2013

Metacognition and Academic Achievement in Middle School Students

Tim Naratil

Emily Howe

METACOGNITION AND ACADEMIC ACHIEVEMENT IN MIDDLE SCHOOL STUDENTS

Timothy C. Naratil '13 and Emily C. Howe '13
Dina Anselmi and David Reuman, Department of Psychology Trinity College
Community Partner: Debra Avery, Hartford Magnet Trinity College Academy

Introduction

What is metacognition?

- The comprehension of and control over one's own thinking and learning.
- For example, figuring out what strategies to use when preparing for an exam versus a project.

How is metacognition related to academic performance?

- Students with higher levels of metacognition are more academically successful, learn more, and perform better in school.

Can metacognition be taught?

- Metacognitive interventions are highly successful when they are longer and focus on metacognition rather than motivation.
- However, metacognition is more helpful for open-ended assignments than other assignments, such as examinations.

Figure 1. Steps in Metacognitive Cycle

Hypotheses

H1: Students who received the self-regulation intervention would become more metacognitively aware and increase their use of metacognitive strategies.

H2: Students who received the self-regulation intervention would have a general increase in their course grades, particularly grades related to open-ended assignments.

H3: Metacognition will be measured more effectively by employing a new measure, the MC5.

Methods

Participants

Four social studies classes of eighth grade students from a middle school in the Hartford Public School District participated in this study (N = 79). All classes were taught by the same instructor, for the same amount of time, and were similar in size.

Measures

Jr. Metacognitive Awareness Inventory

Eighteen self-report items assessed students' use and knowledge of metacognition.

Metacognition 5

Thirty-two self-report items assessed students' use of metacognition as part of the five components of the cycle of self-directed learning.

Measures of student beliefs and motivation

Ability Beliefs, Effort Beliefs, Self-Efficacy, and PALS

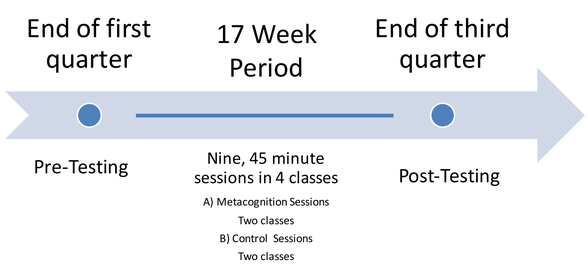
Demographic Questions

Gender, race/ethnicity, date of birth and hometown were reported

Performance Measures

First and Second Quarter Grades and individual class assignment grades were collected.

Timeline of Study Procedure



Intervention Lessons

Metacognition and cognition taught in each lesson. Order of lessons were:

- Introductions and Basic Overview
- In-Depth Overview, and Motivation & Beliefs about Intelligence
- Understand the Assignment, and Highlighting and Flashcards
- Know Strengths and Weaknesses, and Mnemonics and Self-Testing
- Plan, and How to Write an Amazing Paper
- Review of first five sessions
- Apply Strategies & Monitor Performance – Metacognition Jeopardy, and Skim/Slow Down and Study Guides
- Reflect and Adjust, and Teach Someone and Charts/Diagrams
- Industrial Revolution Practice Metacognition Assignment & Wrap Up

Measuring Metacognition

Measurement Problems with the Jr. MAI

- Not aligned to Ambrose et al.'s theory of metacognition
- Adult measure modified for adolescents
- Some items are ambiguous
- Some items not connected to specific metacognitive skills

Development of the Metacognition 5 (MC5)

- Questions created for each of Ambrose et al.'s five steps of metacognition
- Developed specifically with 8th grade social studies class in mind
- Aligned with the theory of metacognition used to design the intervention in the current study

Sample Lesson – Session Three

Metacognition Group	Control Group
Metacognitive Strategy • Understand the Assignment • Understand directions, know the assignment's goal, clarify with teacher if necessary • Activity- "Following Directions"	**President Thomas Jefferson** • Brainstorming Activity • Fun facts

Cognitive Strategy 1
• Highlighting
  • Color-coding techniques
  • How much is too much?
	• Early life
	• Family life

Cognitive Strategy 2
• Flashcards
  • YES – people, dates, short answers
  • NO – opinions or open-ended questions
	• Political life & presidency
	• Life after the presidency

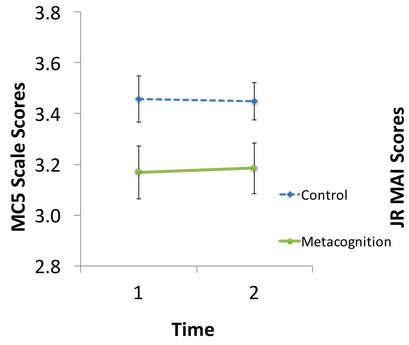
Acknowledgements

We would like to thank the students who participated in our study. Their enthusiasm and energy will be missed. We would like to thank our classroom teacher for allowing us into her classroom and supporting us throughout the process. Additionally, we would like to thank our research assistants for all their hard work. Finally, we would like to thank the CLI community for their support and guidance.

References available on request

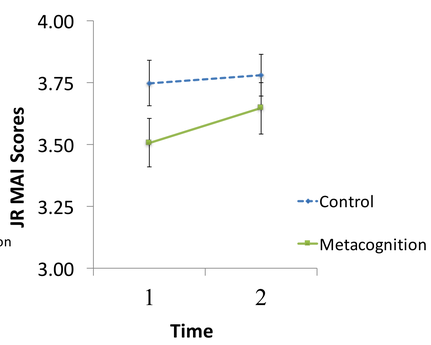
Results

Figure 1. MC5 means at Pre- and Post-Testing



Contrary to our first hypothesis, results showed no significant differences in the group-by-time interaction, but the control group was significantly higher on metacognitive awareness, at pre- and post-testing.

Figure 2. Jr. MAI means at Pre- and Post-Testing



Contrary to our first hypothesis, results showed no significant differences in the group-by-time interaction, but the intervention group did have a greater increase in metacognitive awareness.

Performance Measures Results

In addition, course grades were analyzed. There were no significant differences between groups or between group-by-time interactions, but there was a significant overall effect of time. Specifically, all groups' grades decreased from first to second quarter.

Lastly, students in the experimental group scored significantly higher on a unit test than students in the control group.

Discussion and Direction for Future Research

Findings :

- Both self-report measures of metacognition showed no significant differences.
- Performance measures, in terms of quarter grades, showed no significant group differences.
- Performance measures, in terms of a third quarter unit test, showed the metacognition group scoring significantly higher than the control group.

Lack of strong results may be explained by the following factors:

- Although the Jr. MAI is a valid measure of metacognition, it fails to align with our theory of metacognition, and may be unable to capture changes due to our intervention.
- Although the new measure, the MC5, corresponds more directly to our theoretical model, the MC5 is only in its first iteration and will therefore need to be revised for future research.
- Although the intervention included four different sections of students, the instructor was the same. The award-winning teacher may be teaching self-regulation to all of her students, which may mask the effectiveness of our intervention.

Future researchers should:

- Continue to develop an effective measure of metacognition that aligns with the theory of metacognition being taught in the classroom. Self-report measures are challenging to create and typically need multiple rounds of edits before becoming effective.
- Consider modifying the intervention to increase metacognitive awareness in students.