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.”
**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).

<table>
<thead>
<tr>
<th>Name of FAL</th>
<th>Average Pre-Lesson Assessment</th>
<th>Average Post-Lesson Assessment</th>
<th>Average Growth Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and Solving Linear Equations</td>
<td>1.65</td>
<td>2.09</td>
<td>0.44</td>
</tr>
<tr>
<td>Comparing Investments</td>
<td>1.63</td>
<td>1.95</td>
<td>0.32</td>
</tr>
<tr>
<td>Representing Linear and Exponential Growth</td>
<td>1.5</td>
<td>2.3</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**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.

---

**Don’t miss the opportunity to send your teaching and leadership team to the most important professional development conferences of the year.**

**Networking Conference**

Can your district benefit from planning strong math assignments to meet college- and career-ready standards? Join us for the **Fourth Annual College- and Career Readiness Standards Networking Conference**, July 11-13, in Louisville, Kentucky.

**HSTW Conference**

Share and learn best practices for engaging your students while preparing them for life after graduation. Join us for the **30th Annual High Schools That Work Staff Development Conference**, July 13-16, 2016, in Louisville, Kentucky.

**SREB Readiness Courses Institute**

The **Readiness Courses Institute** will be held July 11-15 during the 30th Annual HSTW Staff Development Conference in Louisville, Kentucky.

Click here to learn how you may receive up to **$600 in stipends** to attend the Readiness Courses Institute. **Bonus**: Attend and receive complementary registration for the High Schools That Work Staff Development Conference.

Ready for High School courses in literacy and math prepare eighth- and ninth-graders for high school and strengthen their critical thinking, problem-solving and communication skills. They will be available at no cost to schools starting in 2016-17. For schools interested in implementing these courses, we encourage you to attend the Readiness Courses Institute.