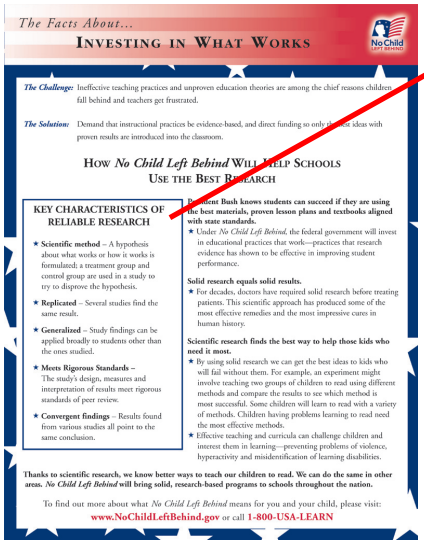
Scientifically Based Research

How the Cognitive Tutor Aligns with NCLB

Carnegie Learning's Cognitive Tutors are the most extensively researched high school mathematics curricula on the market today. They are based on over 20 years of research on how students think, learn, and apply new knowledge in mathematics. The system is built on cognitive models, which represent the knowledge a student might possess about a given subject. The software assesses students' mathematical knowledge on a step-by-step basis and presents activities tailored to their individual skill levels.



The Facts About...

INVESTING IN WHAT WORKS

The Challenge: Ineffective teaching practices and unproven education theories are among the chief reasons children fall behind and teachers get frustrated.

The Solution: Demand that instructional practices be evidence-based, and direct funding so only those ideas with proven results are introduced into the classroom.

HOW *No Child Left Behind* WILL HELP SCHOOLS USE THE BEST RESEARCH

KEY CHARACTERISTICS OF RELIABLE RESEARCH

- **Scientific method** – A hypothesis about what works or how it works is formulated; a treatment group and control group are used in a study to try to disprove the hypothesis.
- **Replicated** – Several studies find the same result.
- **Generalized** – Study findings can be applied broadly to students other than the ones studied.
- **Meets Rigorous Standards** – The study's design, measures and interpretation of results meet rigorous standards of peer review.
- **Convergent findings** – Results found from various studies all point to the same conclusion.

President Bush knows students can succeed if they are using the best materials, proven lesson plans and textbooks aligned with state standards.

- Under *No Child Left Behind*, the federal government will invest in educational practices that work—practices that research evidence has shown to be effective in improving student performance.

Solid research equals solid results.

- For decades, doctors have required solid research before treating patients. This scientific approach has produced some of the most effective remedies and the most impressive cures in human history.

Scientific research finds the best way to help those kids who need it most.

- By using solid research we can get the best ideas to kids who will fail without them. For example, an experiment might involve teaching two groups of children to read using different methods and compare the results to see which method is most successful. Some children will learn to read with a variety of methods. Children having problems learning to read need the most effective methods.
- Effective teaching and curricula can challenge children and interest them in learning—preventing problems of violence, hyperactivity and misidentification of learning disabilities.

Thanks to scientific research, we know better ways to teach our children to read. We can do the same in other areas. *No Child Left Behind* will bring solid, research-based programs to schools throughout the nation.

To find out more about what *No Child Left Behind* means for you and your child, please visit:
www.NoChildLeftBehind.gov or call **1-800-USA-LEARN**

"The Facts About Investing In What Works" is available in the "Proven Methods" section on the NCLB Website at www.nclb.gov.

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Carnegie Learning's Cognitive Tutor

- Scientific Method—Cognitive Tutor Hypothesis: A detailed model of student thinking can drive effective instruction in a personalized, tutorial format.
- Replicated—More than 50 peer-reviewed studies on Cognitive Tutors have been published.
- Generalized—Multiple control-group evaluations of full Cognitive Tutor courses have been conducted with urban, suburban, and rural students of all ethnicities.
- Meets Rigorous Standards—Cognitive Tutor studies has been published in peer-reviewed journals and publications by the National Academy of Science.
- Convergent Findings—The effectiveness of Cognitive Tutor products has been shown on state exams, standardized tests, performance assessments, attendance and other measures.

Research has shown that students using the Cognitive Tutor:

- Perform 30% better on questions from the TIMSS assessment
- Demonstrate an 85% better performance on assessments of complex mathematical problem solving and thinking
- Have a 70% greater likelihood of completing subsequent Geometry and Algebra II courses
- Achieve 15-25% better scores on the SAT and Iowa Algebra Aptitude Test
- Experience equivalent results for minority and non-minority students

A recent random-assignment study showed significant advantages for students using the Cognitive Tutor over a traditional curriculum, even when both groups of students had the same teacher.

For more information about the Cognitive Tutor, log on to our Web site at www.carnegielearning.com, or contact us at:

Carnegie Learning

Telephone: (888) 851-7094 (select option for Educational Sales)
E-Mail: edsales@carnegielearning.com
1200 Penn Avenue, Suite 150, Pittsburgh, PA 15222

All of the Cognitive Tutor mathematics curricula from Carnegie Learning are based on extensive scientific research from Carnegie Mellon University, along with field tests in schools throughout the United States. The Cognitive Tutors are based on the ACT-R theory of learning, memory and performance (Anderson, 1993; Anderson & Lebiere, 1998) that has been validated by hundreds of lab and field studies (e.g., Blessing & Anderson, 1996; Lee & Anderson, 2001; Lovett & Anderson, 1994). The Tutors themselves were developed using a rigorous empirical testing process resulting in over 50 publications validating the effectiveness of cognitive modeling (e.g., Aleven & Koedinger, 2002; Anderson, Corbett, Koedinger & Pelletier, 1995; Corbett, McLaughlin, & Scarpinatto, 2000; Corbett, Trask, Scarpinatto & Hadley, 1998; Koedinger, Anderson, Hadley & Mark, 1997).

Sample References:

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