

# Accelerated Maths Software and AM Best Practices

## Key Scientifically Based Research Summary

Accelerated Maths software makes the essential student practice component of any maths curriculum more effective. This practice time is personalised to each student's individual level to ensure a high rate of success and immediately followed by feedback to help educators target instruction. Personalised maths practice includes closely monitoring student progress and intervening with appropriate instruction when necessary.

Accelerated Maths software and AM Best Practices have been shown by scientifically based research to be effective in helping educators dramatically accelerate maths growth in US K–12 classrooms (equivalent to UK years 1–13).<sup>\*</sup> Numerous studies by independent researchers demonstrate that students' maths abilities improve with the use of these tools, and that the performance gap between various subgroups of students is substantially reduced. And Accelerated Maths was the first progress-monitoring tool reviewed by the **National Center on Response to Intervention** to be categorised as a mastery measurement tool ([www.rti4success.org](http://www.rti4success.org)) and has received highest ratings in that category.

The large evidence base supporting Accelerated Maths consists of a number of experimental and quasi-experimental research studies—generally considered by the research community to provide the strongest evidence of effectiveness and to be consistent with the definition of scientifically based research—and includes articles that have been published in peer-reviewed journals. Key studies that support Accelerated Maths are summarised on these pages.

To access more than 90 additional research pieces on Accelerated Maths, visit Renaissance Learning's research website: <http://research.renlearn.com/> or call +44(0)20 7184 4000.

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<sup>\*</sup> Throughout these summaries, "grades" refers to US school grades, which are 1 lower than the equivalent UK school years. Grade 3 = Year 4, Grade 4 = Year 5, etc.

# Large-Scale Study Reveals Impact of Accelerated Maths on Grades 3–10 and Subgroups

## About the Authors

**Jim Ysseldyke, Ph.D., NCSP**, is Emma Birkmaier Professor of School Psychology in the Department of Educational Psychology at the University of Minnesota. He specialises in research and development focused on enhancement of student competence and building the capacity of systems to meet students' needs.

**Steven Tardrew** was formerly director of research and evaluation for Renaissance Learning, Inc.

Ysseldyke, J., & Tardrew, S. (2007). Use of a progress monitoring system to enable teachers to differentiate math instruction. *Journal of Applied School Psychology, 24*(1), 1–28.

Ysseldyke, J., & Tardrew, S. (2003). *Differentiating math instruction: A large-scale study of Accelerated Math* (Final Report). Wisconsin Rapids, WI: Renaissance Learning.

## Details

Location: 24 U.S. states

Design: Independent, quasi-experimental, peer-reviewed

Sample: 2,202 students in US grades 3–10 at 47 schools

Measure: STAR Maths

Duration: 1 semester

## Results

Students in Accelerated Maths classes gained 7 to 18 percentiles more than comparison students. In every US grade and subgroup identified, such as eligibility for Title I\* and free or reduced-meal programs, students in Accelerated Maths classes performed better than students in classes not using the software.

Additionally, students who more closely followed AM Best Practices by scoring greater than 85% correct and completing more objectives, gained even more than students who did not.

Accelerated Maths educators reported qualitative improvements in their classrooms as well—teachers spent more time providing individual instruction, students spent more time academically engaged, and students enjoyed maths more and took responsibility for their work. Eighty percent of Accelerated Maths educators stated that students were learning basic maths skills better.

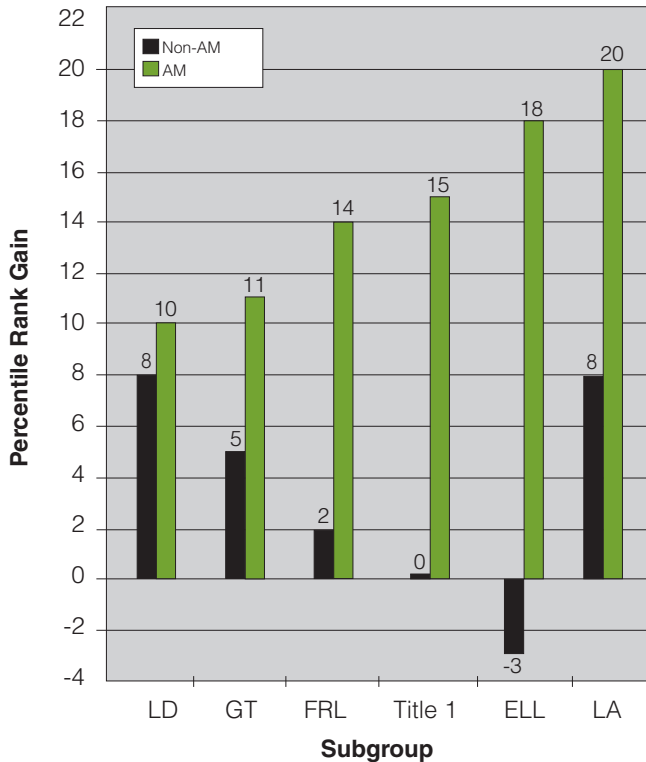
## For more information

Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)

Report (L1645): <http://doc.renlearn.com/KMNet/R001288803GBE8AC.pdf>

\* Title 1 is designed to help students served by the program to achieve proficiency on challenging State academic achievement standards. Title I schools with percentages of low income students of at least 40 per cent may use Title I funds, along with other Federal, State and local funds, to operate a "schoolwide program" to upgrade the instructional program for the whole school. <http://www2.ed.gov/programs/titleiparta/index.html>

**Maths Achievement Gains by Subgroup**



**LD** = Learning Disabled or Special Educational Needs  
**GT** = Gifted and Talented  
**FRL** = Free/Reduced Meals  
**Title 1** = Students in Title 1 Programs  
**ELL** = English Language Learners\*  
**LA** = Low Achievers  
 \* Equivalent to English as an Additional Language (EAL)

## Juniors at Arizona High School Pass the AIMS After Accelerated Maths Intervention

Springer, R. M., Pugalee, D., & Algozzine, B. (2007). Improving mathematics skills of high school students. *Clearing House*, 81(1), 37–44.

### Details

Location: Arizona  
 Design: Independent, experimental, peer-reviewed  
 Sample: 28 students in US grade 11  
 Measure: Arizona Instrument to Measure Standards (AIMS)  
 Duration: 1 year

### Results

High school juniors who failed the AIMS in US 10th grade were randomly assigned to 2 groups. The experimental group enrolled in a course designed to aid in passing the AIMS test, which used Accelerated Maths. The control group participated in normal US 11th-grade curriculum without extra assistance.

More than half the students in the Accelerated Maths class passed the AIMS test. And, all students in the Accelerated Maths classroom demonstrated positive gains on the AIMS test.

### For more information

Summary: <http://doc.renlearn.com/KMNet/R003475520GEEA02.pdf>  
 Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)

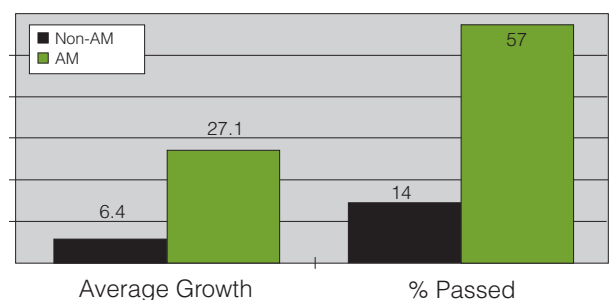
### About the Authors

**Robert M. Springer, Ph.D.**, is the vice president of education for SaddleBrooke Community Outreach. He directs a maths and reading tutoring program with about 150 tutors at seven schools ranging from 3rd grade to high school.

**David Pugalee, Ph.D.**, is an associate professor in the Department of Middle, Secondary, and K–12 Education, and a research associate for the Center for Mathematics, Science and Technology Education at the University of North Carolina at Charlotte.

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### AM Students Perform Better on AIMS Test



## Accelerated Maths With AM Best Practices Is Key to More Growth

Ysseldyke, J., & Bolt, D. (2007). Effect of technology-enhanced continuous progress monitoring on math achievement. *School Psychology Review*, 36(3), 453–467.

### Details

Location: 8 schools in AL, FL, MI, MS, NC, SC, and TX  
 Design: Independent, experimental, peer-reviewed  
 Sample: 1,880 lower- and middle-year students  
 Measures: STAR Maths, TerraNova  
 Duration: 1 school year

### Results

In selecting the sample for this study, an attempt was made to represent at least 3 different states, historically disadvantaged groups, and schools receiving Title I funding. Classrooms were randomly assigned to experimental (using Accelerated Maths with existing curriculum) and control (using only existing curriculum) groups. Students were pre- and posttested using STAR Maths and TerraNova. Analysis of first-year data shows there were big differences in how teachers implemented Accelerated Maths—some students spent much time using Accelerated Maths, while others spent little time, and still others spent virtually no time. The key finding: When Accelerated Maths is implemented as intended, students gain significantly more than students with limited or no implementation.

### For more information

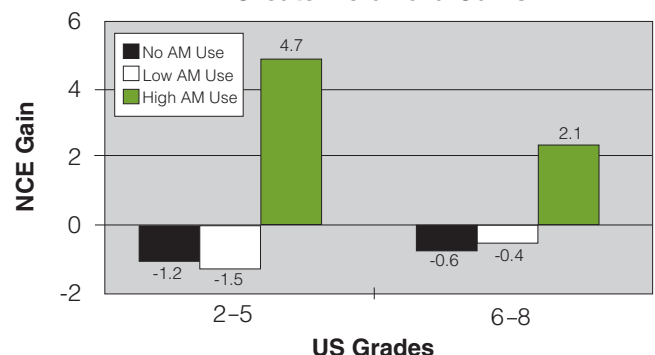
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 Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)

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**Daniel Bolt, Ph.D.**, is an associate professor of educational psychology at the University of Wisconsin–Madison, where he specialises in quantitative methods.

### High AM Implementation Leads to Greater TeraNova Gains



## Schoolwide Accelerated Maths Implementation Benefits Georgia Students

Holmes, C. T., Brown, C. L., & Algozzine, B. (2006). Promoting academic success for all students. *Academic Exchange Quarterly*, 10(3), 141–147.

Holmes, C. T., & Brown, C. L. (2003). *A controlled evaluation of a total school improvement process*, *School Renaissance* (Tech. Rep.). Athens: University of Georgia, Department of Educational Administration.

### About the Authors

**C. Thomas Holmes, Ed.D.**, is a professor of educational leadership in the Department of Workforce Education, Leadership and Social Foundations at the University of Georgia.

**Carvin L. Brown, Ed.D.**, is professor emeritus at the University of Georgia and executive director of the Georgia Accrediting Commission.

**Bob Algozzine, Ph.D.**, is a professor in the Department of Educational Leadership and director of the Behavior and Reading Improvement Center at the University of North Carolina at Charlotte.

### Details

Location: Central and Northern Georgia

Design: Independent, quasi-experimental, peer-reviewed

Sample: 2,287 students at 4 lower-year schools

Measures: STAR Maths, STAR Reading, Georgia

Criterion-Referenced Competency Test (CRCT)

Duration: 3 years

### Results

Of the 4 Title I schools in the sample, 2 were located in urban areas and 2 were located in rural areas. One school in each area was either a high or low implementer of Accelerated Maths and Accelerated Reader. Results from the CRCT indicated that students in the 2 high-implementing schools outperformed students in the 2 low-implementing comparison schools overall (effect size,  $ES = 0.65$ ) and in maths ( $ES = 0.75$ ), reading ( $ES = 0.50$ ) and language arts ( $ES = 0.71$ ). Researcher observations confirmed that the 2 high-implementation schools engaged in AM/AR Best Practices more often than the 2 low-implementation schools.

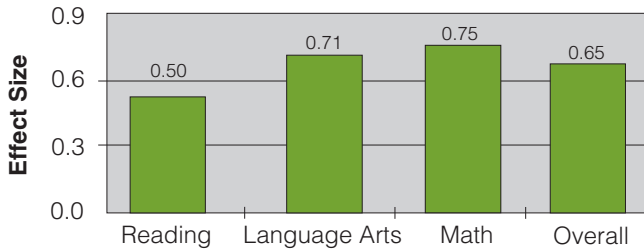
### For more information

Summary: <http://doc.renlearn.com/KMNet/R003878819GG9143.pdf>

Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)

Report: <http://www.eric.ed.gov/PDFS/ED474261.pdf>

**High AM Implementers Outperform Low on CRCT**



## Title I Students See Improvement in Test Scores After Using Accelerated Maths

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**Joseph Betts, MMIS, Ph.D.**, is a school psychologist and measurement statistician. His research interests include latent variable modeling and utilising technology in the classroom to improve student learning.

Ysseldyke, J., Betts, J., Thill, T., & Hannigan, E. (2004). Use of an instructional management system to improve mathematics skills for students in Title I programs. *Preventing School Failure*, 48(4), 10–14.

### Details

Location: 24 U.S. states

Design: Independent, quasi-experimental, peer-reviewed

Sample: 870 students in US grades 3–6 at 47 schools

Measure: STAR Maths

Duration: 1 semester

### Results

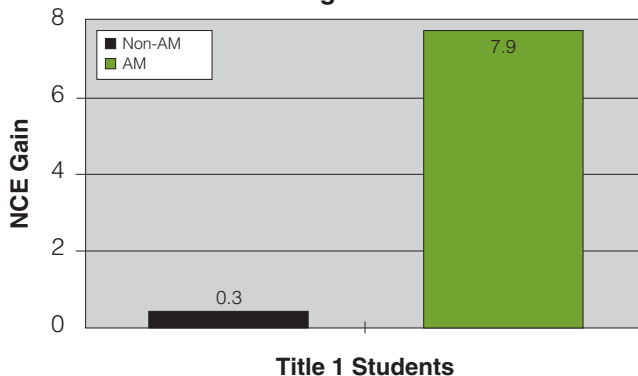
The students in this study were a subset of students who participated in a large national experiment by Ysseldyke and Tardrew, 2003 (see p. 2). A two-group pretest/posttest comparison was used to evaluate the hypothesis that students in a Title I program whose teachers used Accelerated Maths would show greater gains in mathematics achievement than similar students in a Title I program who received no intervention other than their regular maths instruction. Results show that students using Accelerated Maths significantly outperformed the comparison group with an average gain of 7.9 normal curve equivalents (NCEs) compared to an average gain of 0.3 NCEs for students not using Accelerated Maths—a difference in gain of 7.6 NCEs. Thus, evidence was found to support the claim that Accelerated Maths can improve the maths achievement of Title I students.

### For more information

Summary (L2235): <http://doc.renlearn.com/KMNet/R003544112GE9A10.pdf>

Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)

**Title I Students Using AM Achieve More Growth**



## Gifted and Talented Students Score Even Higher After Accelerated Maths Practice

Ysseldyke, J., Tardrew, S., Betts, J., Thill, T., & Hannigan, E. (2004). Use of an instructional management system to enhance math instruction of gifted and talented students. *Journal for the Education of the Gifted*, 27(4), 293–310.

### Details

Location: 24 U.S. states

Design: Independent, quasi-experimental, peer-reviewed

Sample: 843 students in US grades 3–6 (100 were GT students) at 47 schools

Measure: STAR Maths

Duration: 1 semester

### Results

The students who participated in this study were a subset of students who participated in a large national experiment by Ysseldyke and Tardrew, 2003 (see p. 2). All students in Accelerated Maths classrooms experienced greater gains in achievement than their counterparts in comparison classrooms. Specifically, Gifted and Talented (GT) students in Accelerated Maths classrooms advanced significantly more than GT students in comparison classrooms. The mean normal curve equivalent (NCE) gain for the experimental classrooms was 11.9 NCEs, and the mean NCE gain for the control classrooms was 4.8, a difference of 7.1 NCEs. In addition, GT students using Accelerated Maths made higher gains, obtained a higher percent correct on practice and test items, attempted more tests and mastered more objectives than non-GT students using Accelerated Maths.

### For more information

Summary (L2256): <http://doc.renlearn.com/KMNet/R003557125GFD88E.pdf>

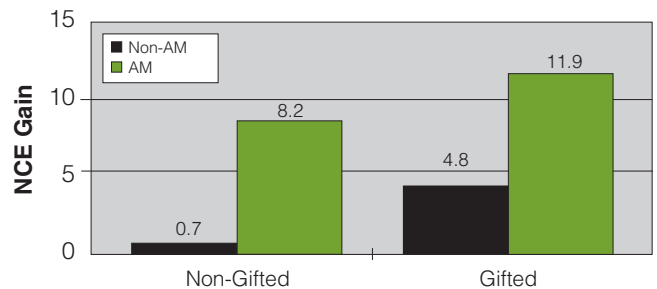
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**Steven Tardrew** was formerly director of research and evaluation for Renaissance Learning, Inc.

### GT Students Make Greater Gains with AM



## Highly Engaged Accelerated Maths Students Excel in Southwest

Brem, S. K. (2003). *AM users outperform controls when exposure and quality of interaction are high: A two-year study of the effects of Accelerated Math on math performance in a Title I elementary school*. Tempe: Arizona State University.

### Details

Location: Southwestern school

Design: Independent, quasi-experimental

Sample: 478 students in US grades 3, 5 and 6

Measures: STAR Maths, Stanford Achievement Test (SAT-9)

Duration: 2 years

### Results

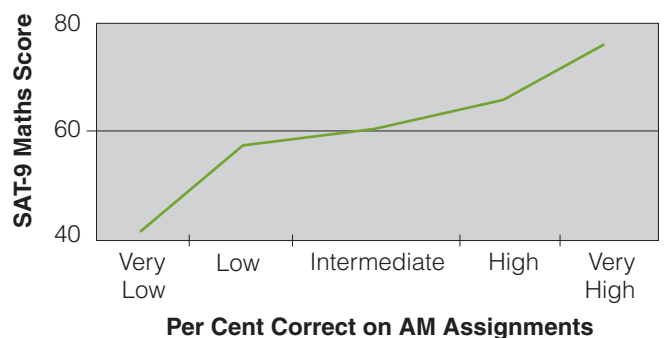
In this longitudinal study at an urban, Title I school, students with a high level of engagement with Accelerated Maths, as measured both by number of problems attempted and average percent correct, gained significantly more on the maths portion of the SAT-9 than students with lower levels of engagement or no exposure. The study results highlight the importance of teacher training in interpreting and using the data provided by Accelerated Maths to guide personalised instruction for all students.

### For more information

Report: <http://doc.renlearn.com/KMNet/R004079426GJ598A.pdf>

### About the Author

**Sarah Brem, Ph.D.**, a cognitive scientist, is an associate professor in the Division of Psychology in Education at Arizona State University.





## Accelerated Maths Helps Minnesota Students Surpass District on NALT

### About the Authors

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**Richard Spicuzza, Ph.D.**, is director of research, evaluation and assessment in the South Washington Public Schools System, and holds graduate teaching status at the University of Minnesota.

Ysseldyke, J., Spicuzza, R., Kosciolk, S., & Boys, C. (2003). Effects of a learning information system on mathematics achievement and classroom structure. *Journal of Educational Research*, 96(3), 163–173.

### Details

Location: Minneapolis, Minnesota

Design: Independent, quasi-experimental, peer-reviewed

Sample: 160 students in US grades 4 and 5 at 3 schools

Measures: STAR Maths, Northwest Achievement Levels Test (NALT)

Duration: 1 year

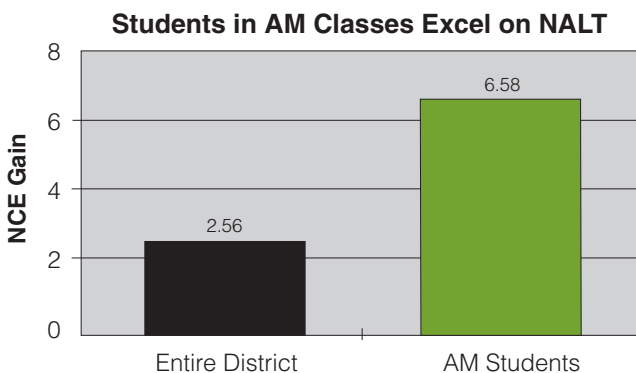
### Results

This quasi-experimental study examined the effects of Accelerated Maths on maths achievement and classroom behaviors known to be related to overall student achievement. Sixty-eight per cent of students participating in the study at these urban schools were eligible for free or reduced-price meals. Independent researchers assigned students to classes that used the school network curriculum, Everyday Maths, with Accelerated Maths and without. Students in Accelerated Maths classrooms excelled in mathematics achievement on STAR Maths and the NALT, including outperforming a school network sample on the NALT by 4.02 normal curve equivalents (NCEs).

### For more information

Summary (L2258): <http://doc.renlearn.com/KMNet/R003556912GE515F.pdf>

Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)



## Accelerated Maths Practice Allows Midwestern Students to Exceed National Norms

Ysseldyke, J., Spicuzza, R., Kosciolk, S., Teelucksingh, E., Boys, C., & Lemkuil, A. (2003). Using a curriculum-based instructional system to enhance math achievement in urban schools. *Journal of Education for Students Placed At Risk*, 8(2), 247–265.

### About the Authors

**Jim Ysseldyke, Ph.D., NCSP**, is Emma Birkmaier Professor of School Psychology in the Department of Educational Psychology at the University of Minnesota. He specialises in research and development focused on enhancement of student competence and building the capacity of systems to meet students' needs.

**Richard Spicuzza, Ph.D.**, is director of research, evaluation and assessment in the South Washington Public Schools System, and holds graduate teaching status at the University of Minnesota.

### Details

Location: Large Midwestern school district

Design: Independent, quasi-experimental, peer-reviewed

Sample: 881 students in US grades 3–5 at 4 schools

Measures: STAR Maths, Northwest Achievement Levels Test (NALT)

Duration: 1 year

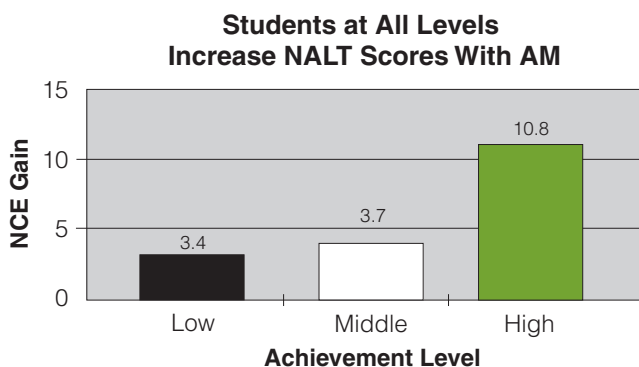
### Results

This study examined the effect of Accelerated Maths on overall student achievement in a large urban district composed of approximately 75% minority students and 67% free or reduced-price meal eligibility. Independent researchers assigned the students to use Accelerated Maths with their curriculum or to continue using only their regular curriculum. Researchers found that students at all achievement levels who used Accelerated Maths demonstrated accelerated rates of performance compared to national norms. Gains ranged from 3.4 to 10.8 NCEs on the NALT, and were similar on STAR Maths. Additionally, the study showed that high-, middle- and low-performing students surpassed national norms, after beginning below national norms before participating in the Accelerated Maths classroom.

### For more information

Summary: <http://doc.renlearn.com/KMNet/R003711127GF6B41.pdf>

Article: Available by request to [research@renlearn.com](mailto:research@renlearn.com)



## Kansas High School Students Realize Higher Scores With Accelerated Maths

Gaeddert, T. (2001). *Using Accelerated Math to enhance student achievement in high school mathematics courses: An action research project*. Unpublished master's thesis, Friends University, Wichita, Kansas.

### Details

Location: Buhler, Kansas  
 Design: Independent, quasi-experimental  
 Sample: 103 high school pre-algebra, algebra and geometry students  
 Measures: STAR Maths, Stanford Achievement Test (SAT-9)  
 Duration: 3.5 months

### Results

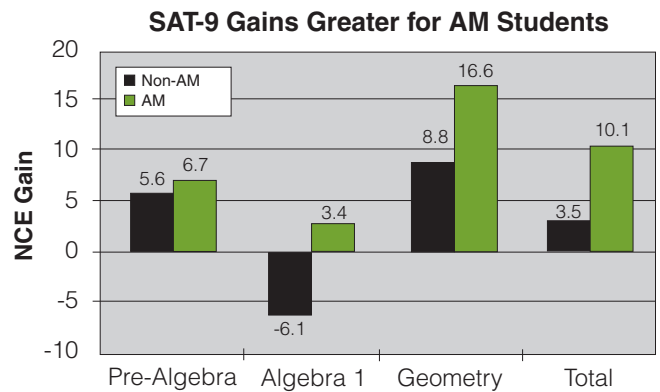
Students in the 3 Accelerated Maths classes experienced more improvement on the SAT-9 and STAR Maths test than students in control classes. The total control group showed an average gain of 3.5 normal curve equivalents (NCEs) while the total intervention group showed an average gain of 10.1 NCEs, an average gain of 6.6 NCEs more than the entire control group. Students also responded to attitudinal surveys at the beginning and end of the study. At the end of the study, students using Accelerated Maths showed more improvement in attitudes toward maths than students in the control classes. Surveys of parents with children in the intervention classes also indicated more positive attitudes toward maths than parents with children in the control classes.

### For more information

Summary: <http://doc.renlearn.com/KMNet/R001182407GD4B68.pdf>  
 Report: <http://www.eric.ed.gov/PDFS/ED463177.pdf>

### About the Author

**Terri Gaeddert** is an assistant professor of education at Sterling College in Kansas. In addition to 11 years of public school experience as a maths teacher and technology specialist, Gaeddert has written supplementary mathematics curriculum materials for the state of Kansas, including assisting in the development of an online, middle-level mathematics endorsement program.



## Midwestern Students at All Achievement Levels Make Greater Gains With Accelerated Maths

Spicuzza, R., Ysseldyke, J., Lemkuil, A., Kosciolk, S., Boys, C., & Teelucksingh, E. (2001). Effects of curriculum-based monitoring on classroom instruction and math achievement. *Journal of School Psychology, 39*(6), 521-542.

### Details

Location: Large Midwestern school network  
 Design: Independent, quasi-experimental, peer-reviewed  
 Sample: 198 students in US grades 4 and 5 at 4 schools  
 Measures: STAR Maths, Northwest Achievement Levels Test (NALT)  
 Duration: 4 months

### Results

The majority of students participating in the study at these urban schools were eligible for free or reduced-price meals. Accelerated Maths students at all achievement levels demonstrated more growth on STAR Maths and the NALT than students in non-Accelerated Maths classrooms. The STAR Maths adjusted mean for Accelerated Maths students was 42.96, while comparison students had an adjusted mean of only 31.45. On the NALT, the adjusted normal curve equivalent (NCE) mean for Accelerated Maths students was 51.25; for the comparison group it was 46.50. The same students also outperformed a district sample of students in non-Accelerated Maths classrooms.

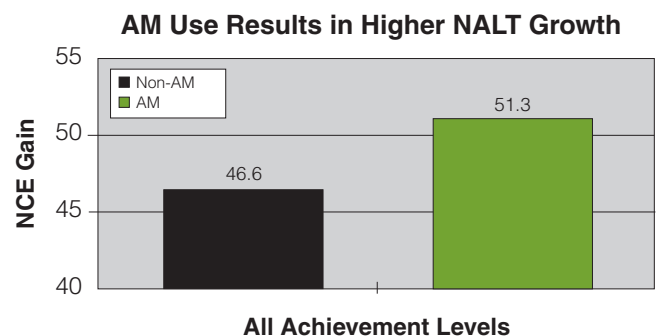
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Summary: <http://doc.renlearn.com/KMNet/R001181703GD4955.pdf>  
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# Accelerated Maths Equals Success for English Language Learners in Minnesota

Teelucksingh, E., Ysseldyke, J., Spicuzza, R., & Ginsburg-Block, M (2001). *Enhancing the learning of English language learners: Consultation and a curriculum based monitoring system.* Minneapolis: University of Minnesota, National Center for Educational Outcomes.

## Details

Location: Minneapolis, Minnesota  
Design: Independent, quasi-experimental  
Sample: 201 ELL students in US grades 4 and 5  
Measures: STAR Maths, Northwest Achievement Levels Test (NALT)  
Duration: 1 semester

## Results

At 4 urban schools, the maths performance of ELL students using Accelerated Maths with AM Best Practices was compared to a control group of students who did not receive the intervention. ELL students participating in classrooms using Accelerated Maths in conjunction with their maths curriculum gained 6.7 normal curve equivalents (NCEs) on the NALT compared to ELL students from the control group who gained 3.9 NCEs.

## For more information

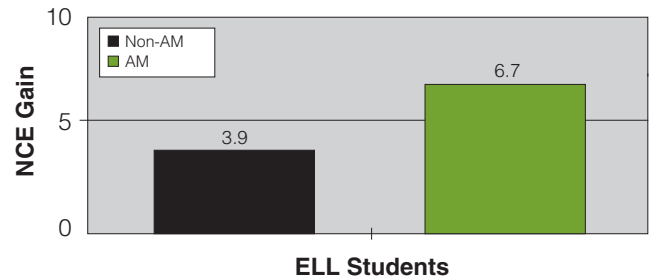
Report: <http://www.cehd.umn.edu/NCEO/onlinepubs/archive/AssessmentSeries/CBAreportELL.pdf>

## About the Authors

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**Jim Ysseldyke, Ph.D., NCSP**, is Emma Birkmaier Professor of School Psychology in the Department of Educational Psychology at the University of Minnesota. He specialises in research and development focused on enhancement of student competence and building the capacity of systems to meet students' needs.

**ELL Students Make Greater Strides on NALT With AM**



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