APPLYING RESEARCH ON METACOGNITION IN THE CLASSROOM

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Session Objectives

By the end of this session, participants should be able to. . .

Define metacognition and explain its importance in teaching and learning

List three fundamental principles for successful instruction in metacognition.

Describe specific ways to integrate metacognition activities into your classroom.

Metacognition – what is it?

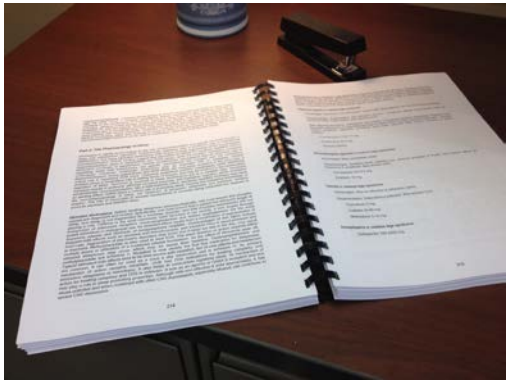
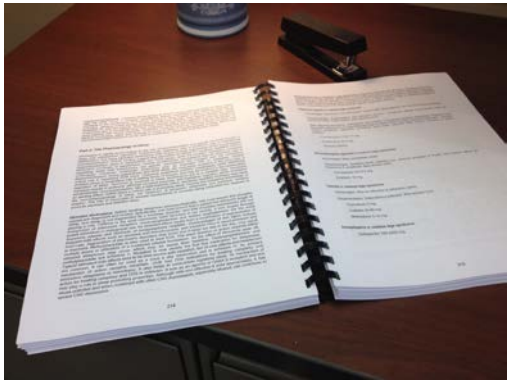
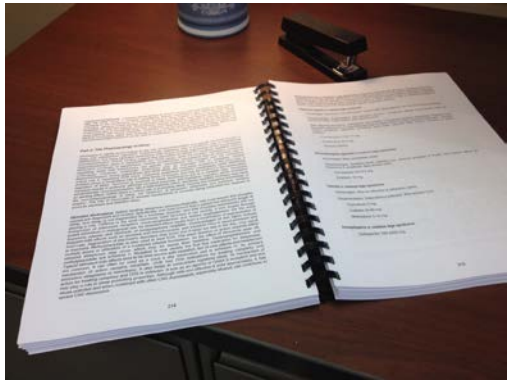
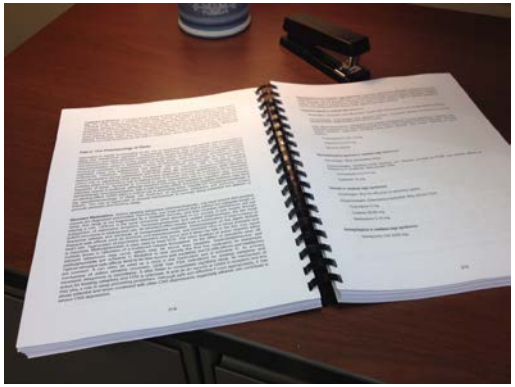
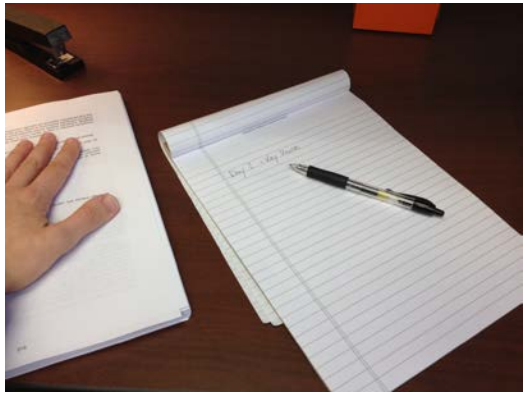
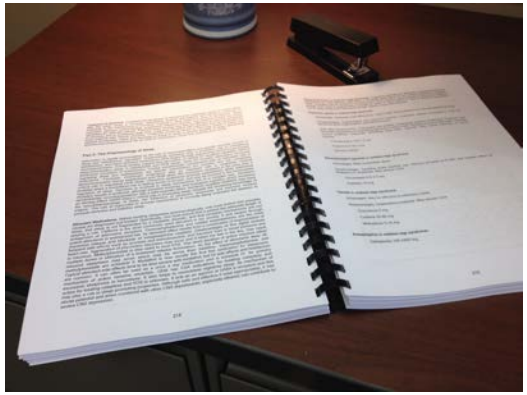
- Is metacognition the same as reflection?
  - Think, pair, share!

- Metacognition – Thinking about thinking
  - *"Metacognition refers to one's knowledge concerning one's own cognitive processes and products or anything related to them."*

- Reflection – May constitute a moment or type of metacognitive activity – and often used synonymously with metacognition.

Flavell, 1976

Retrieval Practice and Metacognitive Errors

Roediger and Karpicke, 2006

Metacognitive Framework

- Proposed framework for studying and implementing strategies to improve metacognitive accuracy includes:
  - Planning
  - Monitoring
  - Evaluating

Schraw, 1998

Adapted from Schraw, 2001 and LaVaque-Manty, 2013

Metacognition in the Classroom
Example 1

Introductory Biology

Critical Thinking and Metacognition

- Example from Introductory Biology course
  - Duke University undergraduates
  - Developed "Critical Thinking in Biology" module
  - Students' learning objectives:
    - Describe a strategy for approaching scientific questions
    - Describe the structure of exam questions that address critical thinking (CT)
    - Apply improved understanding to new CT exam question
    - Analyze own answers – and those of peers – to identify weaknesses in critical thinking

Lemons et al., 2013

Metacognitive Lab Module Design

- Step 1: Analyze structure of scientific questions
  - Take-home genetics assignment
  - Set of progressively more complex questions
    - First, foundational knowledge (correctly read a genetic pedigree, understand key genetic terms.)
    - Next, apply knowledge to determine inheritance patterns and to formulate an argument to explain observed pattern
  - Assignment included guiding material on *how* to answer the questions.
  - Students were given information about why and how to connect foundational knowledge to higher-order reasoning.

Lemons et al., 2013

Metacognitive Lab Module Design

- Step 2: Analyze structure of answers to scientific questions
  - Students evaluated essays of varying quality with a set of guiding questions
    - *"Many students presume that a best response strategy is to relate everything they know about a subject figuring the odds of getting the right answer will improve with increasing amounts of text."*
  - Students then evaluated their own essays with same guiding questions

Lemons et al., 2013

Metacognitive Lab Module Design

- Step 3: Apply and transfer understanding to a new scientific problem
  - Answered new question about genetic drift and scrub jays in the United States
  - Exchanged answers for peer-evaluation of responses with a rubric
  - Promoted metacognitive awareness of difference between content knowledge and correct reasoning

Lemons et al., 2013

Metacognitive Lab Module Design

- Step 4: Reflection on classroom exercise
  - Structured discussion about strategies:
    - *"How did you approach answering the questions you were given in class today? Could you have found the answers in a textbook?"*
    - *"What are some of the thinking skills you had to use while you were answering the questions?*
    - *"Did you need to recall information, explain, apply, analyze, or evaluate?"*

Lemons et al., 2013

Critical Thinking and Metacognition

- Key Findings and Lessons Learned
  - Compared assignment to similar mid-term question
    - No difference in content accuracy
    - Improvement in average critical thinking scores
  - Student resistance to metacognitive instruction – outside of scope of subject?
    - Suggest metacognitive instruction become a regular part of course, not a one-time offering
  - Would this method work in your course? Why or why not?

Lemons et al., 2013

Metacognition in the Classroom
Example 2

Writing-Intensive Political Science and Psychology Courses

Metacognition in Disciplinary Writing

- Instructors' goal: Improve students' understanding of their writing process
  - Targeted reflection on planning, monitoring and evaluation stages.
    - Planning: Guided reflection on what was already known and what was needed to complete assignment
    - Monitoring: Students provided "think-aloud" comments in the margins of their texts.
    - Evaluating: Students summarized what worked, what didn't and what they planned to do next time.

LaVaque-Manty & Evans, 2013

Targeted Reflection in Writing

- Key Findings and Lessons Learned
  - Students enjoyed in-class discussion of similarities and differences between planning and evaluation strategies.
  - Students acquired new vocabulary for peer-review
  - Metacognitive intervention required "considerable time" for instructors to introduce and explain
    - Notes on the syllabi
    - Lecture slides and discussion
    - Handouts
  - Would this method work in your course? Why or why not?

Lemons et al., 2013

Adapted from Schraw, 2001 and LaVaque-Manty, 2013

Metacognition and Instruction

Three fundamental principles for successful metacognitive instruction:

1. Embedded instruction
2. Informing learners about metacognitive activities
3. Frequent, spaced metacognitive activities

(Veenman, Van Hout-Wolters, Afflerback, 2006)

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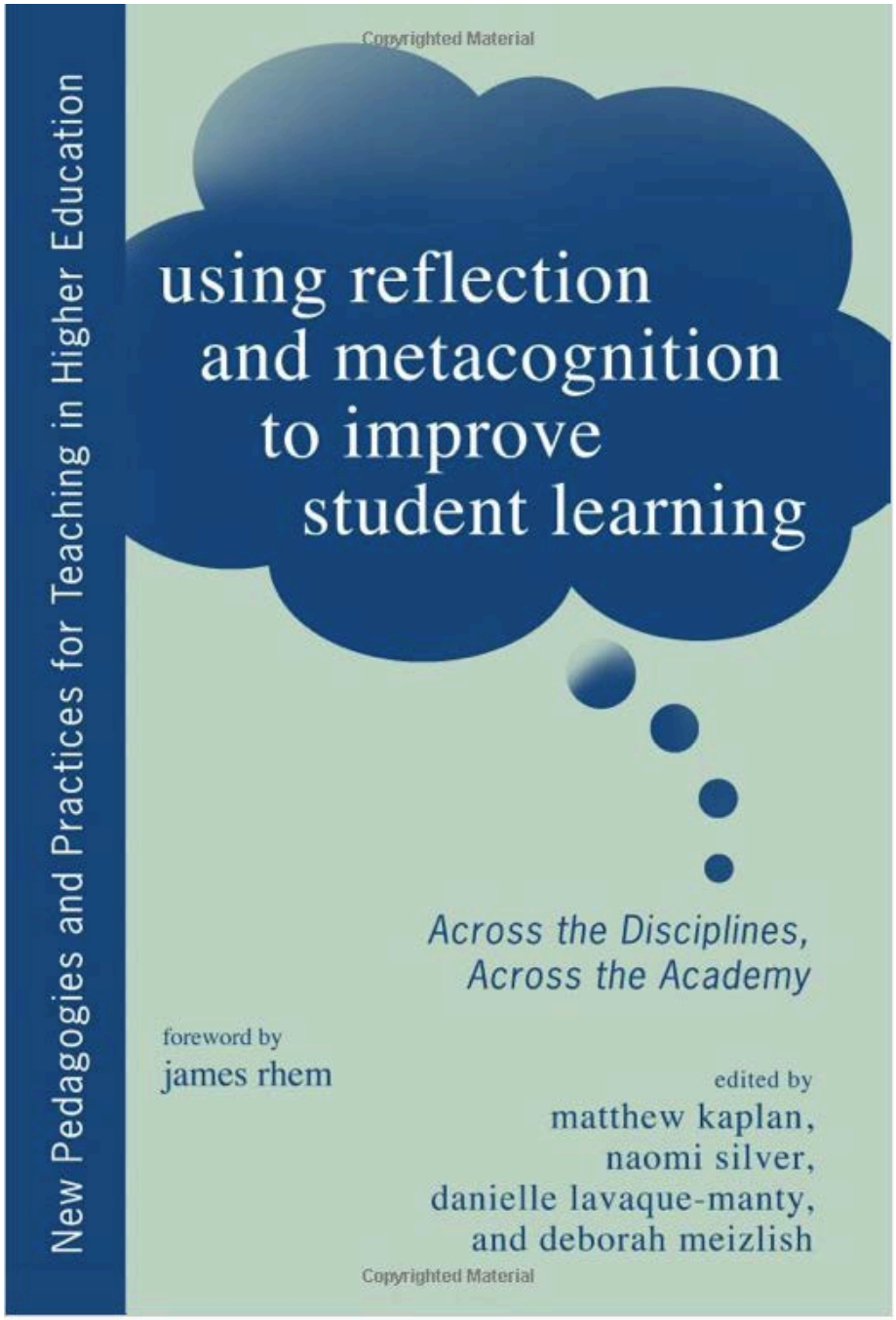
REFERENCES AND RESOURCES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New Pedagogies and Practices for Teaching in Higher Education
using reflection and metacognition to improve student learning
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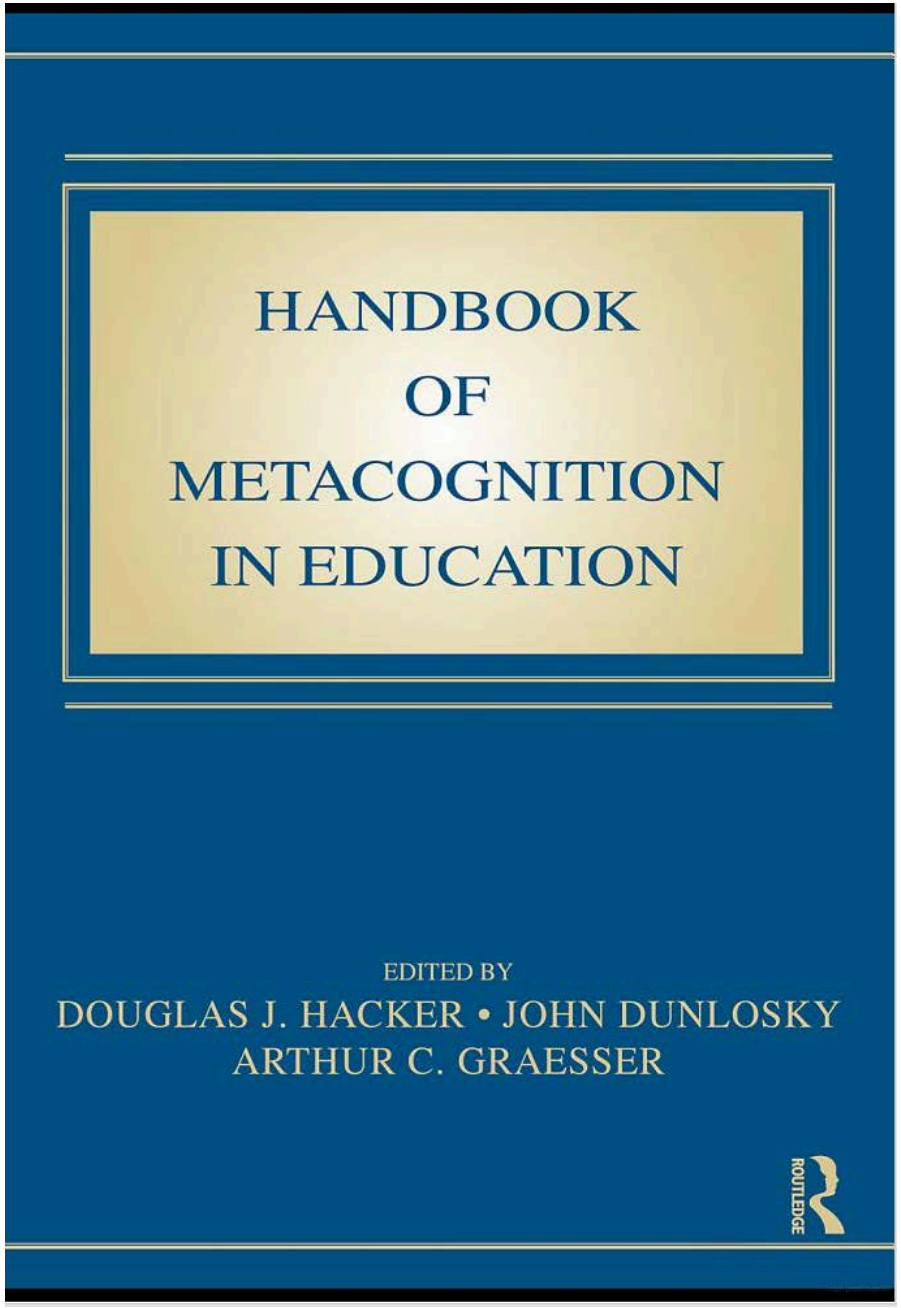
HANDBOOK
OF
METACOGNITION
IN EDUCATION
EDITED BY
DOUGLAS J. HACKER • JOHN DUNLOSKY
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Additional Reading and References

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