

Preface

Metacognition is a term used to identify a kind of cognition oriented to monitor and regulate cognition engaged in a given mental activity (e.g., listening, reading, memorizing). Human beings consciously, even unconsciously, acquire and exploit metacognitive knowledge, and develop metacognitive skills every day to perform complex cognitive duties such as: learning, decision-making, and problem solving. Thus, individuals daily deal with metacognitive experiences!

This book offers a glance of recent metacognition labor, which pursues to extend the research, application, and practice reached in the field. The chapters make up a sample of the work currently achieved in countries from three continents, which illustrates a sample of the state-of-the-art. According to the nature of the contributions accepted for this volume, five kinds of topics are identified as follows:

- *Conceptual* introduces a profile of the metacognition to describe its nature, purpose, components, skills, models, and methods. Through this section, readers are stimulated to acquire an overall idea of the metacognition, metacognitive knowledge, metacognitive strategies, and visualize theoretical concepts such as meta-metacognition.
- *Frameworks* outline essential logistics to command the stimuli, performance, and evaluation of metacognitive components and skills. In this section, readers are enabling to enhance metacognitive skills and self-regulatory functions, assess metacognitive skills and self-regulated learning, and profit from executive management metacognition and strategic knowledge metacognition.
- *Studies* share research experiences oriented to respond how metacognition contributes to accomplish successful learning. Along the section, readers are informed of the results obtained from the following academic domains: English listening proficiency, science informal learning, and cognitive self-regulation during the process of learning with stress at the university.
- *Approaches* depict how metacognition is addressed in computer-supported collaborative learning (CSCL) settings and training programs for teaching practices. In this section, readers appreciate the development of social metacognition in CSCL to facilitate collaborative problem solving, content authoring, as well as the recreation of metacognitive experiences to train teachers.

- *Tools* describe and promote intelligent authoring systems (ITS) as a platform to develop learners' diagnosis and inquiry skills. Readers can examine in this section a couple of ITS, where one provides virtual patient cases to practice medical diagnostic; and other provides examples and partial information to trigger learner inquires about historical events.

This volume is the result of the research recently achieved by authors, who are willing to share their models, methodologies, results, and findings to the community of practitioners, pedagogues, psychologists, computer scientists, academics, and students interested in the valuable topic of metacognition!

After the cycle of chapter submission, revision, and tuning according to the Springer quality principles, fourteen works were approved, edited as chapters, and organized according to the prior five topics.

The first part contains *conceptual* topics that are presented in Chaps. 1–3; the second part depicts *frameworks* through Chaps. 4–6; the third part concerns with *studies* that are outlined in Chaps. 7–9; the fourth part is related to *approaches* described in Chaps. 10–12; and finally the fifth part unveils *tools*, which are characterized in Chaps. 13 and 14. A profile of the chapters is given as follows:

1. Chapter 1 offers a review of models that guide metacognitive strategy instruction as well as a hybrid strategy instruction sequence to improve comprehension monitoring and self-regulatory control processes. A distinction of specific instructional strategies that can be used to improve monitoring and control processes is also made.
2. Chapter 2 introduces the cognitive level of meta-metacognition. Specifically, second-order judgments which regulate metacognitive judgments. In addition, a method for analyzing how people make second-order judgments to assess the accuracy of metacognitive judgments is outlined. Some reflections are made concerning individual differences in second-order judgments and the existence of human meta-metacognitive ability.
3. Chapter 3 proposes a conceptual model of the metacognitive activity. It is based on neurological and biological viewpoints. The main idea is to depict metacognition as a living system that behaves as an autopoietic system. Thus, metacognition is a mechanistic system that generates metacognitive products according to its own components, such as processes and skills.
4. Chapter 4 draws a framework supported by tools to stimulate individual and group metacognitive skills, as well as self-regulatory functions and critical thinking. It claims the synergy between tools, teams, and talents, where learners develop skills. Based on those items, a model of metacognition is composed by subjects such as motivation, mindfulness, and emotions to be implemented in a CSCL setting. Authors assert such tools facilitate the development of higher-order critical, reflective, and collaborative metacognitive thinking skills.
5. Chapter 5 depicts an evaluation framework for the application of metacognitive skills and self-regulated learning (SRL) at problem solving. The guide applies several instruments such as calibration, feedback, and rubrics. These instruments assess the analysis process used by the student to solve a problem, as well as the feedback demanded on self-learning and given by the teacher.

6. Chapter 6 describes WebQuest as a learning object for embedding metacognition through inquiry-oriented learning activities delivered through the web. The design of WebQuests includes seven subjects: welcome, introduction, tasks, process, evaluation, conclusion, and teacher page. A series of illustrative examples are given for diverse courses oriented to junior and high school levels.
7. Chapter 7 reports a study about the relationship between metacognitive awareness of listening strategies and listening proficiency about English as a foreign language. The case study concerns high school students who respond to three instruments to assess their English proficiency, metacognitive awareness listening, and academic SRL. Once an inferential statistic analysis is estimated, it was found out that only problem-solving strategies have a major role in listening proficiency of mid self-regulated students!
8. Chapter 8 examines the impact of citizen science programs particularly on student self-regulation with an emphasis on metacognition and motivation. In the study a microanalytic methodology is applied to assess metacognitive and motivational processes of self-regulated learning, which are tailored for novice, transition, and expert users. In addition, a conceptual model and some guidelines for creating effective citizen science programs are outlined.
9. Chapter 9 defines conceptual characteristics and relationships of personal self-regulation, self-regulated learning, and coping strategies, which are used for dealing with stress at learning. The study claims the importance of personal self-regulation (SR) in determining the degree of cognitive SR during the process of learning with stress, as well as the relationship between personal SR and the type of coping strategies, and the relationship between SRL and coping.
10. Chapter 10 aims metacognition as socially shared construct in CSCL settings that contributes to collaborative problem solving. Thus, a series of trials are performed to identify how subjects externalize their thoughts during the process of problem solving with their peers. One of the results indicates that for socially shared metacognition to emerge, it is required that individual group members make their thinking and metacognitive monitoring visible.
11. Chapter 11 explains how to teach students programming by means of games that they collaboratively play, as well as how the metacognition contributes to achieve the goal in a CSCL setting. The approach claims that such an environment facilitates the development of monitor and regulation skills by means of common task development, working in groups, cooperative behavior, positive interdependence, and individual accountability and responsibility.
12. Chapter 12 highlights an approach that supports teachers to develop their metacognitive lifelong learning skills and to reconstruct their conceptual knowledge and procedural strategies when necessary. Authors aim at revealing expressions of metacognition among teachers and examine the changes they designed and applied in their teaching units and teaching processes. The approach concludes that metacognitive knowledge and metacognitive experiences are essential for the development of good, established teachers.
13. Chapter 13 describes how to scaffold metacognitive activities in medical problem solving training by means of BioWorld. Such an ITS instructs novice physicians in developing medical diagnostic reasoning as they receive feedback in

the context of solving virtual cases. The system dynamically assesses the user's performance against expert solution paths. It provides help by means of a set of pre-defined rules based on the context of the learner's activity.

14. Chapter 14 concerns with dysregulated learning, where different classes of failures lead to minimal learning. The work presents the MetaHistoReasoning tool, which is an ITS that traces a domain-specific account of the metacognitive activities involved in learning while performing inquiries about the causes of historical events. The tool induces confusion by failing to mention any information pertaining to the causes of an event. In this way, learners should attain a coherent understanding of the event by seeking and transforming information obtained from sources in accordance with disciplinary-based practices.

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