



**EPSSL** | EDUCATION POLICY STUDIES LABORATORY  
Education Policy Research Unit

## SCHOOL REFORM PROPOSALS: THE RESEARCH EVIDENCE

### CONVERGING FINDINGS ON CLASSROOM INSTRUCTION

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#### *Research Quality*

Research on instruction and teacher behavior covers three areas: cognitive processing; teachers whose classes make higher achievement gains than others; and helping students learn and apply cognitive strategies in learning. Research includes an extensive series of observations of teachers, correlated with student test scores and followed by experimental studies that tested behaviors of master teachers.

#### *Research Findings*

**Knowledge Structures:** Information in long-term memory is stored in networks called knowledge structures. Well-connected and elaborate knowledge structures allow for easier retrieval of old material, permit more information to be carried in a single chunk, and facilitate the understanding and integration of new information.

**Cognitive Processing:** Research on cognitive processing shows teachers can help students build knowledge structures through extensive reading, review, practice, and discussion; organizing new material to facilitate comprehension; and supervising students so they avoid misconceptions.

**Teacher Effects:** Studies drawn from extensive classroom observation identified teacher behaviors most related to student achievement gain. Teachers whose classrooms made the greatest gains in reading or mathematics began with a short review of previous learning; stated goals for a new lesson; presented material in small steps; provided for frequent student practice; gave clear and detailed instructions and explanations; asked frequent questions to check student understanding; guided students during initial practice; provided systematic feedback and corrections; and provided explicit instruction and practice for individual exercises, monitoring students during individual work.

**Improving Success Rates:** Teaching in small steps and the use of heterogeneous small work and study groups improve success rates, the latter by having students who have learned the material re-explaining it to other students. Another approach is to regroup students by achievement across classrooms for reading and math. *Mastery Learning* seeks to bring all students to mastery on one section of material before they proceed to the next section.

**Teaching Cognitive Strategies:** Cognitive strategies support learners as they develop new internal procedures that enable them to perform higher-level operations in areas such as reading comprehension and scientific problem solving. Until the late 1970s, students were seldom provided with any help in reading comprehension. Using research on cognition and information processing, investigators began to develop and validate cognitive strategies that could help students with question-generation and summarization in reading, and similar strategies appropriate to mathematics problem solving, physics problem solving, and writing.

**Scaffolds:** *Scaffolds*, temporary cognitive supports that help learners during initial learning, include: procedural prompts that can guide student processing; modeling procedural prompts, and “thinking aloud” to underscore and elaborate upon instruction; initial practice guidance to reduce the difficulty of the task; feedback and self-checking procedures; and independent practice with new examples.

### ***Recommendations***

- Present new material in small steps so that the working memory does not become overloaded.
- Help students develop an organization for the new material.
- Guide student practice by supporting students during initial practice, and providing for extensive student processing.
- When teaching higher-level tasks, support students by providing them with cognitive strategies.
- Help students learn to use the cognitive strategies by providing them with procedural prompts and modeling the use of these procedural prompts.
- Provide for extensive student practice.

The foregoing is a summary of a chapter in the book *School Reform Proposals: The Research Evidence* (Information Age Publishing, 2002), edited by Alex Molnar. The full chapter can be viewed at:

[http://www.asu.edu/educ/epsl/EPRU/documents/EPRU\\_2002-101/Chapter\\_09-Rosenshine-Final.pdf](http://www.asu.edu/educ/epsl/EPRU/documents/EPRU_2002-101/Chapter_09-Rosenshine-Final.pdf)