

METACOGNITION: Study Strategies, Monitoring, and Motivation

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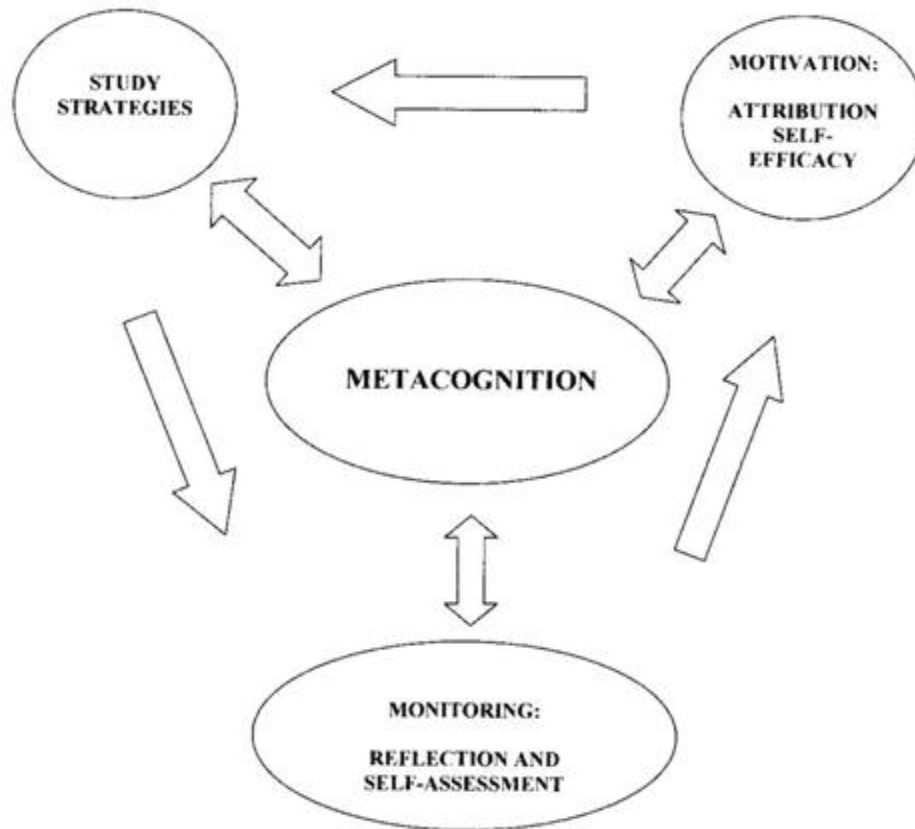
◁>A greatly expanded text version of a workshop
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The main points of the presentation are:

- 1. Instructors should explicitly teach the reading, note-taking, and study strategies that will be effective in their courses.**
- 2. Instructors should teach students how to monitor and self-assess their use of study strategies.**

Outline

- I. [Introduction](#)
- II. [Metacognition and Three Types of Knowledge](#)
- III. [Metacognition and Study Strategies](#)
- IV. [Monitoring Problems with Learning](#)
- V. [Metacognition and Motivation](#)
- VI. [Metacognition and At-Risk Students](#)
- VII. [Five Generalizations from a Review of the Literature of Study Strategies](#)
- VIII. [What Instructors Can Do to Help Students](#)
 - A. Some Sample Metacognitive Strategies
 - B. Strategies for Instructors to Use in Teaching Textbook Reading
 - C. Strategies for Students to Use for Textbook Reading
 - D. Sample Reflective Topics for Self-Monitoring and Self-Assessment
- IX. [References](#)



I. Introduction

In general, **metacognition** is thinking about thinking. More specifically, Taylor (1999) defines metacognition as “an appreciation of what one already knows, together with a correct apprehension of the learning task and what knowledge and skills it requires, combined with the agility to make correct inferences about how to apply one’s strategic knowledge to a particular situation, and to do so efficiently and reliably.”

The more students are aware of their thinking processes as they learn, the more they can control such matters as goals, dispositions, and attention. Self-awareness promotes self-regulation. If students are aware of how committed (or uncommitted) they are to reaching goals, of how strong (or weak) is their disposition to persist, and of how focused (or wandering) is their attention to a thinking or writing task, they can regulate their commitment, disposition, and attention (Marzano et al., 1988). For example, if students were aware of a lack of commitment to writing a long research assignment, noticed that they were procrastinating, and were aware that they were distracted by more appealing ways to spend their time, they could then take action to get started on the assignment. But until they are aware of their procrastination and take control by making a plan for doing the assignment, they will blissfully continue to neglect the assignment.

II. Metacognition and Three Types of Knowledge

To increase their metacognitive abilities, students need to possess and be aware of three kinds of content knowledge: declarative, procedural, and conditional. **Declarative knowledge** is the factual information that one knows; it can be declared—spoken or written. An example is knowing the formula for calculating momentum in a physics class (momentum = mass times velocity). **Procedural knowledge** is knowledge of how to do something, of how to perform the steps in a process; for example, knowing the mass of an object and its rate of speed and how to do the calculation. **Conditional knowledge** is knowledge about when to use a procedure, skill, or strategy and when not to use it; why a procedure works and under what conditions; and why one procedure is better than another. For example, students need to recognize that an exam word problem requires the calculation of momentum as part of its solution.

This notion of three kinds of knowledge applies to learning strategies as well as course content. When they study, students need the declarative knowledge that (1) all reading assignments are not alike; for example, that a history textbook chapter with factual information differs from a primary historical document, which is different from an article interpreting or analyzing that document. They need to know that stories and novels differ from arguments. Furthermore they need to know that there are different kinds of note taking strategies useful for annotating these different types of texts. And (2) students need to know how to actually write different kinds of notes (procedural knowledge), and (3) they need to know when to apply these kinds of notes when they study (conditional knowledge). Knowledge of study strategies is among the kinds of metacognitive knowledge, and it too requires awareness of all three kinds of knowledge.

III. Metacognition and Study Strategies

Research shows that explicitly teaching study strategies in content courses improves learning. (Commander & Valeri-Gold, 2001; Ramp & Guffey, 1999; Chiang, 1998; El-Hindi, 1997; McKeachie, 1988). Research also shows that few instructors explicitly teach study strategies; they seem to assume that students have already learned them in high school—but they haven't. (McKeachie, 1988). Rote memorization is the usual learning strategy—and often the only strategy—employed by high school students when they go to college (Nist, 1993).

Study strategies are diverse and don't work in every context. For example, reading for information acquisition won't work in a literature course and won't work if students are supposed to critically evaluate an article. But students who have learned only the strategy of reading to pass a quiz on the information will not go beyond this strategy. Study strategies don't necessarily transfer into other domains. Students need to know they have choices about which strategies to employ in different contexts. And students who learn study skills in one course need to apply study strategies in other contexts than where they first learned it.

Students need to monitor their application of study strategies. Metacognitive awareness of their learning processes is as important as their monitoring of their learning of the course content. Metacognition includes goal setting, monitoring, self-assessing, and regulating during thinking and writing processes; that is, when they're studying and doing homework. An essential component of metacognition is employing study strategies to reach a goal, self-assessing one's effectiveness in reaching that goal, and then self-regulating in response to the self-assessment.

IV. Monitoring Problems with Learning

When students monitor their learning, they can become aware of potential problems. Nickerson, Perkins, and Smith (1985) in *The Teaching of Thinking* have categorized several types of problems with learning.

A. Problems with Process; Making errors in encoding, operations, and goals:

1. Errors in Encoding

Missing important data or not separating relevant from irrelevant data. For example, some literature students will base their interpretation of a poem on just the first stanza.

2. Errors in Operations

Failing to select the right subskills to apply. For example, when proofreading, some students will just read to see if it sounds right, rather than making separate passes that check for fragments, subject-verb disagreement, and other errors they have learned from experience they are likely to make.

Failing to divide a task into subparts. For example, some math students will jump right to what they think is the final calculation to get the desired answer.

3. Errors in Goal Seeking

Misrepresenting the task. For example, students in a speech communication class instead of doing the assigned task of analyzing and classifying group communication strategies used in their group discussions will just write a narrative of who said what.

Not understanding the criteria to apply. For example, when asked to evaluate the support provided for the major claim of an article, students will explain why they liked the article rather than apply appropriate evaluative criteria.

B. Problems with Cognitive Load

Too many subskills necessary to do a task. For example, some students might have not yet learned how to carry out all the steps in a complex nursing procedure.

Not enough automatic, internalized subskills. For example, students in an argument and persuasion class might have to check their notes on how to analyze persuasive strategies because they have not internalized the procedure.

C. Problems with Abilities

Lacking the level of needed mental abilities. For example, students are asked to think abstractly about general concepts and issues, but they can only think concretely about specific situations.

A good way to discover what kind of errors students are making in their thinking processes is to get them to unpack their thinking, to tell you step by step how they are going about the task. By listening to how they are doing the cognitive task, an instructor can detect where the student is going wrong. Asking students to describe their thinking processes also develops their metacognitive abilities—a very necessary skill to improve thinking.

V. Metacognition and Motivation

Metacognition affects motivation because it affects attribution and self-efficacy. When students get results on tests and grades on assignments (especially unexpected results such as failures), they perform a mental causal search to explain to themselves why the results happened. When they achieve good results, students tend to attribute the result to two internal factors: their own ability and effort. When they fail, they might attribute the cause to these same internal factors or they might, in a self-protective rationalization, distance themselves from a sense of personal failure by blaming external causes, such as an overly difficult task, an instructor's perverse testing habits, or bad luck. This tendency to attribute success to ability and effort promotes future success because it develops confidence in one's ability to solve future unfamiliar and challenging tasks. The converse is also true. Attributing failure to a lack of ability reduces self-confidence and reduces the student's summoning of intellectual and emotional abilities to the next challenging tasks; attribution theory also explains why such students will be unwilling to seek help from tutors and other support services: they believe it would not be worth their effort. In addition to blaming failure on external causes, underachievers often "self-handicap" themselves by deliberately putting little effort into an academic task; they thereby protect themselves from attributing their failure to a painful lack of ability by attributing their failure to lack of effort (Stage et al, 1998) (Click [here](#) for a review and summary of *Creating Learning Centered Classrooms* by Stage et al.)

VI. Metacognition and At-Risk Students

The last two decades have seen a great deal of research directed towards improving the academic success of at-risk students. As McKeachie (1988) explains, the problems are

- Students "enter the higher levels of education with . . . strategies that handicap them in achieving success." (p. 5)
- "[N]either home backgrounds nor schools have helped young adults become aware of alternative ways of approaching learning situations, and of options other than increasing or decreasing one's effort as one approaches different learning situations" (p. 5)
- Teachers give plenty of feedback about the correctness of learning outcomes but not about how to achieve these outcomes.

The use of learning strategies is linked to motivation. When students fail, they tend to assign the cause to something stable and unchangeable—low innate ability—rather than to something they have the ability to change—employing different, more effective, learning strategies.

VII. Five Generalizations from a Review of the Literature of Study Strategies

Simpson and Nist (2000) have conducted a review of the literature on strategic learning in the last 20 years and summarize it in five generalizations:

1. Understanding the task is of great importance

The tasks that students need to perform vary not only among disciplines but among instructors in the same discipline. An effective strategy for preparing for a multiple choice test in biology is different from what is needed to prepare for a history exam with an essay that asks students to synthesize information from several chapters. Yet students often employ the same strategy—and sometimes the least effective strategy—for studying for very different kinds of tests. Furthermore, many students who perform badly misinterpret the tasks; for example, by misunderstanding what clearly written essay instructions asked them to do. Students need to understand the task accurately in order to use the most effective strategies.

2. What students believe about learning affects their selection of study strategies

“What students believe about learning and studying has an influence on how they interpret the task, how they interact with text, and, ultimately, the strategies they select.”

3. Instructors need to provide good instruction in how to use study strategies

Simpson’s and Nist’s first point in this section is that it takes time to teach explicit use of strategies. In one experiment students were explicitly taught the “metacognitive strategies of planning and evaluating,” but “distinct and significant improvement did not emerge until 4 weeks after the initial instruction.” Second, students should not only be taught what the features of a strategy (declarative knowledge of the strategy) but also procedural and conditional knowledge: the steps to use and when to employ them. Students need to practice on authentic texts from the course and the texts should be challenging enough so that students will not employ simplistic approaches. Third, practice with strategies should occur within a specific course; isolated study skills courses have limited success. Fourth, instruction in study strategies “should be explicit and direct” and include five features: “(a) strategy descriptions; (b) discussions of why the strategy should be learned and its importance; (c) think-alouds, models, and examples of how the strategy is used, including the processes involved and when and where it is appropriate to apply the strategy; (d) explanations as to when and where it is appropriate to apply the strategy; and (e) suggestions for monitoring and evaluating whether the strategy is working and what to do if it is not.” Instructors should design guided practice where students use the strategies on authentic course tasks and provide feedback.

4. Instructors should teach a variety of strategies that research has shown to be effective.

Researchers have found that four reading and studying strategies are effective:

- A. Generate questions and answer them. Students need to be taught how to create higher-level questions and how to answer them; sometimes this is done in small groups or pairs. The strategy improves students' comprehension of the text.
- B. Write summaries. Students need to use their own words and be taught the rules of summarizing (which is difficult). "Writer-based summaries not only improve students' comprehension, but also help them monitor their understanding."
- C. Write elaborations. Ask students to create examples, make analogies, explain relationships between concepts. [The Cornell note-taking method and double-entry notebook are examples of elaborations.]
- D. Use organizing strategies. Concept maps, network representations, and other graphic organizers can be effective.

5. Emphasize the cognitive and metacognitive processes that underlie a study strategy.

The value of a strategy lies more in the cognitive and metacognitive processes used than the steps in the strategy itself. The key steps are "elaborating, planning, monitoring, and evaluating."

VIII. What Instructors Can Do To Help Students.

A. Some Sample Metacognitive Strategies

Learning portfolio. Commander and Valeri-Gold (2001) describe a learning portfolio as a collection of student papers applying learning strategies to their course work. Among the benefits for instructors evaluating student work are that learning portfolios "(a) capture the intellectual substance and learning situation in ways that other methods of evaluation cannot; (b) encourage students to take a role in the documentation, observation, and review of learning; are a powerful tool for improvement; and (d) create a culture of professionalism about learning" (p.6). The chief benefits for students are their actually performing effective learning strategies and the opportunity for self-assessment.

Individual learning plan (ILP) as a contract with the instructor. Linda H. Chiang (1998) describes the process as "setting ILP goals, developing an ILP, monitoring the learning process, writing a reflective journal, conducting one-on-one conferences, and making summative evaluations" (p. 5).

Test Debriefing. Maryellen Weimer (2002) in *Learner-Centered Teaching* describes how she uses metacognition as she debriefs students after returning an exam in order to give them a sense of control over their learning. She asks students to write down the numbers of questions they missed and then has perform three analyses:

1. Students first go through their notes on the missed questions and determine whether any of these were on days they missed class and had to rely on someone else's notes.
2. Dr. Weimer then identifies which questions came from the assigned reading and which from her lectures and asks students to identify whether more missed questions came from reading notes or class notes.
3. She then has students look through their exam, check for answers that they changed, and determine how many any of their changes resulted in correct answers. If there is a pattern, it is useful self-knowledge.

Then students write a reflective note to themselves about what they learned from preparing for and taking this exam that will help them prepare for the next one and to describe what steps they will take between now and the next exam. (Click [here](#) for a review and summary of Maryellen Weimer's *Learner-Centered Teaching*.)

B. Strategies for Instructors to Use in Teaching Textbook Reading

1. Preview the assigned reading

- Have students write down what they already know about the subject of the chapter; briefly discuss
- Present an oral summary of the chapter in the previous class
- Ask interesting questions that will be answered in the reading assignment
- Take a poll on some of the issues addressed in the reading assignment
- Emphasize the interest, usefulness, and fit in the course sequence of the chapter

2. Do not repeat the reading in a lecture

Do not make listening to your lecture become the students' reading strategy. It is tempting when students do not or can not read the textbook chapters to make sure the course content is "covered" by telling the students what they should have learned if they had read the textbook. Among the reasons for **not** lecturing on assigned reading are

- Your students will not learn to read for comprehension--a needed skill.
- As passive learners listening and taking notes, students will not use class time on higher order thinking tasks, such as applying, analyzing, synthesizing, comparing, evaluating.

3. Teach explicitly those study strategies that will be effective in your course

- Demonstrate how to do the assigned writing tasks
- Provide models
- Provide feedback

- Make the students' reading goals clear: read for general or detailed comprehension, read critically, or read for insight.

4. As homework have students write in response to the assigned textbook reading

Write your daily instructions for students in the daily course syllabus

5. Monitor compliance

Develop ways to ensure that students do their daily written homework without burdening yourself with daily feedback or recordkeeping. (See "[A Strategy for Getting Students to Do Their Homework.](#)")

6. Use the written homework in whole-group or small-group discussions and activities

C. Strategies for Students to Use for Textbook Reading

1. Answer instructor-provided questions
2. Ask and answer student-generated questions
3. Produce an outline or concept map
4. Write summaries of each section in the chapter
5. Use the SQ4R method: Survey the text, formulate questions, read, record notes, recite, reflect
6. Write notes that elaborate on the textbook:
 - a. Cornell method: one column for key words and concepts, a second column for comments, summaries. Useful for comprehension and later recall.
 - b. Double-entry method: one column/page for copied passage, adjacent column/page for personal reflections on the passage. Developed by Berthoff (1987); useful for engaging with the text.
 - c. Simpson and Nist (1990): seven textbook annotation processes
 - Write brief summaries in the text margins
 - List ideas (causes, effects, characteristics, etc.)
 - Identify examples in the margin (write "EX")
 - Write key information on graphs and charts
 - Predict potential test questions
 - Call attention to confusion with a ? in the margin
 - Underline key words
7. Connect the reading to a past lecture or to prior knowledge
8. Compare/contrast with another reading
9. Critique/evaluate the reading
10. Apply the chapter content to a scenario or case

11. Write self-assessments of your understanding of the reading. See D. below in next list of topics.

D. Sample Reflective Topics for Self-Monitoring and Self-Assessment

Reading for Comprehension

◇ “What do you notice about your reading when you are understanding what you read? What is it that causes you difficulties when you read? In what areas of reading and remembering do you feel most at ease?” (Soldner, 1997)

“Did any parts of the passage confuse me? What did I do to clarify the confusion?” (Gourgey, 1997)

Associative and Affective Personal Response

“How does this poem make you feel? What in your own life might have influenced how you responded to the poem?” (Newton, 1991)

At the Start of an Online Course

- What concerns do you have about the course? How do you plan to deal with your concerns?
- What are your chief strengths as a learner? How will they help you in an online course?
- Read the section "Plan How to Succeed in a Web-Based Course" (in the Syllabus, in "Course Introduction"). How do you plan to manage your time to do well in this course?
- Considering past courses you have taken, what will you need to improve or to continue doing in order to do well in this course? (Peirce, business writing course)

Sample Topics Connecting Class Activity, Textbook, and Personal Experience

Reflect on what you learned about the group writing process from your experience with the Module One group task on reporting on web sites. What appropriate advice does chapter 2 (in the section on working in teams and small groups) have that applies to your experience? What went well? What went badly? What would you do differently next time? What helps and hinders your own involvement in group writing projects?

Reflect on what you learned from the Module Two (Employment Messages) reading and writing tasks, even if you had already prepared your résumé before starting this course. Did you learn anything new? What prior knowledge was reinforced? Did you improve your approach to writing tasks? What was easy/hard? (Peirce, business writing course)

Self-Assessment of Research Paper

To improve your performance on similar future research tasks, write a reflective, self-assessment of your research process for this assignment. At which steps in the process were you most satisfied with how you worked? When were you least satisfied? What skills do you feel you improved? In what ways do you feel more capable? What were the chief obstacles to being efficient? What will you do differently next time? (Peirce, used in various writing courses)

IX. References

- Applegate, M. D., Quinn, K. B., & Applegate, A. J. (1994). Using metacognitive strategies to enhance achievement for at-risk liberal arts students. *Journal of Reading, 38*, 32-40.
- Berthoff, A. E. (1987). Dialectical notebooks and the audit of meaning. In T. Fulwiler (Ed.), *The Journal Book* (pp. 11-18). Portsmouth, NH: Boynton/Cook.
- Commander, N. E., & Valeri-Gold, M. (2001). The learning portfolio: A valuable tool for increasing metacognitive awareness. *The Learning Assistance Review 6*(2), 5-18.
- Chiang, L. H. (1998). Enhancing metacognitive skills through learning contracts. Paper presented at the annual meeting of the Mid-Western Educational Research Association, Chicago. (ERIC Document Reproduction Services No. ED425 154).
- El-Hindi, A. E. (1997). Connecting reading and writing: College learners' metacognitive awareness. *Journal of Developmental Education, 21*(2), 10-17.
- Gourgey, A. F. (1997). Getting students to think about their own thinking in an integrated verbal-mathematics course. *Research and Teaching in Developmental Education, 14*, 49-56.
- Hill, M. (1991). Writing summaries promotes thinking and learning across the curriculum—but why are they so difficult to write? *Journal of Reading, 34*, 536-539.
- Hacker, D. J. (1998). Definitions and empirical foundations. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 1-23). Mahwah, NJ: Erlbaum.
- Marzano, R. J., Brandt, R. S., Hughes, C. S., Jones, B. F., Presseisen, B. Z., Rankin, S. C., & Suhor, C. (1988). *Dimensions of thinking: A framework for curriculum and instruction*. Alexandria, VA: Association for Supervision and Curriculum Development.
- McKeachie, W. J. (1988). The need for study strategy training. In C. E. Weinstein, E. T. Goetz, & P. A. Alexander (Eds.), *Learning and study strategies: Issues in assessment, instruction, and evaluation* (pp. 3-9). New York: Academic Press.

- Newton, E. V. (1991). Developing metacognitive awareness: the response journal in college composition. *Journal of Reading*, 34, 476-478.
- Nickerson, R. S., Perkins, D. N., & Smith, E. E. (1985). *The teaching of thinking*. Hillsdale, NJ: Erlbaum.
- Nist, S. (1993). What the literature says about academic literacy. *Georgia Journal of Reading*, (Fall-Winter), 11-18.
- Paris, S. G. (1988). Models and metaphors of learning strategies. In C. E. Weinstein, E. T. Goetz, & P. A. Alexander (Eds.), *Learning and study strategies: Issues in assessment, instruction, and evaluation* (pp. 299-321). New York: Academic Press.
- Ramp, L. C. & Guffey, J. S. (1999). The impact of metacognitive training on academic self-efficacy of selected underachieving college students. (ERIC Document Reproduction Services No. ED432 607).
- Simpson, M. L., & Nist, S. L. (1990). Textbook annotation: An effective and efficient study strategy for college students. *Journal of Reading*, 34, 122-129.
- Simpson, M. L., & Nist, S. L. (2000). An update on strategic learning: It's more than textbook reading strategies. *Journal of Adolescent and Adult Literacy*, 43(6). Retrieved November 8, 2002, from Academic Search Premier.
- Soldner, L. B. (1997). Self-assessment and the reflective reader. *Journal of College Reading and Learning*, 28, 5-11.
- Stage, F. K., Muller, P. A., Kinzie, J., & Simmons, A. (1998). *Creating learning centered classrooms: What does learning theory have to say?* Higher Education Report vol. 26, number 4. Washington, D. C.: Association for the Study of Higher Education.
- Taylor, S. (1999). Better learning through better thinking: Developing students' metacognitive abilities. *Journal of College Reading and Learning*, 30(1), 34ff. Retrieved November 9, 2002, from Expanded Academic Index ASAP.

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