

Research References

Study	Miami-Dade County Charter HS
Study Design	Analysis compared the performance of these charter schools on the FCAT to Miami-Dade County district statistics
Scope	Five schools; Algebra I, Geometry, Carnegie Learning Math Prep for FCAT
% Gain Achieved	71, 74, and 85.5% of students made FCAT gain
Overall Impact of Study	The results clearly trend toward demonstrating significant learning gains, especially once the teachers have had ample time and experience to capitalize on the pedagogical advantages of the CL Blended Math Solutions: collaborative learning in the classroom, and individualized instruction in the Cognitive Tutor software.

Study	Moore Independent School District
Study Design	Random assignment, within-teacher. Measured performance on the ETS Algebra End-of-Course Standardized Exam, teacher report/course grade, and attitude survey
Scope	Five schools; Algebra I
% Gain Achieved	3.3% more CT students than traditional students passed their Algebra I class; 2.3% more CT students received "A"s
Overall Impact of Study	Results on all measures favor Cognitive Tutor students. The fact that these results were obtained in a true experimental context eliminates many bias explanations that might be used against a correlational or quasi-experimental design. The results were not only scientifically significant, but substantial (ranging from about 0.18 to 0.3). Results were consistent across ethnic groups, and follow-up surveys showed enthusiasm on behalf of both teachers and students.

Study	El Paso Independent School District
Study Design	Comparison group. Measured performance on the Texas End-of-Course Standardized Exam
Scope	Algebra I
% Gain Achieved	The mean proportion of students who passed the exam was 0.39 for Cognitive Tutor Students, as compared to 0.25 for traditional classroom students
Overall Impact of Study	Cognitive Tutor Algebra I was a great success in its first term of implementation. After only one semester with the Cognitive Tutor, students who had previously failed Algebra I performed notably better on the Texas End of Course exam for Algebra I than students who did not use the Tutor. Results were especially strong for Hispanic students. Teachers within the district were very encouraged by these results, and some began using the Tutor in the spring semester rather than waiting until the beginning of the next school year.

Study	Kent School District
Study Design	Regression discontinuity. Measured performance on the Achievement Levels Test (ALT)
Scope	7 junior high schools and 1 high school; Algebra I
% Gain Achieved	Averaged a gain of 12.3 points from pre to post test on ALT (as compared with 9.5 points for traditional students); knowledge gains for CT students were 31.4 points (as compared with 16.7 points for traditional students)
Overall Impact of Study	The results indicate that the Cognitive Tutor program produces gains for all students, but is particularly powerful for students who are struggling to learn English, and for students who are from low-income families. Dr. Plano concluded that the Cognitive Tutor Algebra I program “be made available to all type of learners with particular emphasis on lower-ability and ELL status students.” Based on these results, the researcher also recommended use of Cognitive Tutor Geometry as a second course.

Study	Miami-Dade County Public Schools
Study Design	Comparison group. Measured performance on the FCAT Exam, course grade, and surveys from teachers
Scope	10 high schools, Grade 9; Algebra I
% Gain Achieved	3.7% more CT students than conventional students passed the FCAT; 24.8% more CT ESE students than conventional ESE students passed the FCAT; 8.1% more CT LEP students than CT conventional students passed the FCAT
Overall Impact of Study	Given the impressive results of the study, the Reliability Group recommended that “Cognitive Tutor should be mandatory for all Exceptional Education and LEP students,” and that the Cognitive Tutor Algebra I curriculum be made available to students at all Miami-Dade high schools.

Study	Milwaukee Public Schools
Study Design	Matched control group. Measured performance on the Math SAT, Problem Situations test, and Multiple Representations test
Scope	Two high schools; Algebra I
% Gain Achieved	Math SAT subset: CT students had a proportional score of .36 versus .29 for the control group; for the Problem Situation Test, CT students scored .63 versus .41 for the control group; for the Representations test, CT students scored .54 versus .38 for the control group
Overall Impact of Study	The results favor the Cognitive Tutor students over the control group on all measures. As would be expected, the differences are largest on the Problem Situation and Representations tests, since those tests are better aligned with the Cognitive Tutor curriculum. The fact that Cognitive Tutor classes did at least as well on the Math SAT subset supports the applicability of Cognitive Tutor course’s instruction to the more basic skills covered on those tests.

Study	CLI Study: Summary Research Results
Study Design	N/A
Scope	Cites research conducted in Pittsburgh and Milwaukee schools; Algebra I, Geometry, Algebra II
% Gain Achieved	CT students performed 85% better than traditional students in Algebra I assessments of complex problem solving and thinking; CT students performed 14% better on standardized assessments; CT students who completed the three-course sequence performed 30% better on the TIMSS assessment and 227% better on real-world problem solving assessments; CT students were 69% more likely to pass traditional Geometry and 71% more likely to pass Algebra II
Overall Impact of Study	The studies described in this paper confirm the significant advantages that Cognitive Tutor curricula offer over more traditional approaches to mathematics instruction. Students in Cognitive Tutor classrooms perform better on both applied and traditional assessments, and they succeed when placed in subsequent traditional mathematics courses. Benefits were significant to students of all races and backgrounds, and the advantages of the Cognitive Tutor approach appear in study after study.

Study	CLI Study: Applying Cognitive Science to Education
Study Design	Explored the theoretical basis for Cognitive Tutor, specifically Anderson's ACT-R theory of human cognition
Scope	Cites research conducted in several other studies, including Moore ISD, Miami-Dade County, Pittsburgh, Milwaukee, and Kent
% Gain Achieved	Cites performance gains gathered from all studies cited
Overall Impact of Study	Careful research into how people learn and the embodiment of sound educational principles into a Cognitive Tutor have proven to dramatically improve student learning. Our development processes have emphasized constructing tasks that make the connection between conceptual and procedural knowledge. Students are encouraged to actively engage with the mathematics, so that they can strengthen their skills and apply them in different contexts. Cognitive modeling has proven to be a powerful technique for discovering the skill's underlying tasks, monitoring individual student mastery of these skills, and customizing curriculum so that each student gets the right amount of practice on each of the skills.

Study	Everett Public Schools
Study Design	N/A; Overview and description of implementation initiative
Scope	Bridge to Algebra, Algebra I, Geometry, Algebra II
% Gain Achieved	N/A
Overall Impact of Study	N/A

Study	CLI/Moore ISD collaborative study: An Experimental Study of the Effects of CT Algebra I on Student Knowledge and Attitude
Study Design	See the Moore ISD study listed above
Scope	Five schools; Algebra I
% Gain Achieved	Elaboration on results found in Moore ISD study listed above
Overall Impact of Study	The results presented here are unequivocal. Students using the Cognitive Tutor curriculum outscore students using the traditional curriculum on the ETS Algebra end-of-course assessment and on their course grades. These results are consistent across teachers and across schools, and the advantage for the Cognitive Tutor holds for students of both sexes and all ethnicities represented in the data.

Study	CLI Study: Successful Application of Cognitive Science
Study Design	Discussed effectiveness of the theoretical base of the Cognitive Tutor, as well as an in-depth look at some of its features
Scope	N/A
% Gain Achieved	N/A
Overall Impact of Study	Cognitive Tutor technology represents cognitive science's best effort to capture the effectiveness of a human tutor. In 1999, Carnegie Learning's Cognitive Tutor Algebra I received the distinction of exemplary status from the U.S. Department of Education. The CT programs are a valuable addition to the classroom as component teaching assistants--charting a path toward measurable skill sets, monitoring progress, and providing the first line of help. Teachers have an opportunity to concentrate on individuals who need their unique attention. The result is a successful learning experience and a well-supported teacher.

Study	Iowa Area Education Agencies
Study Design	N/A (Not a study so much as an overview)
Scope	Algebra I, Geometry
% Gain Achieved	Gain scores in Algebra I of 11-36% when implemented with fidelity; 24-30% when implemented with fidelity for Geometry
Overall Impact of Study	A comparison of low SES, minority, and IEP students in high and low implementation and control groups seems to show that using the Cognitive Tutor Algebra I curriculum benefits these students.