

# Proven by Research

## Differentiated Math Instruction for Your State, Your School, and Your Students!

Apangea Math's interactive, highly supportive environment offers a research-based and proven formula for developing mathematics and problem solving skills in students in grades 3–12, while simultaneously preparing them to succeed on their State Assessments.

Research demonstrates that Apangea Math:

1. Employs an innovative, differentiated, adaptive learning approach.
2. Raises math abilities and improves 21st Century Learning skills.
3. Predicts performance on State Assessments while helping schools make AYP.
4. Succeeds in a variety of implementation scenarios.

But, that's not all! Research further shows that Apangea Math inspires confidence in students, teachers, and administrators...a priceless benefit for struggling learners and those who are determined to see them succeed.



# 1. Apangea Math employs an innovative, differentiated, and adaptive learning approach.

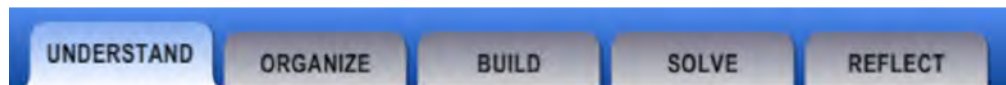
*“Apangea gives me opportunities to work with the kids individually and see what they are struggling with in terms of solving problems. They are engaged and so am I!”*

— Sandra Long,  
Eagle Middle School,  
Idaho

## Innovative Learning Model

Apangea Math is grounded in both theoretical and applied research about how students learn best. The program is based on the cognitive science principles of active problem solving and mastery learning to ensure that all students are reaching their potential and learning *how to learn*. Applied research, conducted over a 10 year period, involved nearly 30,000 students and demonstrated the efficacy of Apangea Math’s 5-step problem solving approach. This model provides a research-based method to improve the understanding of math concepts and increase test score performance. (See Figure 1 below.)

Figure 1: The 5-Step Problem Solving Model



Apangea Math’s tutorial model is based upon the largest body of cognitive tutoring research in the world, which was led by the US Air Force Research Laboratory with funding from the Air Force, National Science Foundation, and others. Overall, \$12M was invested to develop the cognitive tutorial process for math and problem solving skills used in Apangea Math.

*“I really value Apangea for its ability to differentiate my students’ learning so well. I teach many different ability levels in my class and my higher math students are always asking if they can work on Apangea. For my lower students, Apangea is a great re-teaching or introductory tool.”*

— Cami Rush,  
Morningside Elementary  
School, Idaho

## Differentiated Learning

Apangea Math incorporates the research-based principles of differentiated learning while helping teachers personalize their instruction. The customized learning pathways are a primary example. Teachers can review all Apangea Math content and select only those Units and Lessons they want each individual student or each class to work on. By doing so, learning is differentiated for students needing remediation, enrichment, test preparation, or who are using Apangea Math as Tier 2 or 3 intervention in an RTI model.

Additional examples of differentiated learning in Apangea Math include:

- Adjusting the difficulty level of the Problem Solver.
- Opting for use of the calculator based on student need.
- Providing auditory support for eight languages and offering closed captioning.
- Allowing students to choose their own Avatar as their personal learning coach.
- Controlling the speed of the Avatar’s speech.

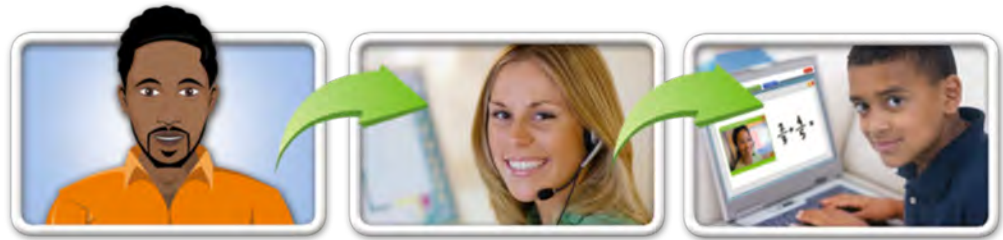
*“Our teachers are very positive about the system because it allows them to manage students who may be working at different levels.”*

— Don Martin,  
East Allegheny Assistant  
Principal, Pennsylvania

## Adaptive Technology

Apangea Math harnesses the power of adaptive technology to customize the learning experience. The most powerful example of this is the data-based adaptation of individual learning pathways and profiles that meet the specific needs of each student. These pathways are automatically altered based on students’ data, including their unique rate of progress and successful acquisition of skills, ensuring that all students absorb material more effectively. Furthermore, if students are struggling in certain areas while mastering others, teachers can easily modify the learning pathways to provide assistance where it’s most needed.

Figure 2: Adaptive Student Support



As students work through the learning pathways created for them, Apangea Math monitors their progress and analyzes when it’s appropriate to step in and provide additional support. This 3-level support system begins with system-generated corrective feedback from an Avatar learning coach, continues with real-time certified math tutors to provide more individualized assistance, and culminates, when necessary, in a live concept tutorial by turning the student’s screen into a two-way interactive white board. (See Figure 2.)

## 2. Apangea Math raises math abilities and improves 21st Century Learning skills.

Recent research demonstrates that Apangea Math effectively raises math abilities while simultaneously improving students’ ability to problem solve and think critically — important 21st Century Learning skills.

### Grand Prairie Independent School District, Texas 2008 Pilot Testing

**The Challenge:** All Texas 8th graders must pass the Texas Assessment of Knowledge and Skills (TAKS) to advance to the 9th grade. Bill Arnold Middle School proactively met this challenge by identifying a group of at-risk 8th graders who were likely to fail the TAKS in 2008. The previous year, only 3 of those 48 students (6.3%) had passed the 7th grade TAKS.

*“The problems in Apangea Learning Math are word problems, it’s a multi-step problem, and my students have to analyze the problem. They have to pull out the information. They have to set-up what it is that they need to answer. They have to come up with a strategy on how they are going to do it. They have to execute that strategy, and then they have to answer the question.”*

— Kenneth King,  
Bill Arnold Middle School,  
Texas

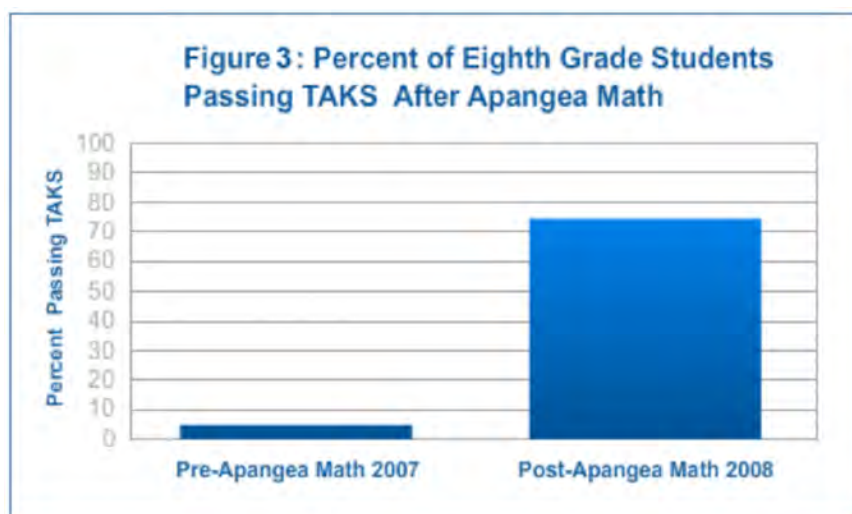
*“The success we are experiencing from Apangea is predicated on our decision to replace an elective with a second math class so students get a full class period to work on Apangea five times a week.”*

— Raymond Edmonds,  
Bill Arnold Middle School  
Principal, Texas

**The Solution:** With only 10 weeks until the 8th grade administration of the TAKS, Apangea Math replaced an elective as the second math class for these struggling students. Apangea Math successfully provided the intensive intervention they needed.

**The Result:** Seventy-three percent of these at-risk 8th grade students passed the TAKS after using Apangea Math for just 10 weeks. (See Figure 3.) In addition to improving TAKS scores, students did the following:

- Displayed greater confidence in their math and problem solving skills.
- Improved their understanding of complex math concepts.
- Were more willing to actively participate in class.
- Demonstrated increased motivation, as evidenced by many independent hours working on Apangea Math during nights and weekends.



**The Reward:** With the success of the pilot, the Math Department at Bill Arnold Middle School expanded the program for the 2008–2009 school year. Apangea Math was scheduled as a second math class and implemented with 120 at-risk students. Bill Arnold continued to see tremendous gains with Apangea. Of those 120 students, 91% achieved a passing score on the 8th grade TAKS, whereas only 20% had passed the previous year. That same year, the Bill Arnold Middle School achieved a rating of “Recognized” by the Texas Education Agency for the first time in history.

### 3. Apangea Math predicts performance on State Assessments while helping schools make AYP.

Apangea Math's innovative approach to math instruction has been proven to predict performance on State Assessments. First, Apangea customized the grade specific learning pathways by state standards. Second, Apangea developed the Practice Zone with multiple choice questions designed to mirror the student's State Assessment.

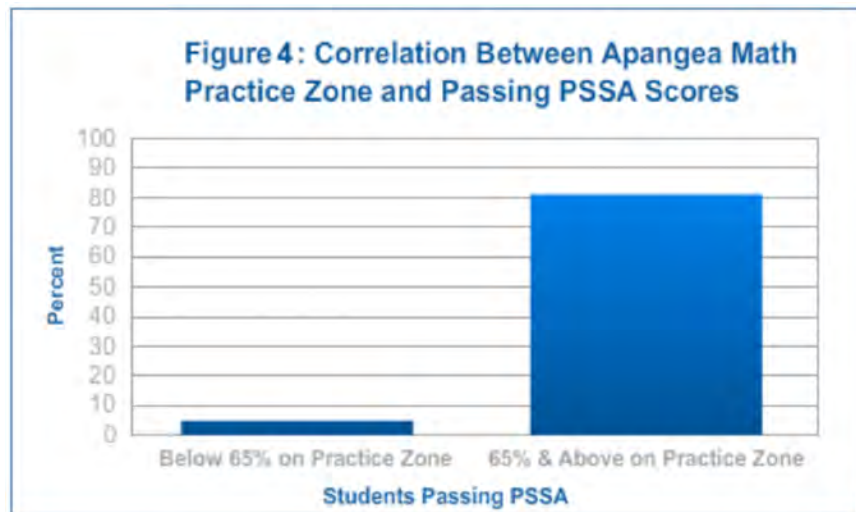
Recent research has shown a positive correlation between students who achieve a 65% or higher Practice Zone Score on the first attempt and students who pass their State Assessments. This correlation holds true when Apangea is used with high school, middle school, and elementary school students.

#### State Assessment Case Studies

**Hopewell High School:** Thirty-three students who scored below proficient on the Pennsylvania System of School Assessment (PSSA) as juniors, enrolled in an Apangea Math remediation class for the first nine weeks of their senior year. They used Apangea Math every day for 45 minutes with impressive results. Eighty-two percent of students who achieved a Practice Zone Score of 65% or higher passed the PSSA re-take in November of 2009. Conversely, none of the students scoring below 65% on their first attempt in the Practice Zone passed their State Assessment. (See Figure 4.)

*"I am truly amazed at the progress these kids are showing from using Apangea. Some of the lowest level kids in the school are actually solving problems that Algebra 2 students struggle with. I really think taking this Apangea approach was exactly what these kids needed. They absolutely get more out of it than they would if I taught the traditional way."*

— Erin Pander,  
Hopewell High School,  
Pennsylvania

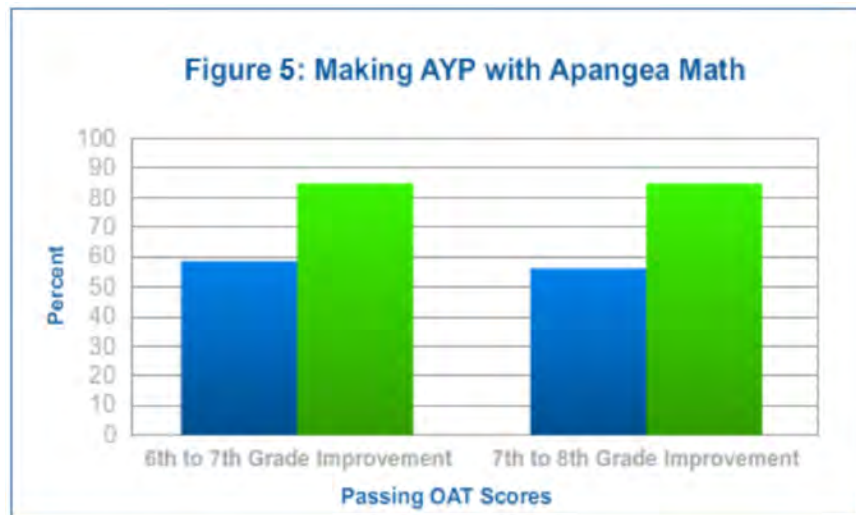


**Aliquippa Elementary School:** The Aliquippa Elementary School in Aliquippa, PA, experienced a similar positive correlation between the use of Apangea Math and the PSSA results of their 5th and 6th grade students. One hundred percent of their 5th and 6th graders who achieved a Practice Zone Score of 65% or higher on the first attempt scored *Advanced* on their PSSA in 2010. Apangea Math was highly successful at intervening early to support these students and get them on track for continued math success in the later grades.

**The message is clear:** Students who consistently use Apangea Math and achieve a 65% or higher in the Practice Zone have a greater than 80% likelihood of scoring Proficient on the all-important State Assessment.

### **Making Adequate Yearly Progress (AYP)**

**Cleveland Entrepreneurship Preparatory School:** Cleveland E Prep's challenge was to make AYP by increasing their passing scores on the Ohio Achievement Test (OAT). Students in 7th and 8th grade used Apangea Math every other school day for a full year with very promising results. The OAT passing rate for 7th graders increased from 59% at the end of 6th grade to 83% after using Apangea Math in 7th grade. Similarly, the OAT passing rate for 8th grade students increased from 58% at the end of 7th grade to 85%. (See Figure 5.)



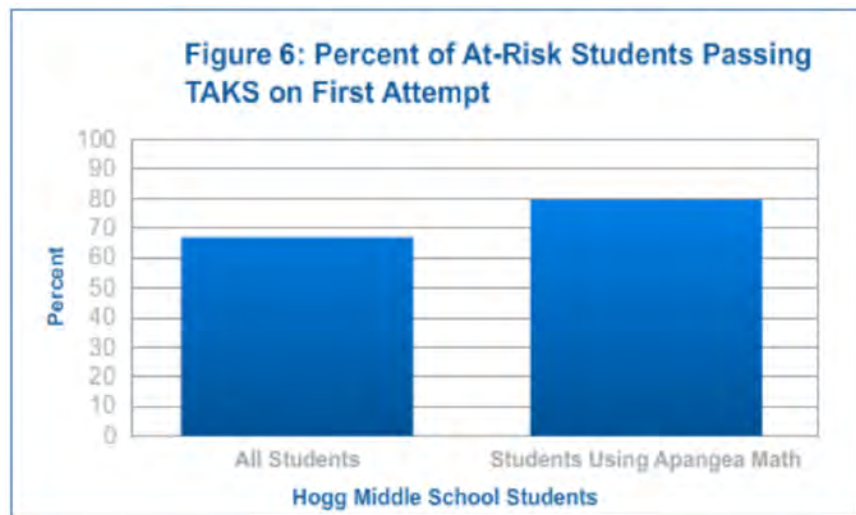
**Adequate Yearly Progress:** After implementing Apangea Math, Cleveland E Prep achieved AYP in Math for grades 6-8, with an overall OAT score increase of 30%.

## 4. Apangea Math succeeds in a variety of implementation scenarios.

One of Apangea Math's many strengths is its ability to be easily implemented in a variety of scenarios based on school needs and limitations. Research has proven that the program can be successfully implemented in a variety of settings to improve students' math and problem solving skills.

### Secondary Math Class

**Hogg Middle School:** During the 2007–2008 year, Hogg Middle School in Houston, TX identified a group of students who were determined to be at-risk for not passing the 8th grade Texas Assessment of Knowledge and Skills (TAKS). Their solution was to create an intensive, second math class to help these struggling students. Apangea Math was implemented for one month with 90 minute sessions two to three times per week. Due to Apangea Math's intervention, 81% of these at-risk students passed the TAKS on the first administration. In contrast, the passing rate for the school's general student population was only 67%. (See Figure 6.)



*"I think if you're a remedial kid, it's hard to get fired up about learning. Apangea Math fires them up. They're putting their fingers on the material. They're actually physically dragging down the goal and physically putting their finger on the variables and assigning the variables. It is immediate gratification for them and keeps them engaged."*

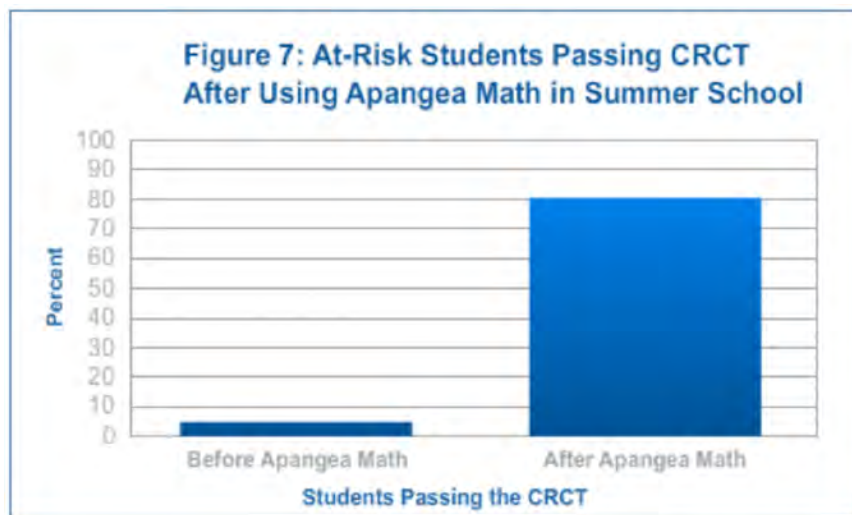
— Jamie Parker,  
Malcolm Bridge Middle  
School, Georgia

### Summer School

**Malcolm Bridge Middle School:** The Malcolm Bridge Middle School in Oconee County, GA identified a group of 8th grade students, including some with learning disabilities, who had failed the Georgia Criterion-Referenced Competency Test (CRCT). As a result, these students were at risk of not moving on to 9th grade. Their solution was to use Apangea Math as a core component of the required CRCT Summer School program. Apangea Math's learning pathways were specifically customized to meet Georgia state standards and to prepare these at-risk students for the 8th grade CRCT. With the use of Apangea Math during Summer School, 78% of these students passed the CRCT. (See Figure 7.)

*“For my lower students, Apangea is a great re-teaching or introductory tool for me to have them use so they can either relearn some things we have already done, or to give them a preview of some of the concepts we will be doing in the near future.”*

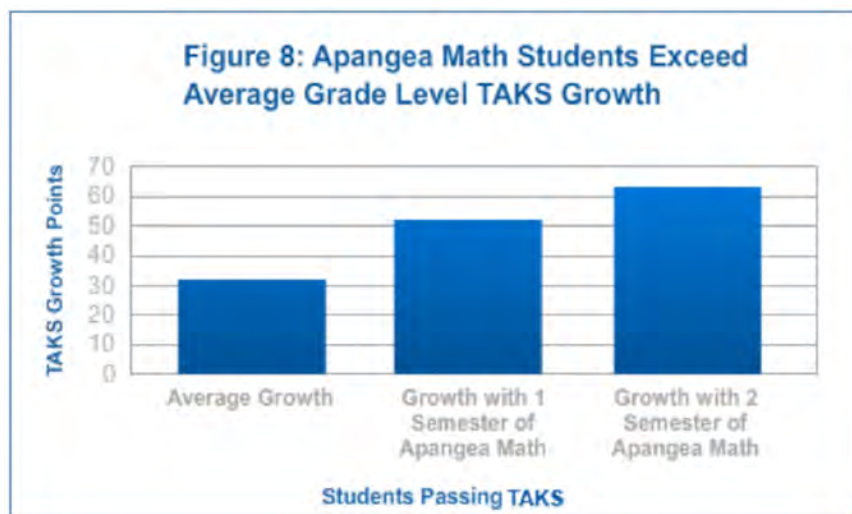
— Cami Rush,  
Morningside Elementary  
School, Idaho



The teachers at Malcolm Bridge Middle School also appreciated how Apangea Math’s unique problem solving approach prepared their students for the types of questions they would encounter on the Georgia State Test. According to one of the school’s math teachers, “Apangea Math is very clear. It’s step-by-step and it won’t let students skip those steps. I love the way that the students have to click on the words and drag them down to identify their variables or goal sentence, allowing them to find their own success along the way.”

### RTI: Tier 2 Intervention

**Garland ISD Middle School:** Based on prior assessment data, a group of Garland Middle School students were identified for Tier 2 intervention at the beginning of the 2009–2010 school year. These struggling students were enrolled in a daily “Math Lab” to provide the additional intervention needed to address their deficits. The majority of them used Apangea Math as part of their Tier 2 intervention with very promising results. These students exceeded the average grade level growth expectation on the Texas Assessment of Knowledge and Skills (TAKS). Average grade level growth on the TAKS is 32 points, whereas Apangea Math students averaged 53 points of growth with one semester of the program and 63 points with two semesters. (See Figure 8.)



*"The most exciting thing about Apangea is the true challenge it provides my gifted and advanced 4th and 5th graders. For many of these students, a challenge doesn't come along as often as it should. Apangea provides this for them."*

— Nicole Ingersoll,  
Middleton School District,  
Idaho

*"54% of our students who previously failed the state math assessment were able to pass after working with Apangea Math."*

~ Nate Carman,  
Assistant Superintendent,  
Pine Tree, Texas

Response to Intervention (RTI) programs are focused on rapid growth with the goal of helping students catch up to their peers' learning trajectory. There is strong evidence that Apangea Math is successful at doing just that as a Tier 2 intervention.

## Enrichment

**East Allegheny School District:** Initially, East Allegheny implemented Apangea Math as a remediation tool in its after school tutoring program. But, it didn't take long for high school administrators to realize that Apangea Math was highly flexible and could truly differentiate instruction to students with varying skill levels. They started using the program for enrichment as well, supporting the needs of their more advanced students. Students experienced dramatic improvements in math performance. Those students using Apangea Math improved two to three grade levels in just 8 months.

## Going Forward...

*"Currently, we are using Apangea as an intervention tool to ensure our students have the best opportunity possible to be successful. But, I look forward to the day we can begin using Apangea as a tool to move students from passing to the commended level."* — Kenneth King, Bill Arnold Middle School, Texas

## Summary

### Apangea Math: Proven Effective

Research examining the efficacy of Apangea Math continues to prove the program's effectiveness with students of a variety of ages, backgrounds, skill levels, and needs. This document highlights the findings of that research, demonstrating the effectiveness of Apangea Math, while simultaneously sharing the success stories of many schools, teachers, and students.

Apangea Math is meeting some of the most important educational challenges facing schools today by effectively raising math abilities, improving 21st Century Learning skills, preparing students for success on their State Assessments, and helping schools reach AYP.

Additionally, Apangea Math is proven effective in a wide variety of implementation scenarios, including:

- Secondary Math Classes
- Summer School
- RTI: Tier 2 Intervention
- Enrichment

This unique combination of proven effective instruction, flexible usage, and the ability to align with state and national requirements is resulting in significant positive results for students, including those most at-risk.