

# Kent School District

## Cognitive Tutor Research Report WA-04-01



### Quick Facts

Urban Public School District, located in Kent, Washington

7 junior high schools and 1 high school

27,000 total students enrolled  
ELL Students: 11%  
FRL Students: 32%  
SPED Students: 15%

779 total students studied

2002-2003 school year

### Study Design

Regression Discontinuity

### Measures

Standardized Exam: ALT

### Study Conducted by

Dr. Gary Plano, Kent School District and Seton Hall University

### Ethnic Breakdown of School

White: 64.9%  
Native American: 1.2%  
Black: 10.4%  
Asian: 15.4%  
Hispanic: 8.1%

This report summarizes data on the use of Cognitive Tutor Algebra I in the Kent, Washington Public Schools during the 2002-03 school year. Dr. Gary Plano of Seton Hall University conducted an independent study examining the effectiveness of Cognitive Tutor versus conventional curricula. The study compared pre- to post-test gains for all ninth-grade students in the district. Students were assigned to a curriculum based on their eighth grade mathematics grade. Students who received lower than a C were assigned to the Cognitive Tutor course, while students receiving better than a C were assigned to the traditional course.

The knowledge gains by Cognitive Tutor students were significantly greater than the gains by students in the conventional curriculum. This difference was particularly pronounced for students classified as English Language Learners (ELL) and for low-income students. Based on these results, the researcher concluded that the Cognitive Tutor program should be made available to all students, and that low-income, ELL, and poor-performing students should be placed directly into the Cognitive Tutor curriculum.

### Participants

Study participants were 779 ninth-grade students in 7 junior high schools and one K-12 school in the Kent, WA School District (a total of 69 classrooms). Thirty-three classrooms consisting of 389 students used the CT Algebra curriculum, including 230 males and 159 females. Thirty-six classrooms consisting of 390 students used a conventional algebra text curriculum, including 150 males and 240 females.

### Method

Students were assigned to the treatment or comparison group based on their course grades in 8th grade mathematics. All students who received a grade of C- or lower were assigned to the Cognitive Tutor course, and all students who received a grade of C+ or higher were assigned to the standard algebra text group. Students who had received a grade of C were permitted to self-select into one group or the other. Due to misassignment of students to curricula, 248 students were excluded from the analysis.

This assignment of students through a "cut-off" score is called a "regression discontinuity" design, and it results in a very strong test of the effectiveness of Cognitive Tutor (see Shadish, Cook and Campbell, 2002). Generally, we would expect students that received poor grades in 8th grade math to be slower learners, less likely to attend school, and less motivated to do well. Poorer students are usually expected to learn less over the course of a year. This would result in smaller improvements for students placed in the Cognitive Tutor Algebra I course, versus the students who were placed in the comparison math classes. The regression discontinuity design tests whether Cognitive Tutor students learn more than they would be expected to, if they had used the traditional curriculum.

The Achievement Levels Test developed by the Northwest Evaluation Association was used as both pre- and post-test to measure the improvements in learning for each of the groups (see <http://www.nwea.org>).

*Cognitive Tutor students learned significantly more than students in the traditional Algebra I curriculum.*

## Results

Cognitive Tutor students learned significantly more than students in the traditional Algebra I curriculum, averaging a gain of 12.3 points from pre to post test on the ALT, versus a gain of only 9.5 points for students in the comparison group ( $p < .05$ ; see Figure 1). The Cognitive Tutor advantage holds for most subgroups as well, and is especially strong for ELL and low-income students.

Figure 2 demonstrates that the knowledge gains made by ELL students with the Cognitive Tutor (31.4 points,  $N=36$ ) were significantly greater than those of ELL students in the traditional curriculum (gain of 16.7 points,  $N=11$ ;  $p < .001$ ). Students qualifying for free or reduced lunch (FRL) programs demonstrate strong benefits as well, with the Cognitive Tutor students seeing gains of 18.69 points ( $N=124$ ) and the traditional students gaining only 13.85 points ( $N=68$ ) ( $p < .001$ ; see Figure 3).

The Cognitive Tutor advantage also holds for both males and females, and for White, Asian, and Hispanic students. The results for Black students indicate a Cognitive Tutor advantage, but it is not statistically significant.

## Conclusion

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.

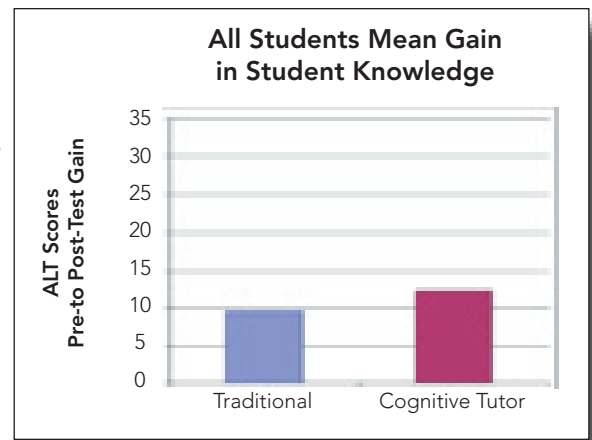


Figure 1

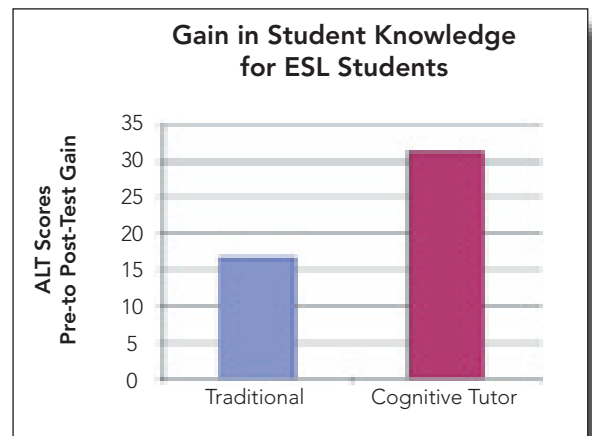


Figure 2

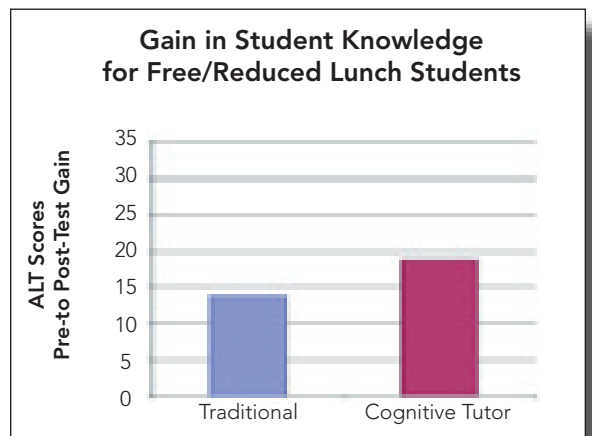


Figure 3

Reference:  
Shadish, W. R., Cook, T. D. and Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin Company.

This report is based, in part on Plano, G. S. (2004). *The Effects of the Cognitive Tutor Algebra on student attitudes and achievement in a 9th grade Algebra course*. Unpublished doctoral dissertation, Seton Hall University. For more information about research on the Cognitive Tutor products, please go to <http://www.carnegielearning.com/results/reports> or email [results@carnegielearning.com](mailto:results@carnegielearning.com).

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