

Strategies That Work

Advancing Mathematics Achievement

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Blending MDC Strategies with Project-Based Learning in the Algebra Classroom



Adriane Duke is an Algebra I teacher at **Annie Camp Junior High School** in Jonesboro, Arkansas. She first learned about the [Mathematics Design Collaborative \(MDC\)](#) during an initial training, led by SREB math consultant Amanda Merritt, in May 2014. Duke's school had previously trained on project-based learning (PBL) through the Buck Institute for Education. Duke was excited about both initiatives and thought the two complemented each other, so she worked to incorporate them into her lesson plans. PBL and MDC became a major part of her classroom culture.

Duke, who works in a low-income school, implemented five formative assessment lessons (FALs) and multiple projects through the 2014-15 school year. Each lesson — whether a FAL or a project — focused on students' ability to perform the eight Standards for Mathematical Practice, especially to persevere at problem solving. "I think that FALs and projects both give students the opportunity to struggle and strive to persevere through the given task," Duke said. "Often, I'll teach the material, but students don't know how to apply those skills. The FALs and projects allow for that application."

Relating to the Real World

After one of her students, Josh, commented, "I don't have anything to relate this to," when speaking of quadratic functions, Duke adjusted her approach to that unit and searched for a project that would help her students understand how quadratic functions are relevant outside of school. She searched online and found a catapult project, which she adapted to meet the goals she had for her students.

Students were given rubber bands, popsicle sticks and plastic spoons to create a catapult to launch a minimarshmallow. Students were expected to create quadratic equations based on the data from the catapults (how far and how high the marshmallow would go when launched). They then adjusted the height of the catapult (off the ground) and adapted their equations to determine how far the marshmallows would go. Duke placed a paper plate in the appropriate spot determined by the students' equations, and students tried to hit the plate with the marshmallow.

Duke planned a lesson that engaged students in a rich task that gave students the opportunity to perform all eight of the Standards for Mathematical Practice. This task, including the student-led discussions and teacher questions, showed evidence that students learned how to model real-world situations with quadratic equations.

"When I visited her school, I loved going in her classroom," Merritt said. "Students were always engaged in doing mathematics, not just working problems on a worksheet. The investigations Ms. Duke plans for her students allow them to build their conceptual understanding of key concepts in Algebra I and apply that knowledge to real-world and non-routine problems.

The Southern Regional Education Board (SREB) provides middle grades and high schools in member states with intensive professional development in leading edge literacy and math strategies that enhance students' abilities to meet new college- and career-readiness standards. The training is offered at no cost to qualifying schools in member states except Florida, Kentucky and Tennessee.*

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Read on: Find out how your school and district will enhance students' creative thinking and problem-solving abilities while enhancing their skills to meet state standards and succeed in school and life.

This week: Arkansas algebra teacher Adriane Duke incorporates MDC along with project-based learning in her classroom.

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* Training fees negotiated separately for direct contract states.

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Significant Results

Below is Duke's data for three FALs. The pre- and post-lesson assessment numbers are based on teacher judgment of students' understanding of math concepts embedded in the FAL. Each student is scored by the teacher on a scale of 0-3, with 3 = understanding, 2 = some understanding, 1 = little to no understanding and 0 = no response.

The results indicate that students significantly increased their level of assessment in all three of these FALs. For example, in the Building and Solving Linear Equations FAL shown first in the table, the average student increased from 1.65 (pre-lesson) to 2.09 (post-lesson).

Pre- and Post-Lesson Assessment Data of Student Growth

Name of FAL	Average Pre-Lesson Assessment	Average Post-Lesson Assessment	Average Growth Summary
Building and Solving Linear Equations	1.65	2.09	0.44
Comparing Investments	1.63	1.95	0.32
Representing Linear and Exponential Growth	1.5	2.3	0.8

Providing the Productive Struggle

Through the support of Jeanne Glover, Jonesboro Public Schools mathematics specialist, and Amanda Merritt, SREB mathematics consultant, Duke stepped outside the traditional role of the teacher and provided her students with opportunities to engage in a productive struggle with mathematics.

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