The Role of Self-Regulation in Developing Metacognition of the Nature of Science in 8th Grade Students

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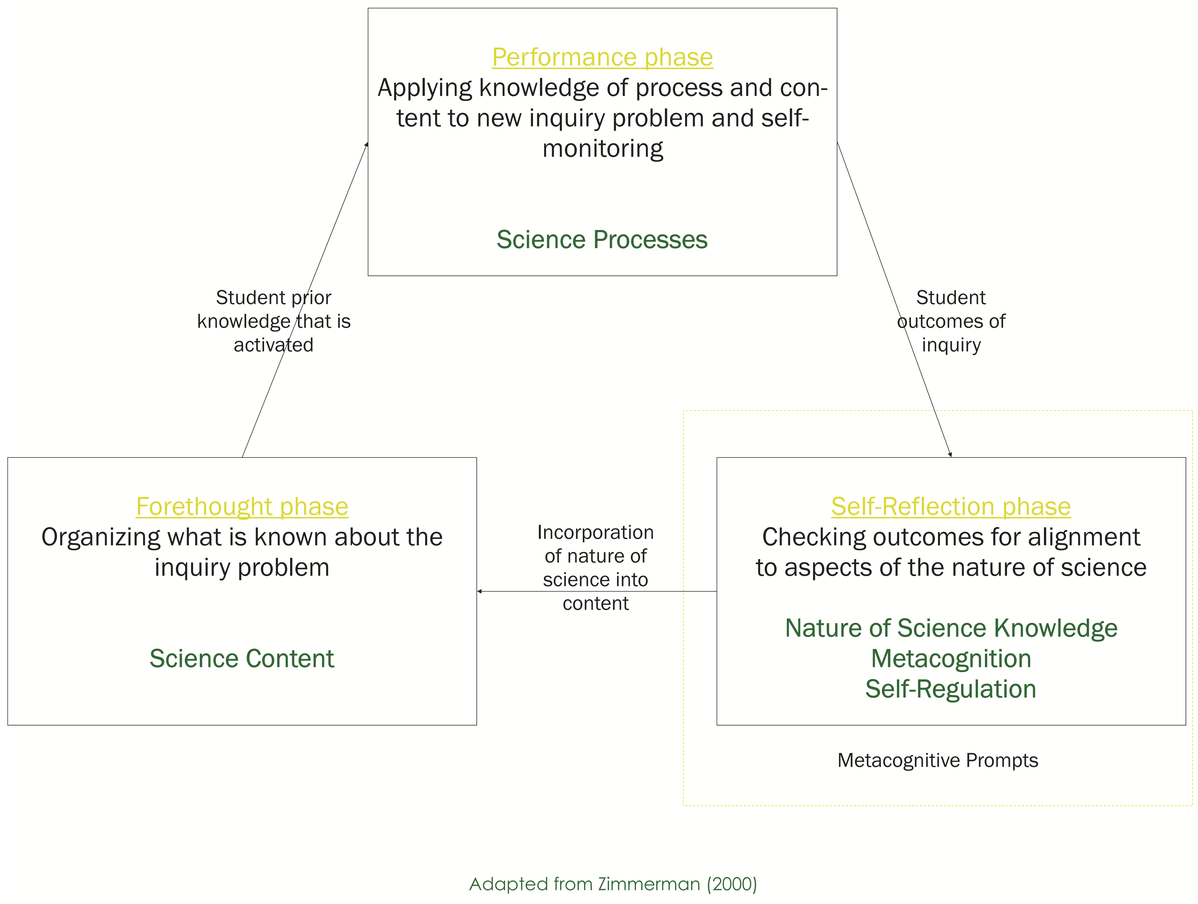
Conceptual Framework

In studying science, many elementary and secondary students learn the subject as a collection of facts and gain little or no understanding of science as a discipline. However, research shows that it is difficult for teachers to transfer their knowledge of the nature of science into explicit lesson plans. As a result of experiencing lessons based on the self-regulation intervention in this study, students are expected to make choices and produce ideas in scientific inquiry, reflect on their choices and ideas, check their reasoning against established ways of knowing in science, and make adjustments when necessary.

Self-Regulated Learning



Adapted from Zimmerman (2000)

Scaffolding Metacognition

Observation
Students are given an exemplary model of the science task they are expected to master

Emulation
Students attempt a similar science task as the model with support. The support is in the form of checklist items. Students compare their performance with a guidelines aligned with the scientific profession.

Self-Control
Students attempt another similar science task as support is faded. Students receive a short checklist and questions for them to communicate rationale for decisions

Self-Regulation
Students display their ability to independently perform the task. They are asked questions to justify their decisions and explain why they are aligned with the guidelines for the scientific enterprise.

Empirical Outcomes

Themes	Evidence
Increase in content knowledge as a result of exposure to content-free prompts	Experimental group significantly outperform comparison groups in content knowledge and nature of science knowledge • ANCOVA in pre– and post-testing situation
Girls exposed to metacognitive prompts tend to see science as a human endeavor	Experimental girls vastly outperformed experimental boys in content and nature of science. Experimental girls reported a new understanding of the collaboration needed in science.
Reliance on and respect for evidence in science inquiry	When confronted with diverging conclusions, the experimental groups recreated the activity to find an answer. The comparison groups relied on peer pressure or waited for a teacher-led answer.
Change in study habits for assessments in science	Students in the experimental group report that they study diagrams, graphs and results from labs as well as their text, while comparison groups study vocabulary words

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