (b) Effort and persistence are not effective and have cost (e.g., exhaustion)
Subjective ease or difficulty of processing has informational value for cognitive or evaluative judgments (e.g., truth).

Objects easy to process (i.e., fluency experiences) are liked more than objects hard to process.

This effect is reversed if the difficulty of processing is considered instrumental for achieving one’s goal (instrumentality heuristic). The experienced difficulty is associated with higher liking.
Confidence along with experiences of mastery (Usher, 2009) (e.g., feeling of improvement or progress made, fluency, ease of learning, or overcoming of obstacles and experienced difficulty) and awareness of effort exerted are critical for self-efficacy beliefs.

Feeling of difficulty, estimate of effort exerted and confidence are influenced by self-concept and feed back on it (Efklides & Tsiora, 2002).

Ease or difficulty in task processing is encoded in metacognitive knowledge of the self and self-concept (Efklides & Vlachopoulos, 2012).
Motivation, affect, and metacognition

- Expectancy-value motivation can function at a person level (e.g., based on previous encounters with tasks) or during task processing.

- Previous affective experiences with similar tasks mediate the effect of task on perceptions of task value (Eccles et al., 1983).

- Metacognitive experiences (e.g., JOL, feeling of difficulty, awareness of effort) impact perceptions of value (e.g., cost) and expectancy during task processing.

- Conversely, task/item value impacts JOLs and subsequent metacognitive control decisions.
Motivation, affect, and metacognition

- **Causal attributions:** They trigger emotions (e.g., pride, shame, gratitude, surprise, hope, anger, guilt, etc.) depending on the perceived cause (or causal dimension) underlying the outcome of one’s behavior (Weiner, 1985, 2014).

- Metacognitive experiences such as confidence, effort, or experienced difficulty (Metallidou, 2001) provide cues for the triggering of attributions.
The control-value theory of achievement emotions (Pekrun, 2006) posits that control and value beliefs provide the basis for appraisals of the learning situation, the learning activities, and the outcomes of learning activities.

Antecedents of achievement emotions are: academic self-concept, prior achievement, achievement goals, intrinsic motivation, and perceived academic control.

Metacognitive experiences impact achievement emotions via self-concept, perceptions of value, and perceptions of control.
Metacognitive feelings (e.g., feeling of difficulty and feeling of success) *mediate* the effects of self-concept and performance on outcome-related emotions (Tornare et al., 2015).

However, there can be direct effects of ME on emotions. For example, state anxiety during task processing is predicted by anxiety-trait but also, inversely, by confidence (Dina & Efklides, 2009).
Self-regulation of learning

Self-regulation of learning can follow a top down or bottom up mode. However, the top down mode of regulation can change depending on information from metacognitive experiences.

Motivation, in terms of task value or achievement goals, impacts emotions but also metacognitive experiences, such as the accuracy of JOLs in a top down manner.

Task value also impacts metacognitive control decisions such as allocation of study time and spaced study, independently of sheer item difficulty.

However, during task processing the best predictor of effort is feeling of difficulty. Also, awareness of effort exertion increases the self-reported feeling of difficulty in a bottom up regulation of cognitive processing.
Emotion regulation is critical for learning. It involves processes such as:

*The selection of the situation* in which an emotion is experienced. The remembered utility or peak-end phenomenon shows why people select an aversive situation that lasts longer than one that lasts less time.

*The change of a situation* that gives rise to an emotion. Problem solving coping, help seeking, and planning are effective strategies. Presumably ME offer cues about the best strategy.
Self-regulation of learning

- *The deployment of attention.* Mind-wandering (i.e., ME) is a cue that attention needs to be regulated or a strategy to avoid boredom.

- *Change of appraisals.* Changing of attributions about, e.g., the experienced difficulty, can change the emotions felt.

- *Change the emotion response.* Suppression of the emotional response is ineffective strategy and probably not informed by ME.
Deliberate emotion regulation is effortful and requires cognitive resources. This has negative implications for cognitive processing. Also, explicit emotion regulation is not effective when there is depletion of resources.

Emotion regulation can be done automatically, e.g., through engagement in an activity, or by teachers, parents, peers.

Training of affective self-regulation can be effective for learning. This requires awareness of one’s emotions and strategies that can downregulate negative affect or upregulate positive affect (Tzohar-Rozen & Kramarski, 2013).
Research on interactions of motivation, affect and metacognition in SRL is sparse.

However, it can provide insight into phenomena that were poorly understood up to now and can open up the way for more effective interventions for the improvement of SRL.