Activities in the Mathematics Classroom that Promote Mathematical Fluency

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Promoting Mathematical Fluency
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Research Questions
• How can I use reading, writing, and speaking the language of mathematics to promote mathematical fluency?
• What activities help students become “fluent” in mathematics?
• Which activities accomplish targeted learning goals such as initial learning or reinforcement?

Methodology
• 40 students from two sections of Algebra II classrooms in a Central Illinois urban high school
• Implemented activities, reviewed student work, and analyzed reflective teacher journals
• Lessons emphasized and assessed reading, writing, and speaking mathematics
• Math-Talk community framework was used to analyze how I promote mathematical discourse (Hufferd-Ackles, Fusin, & Sherin, 2004)

Literature Review
• NCTM (2000) identified learning to communicate mathematically as a major goal for students. When required to justify, students are challenged to think and reason.
• Shield and Swinson (1996) used writing as a means of organizing ideas through “link sheet” activity.
• Huinker and Laughlin (1996) considered the benefit of classroom discourse in exploring concepts with “think-talk-write” activity.
• Discourse aids in writing or writing aids in discourse? Literature lacked evidence on the benefits of the activities.

Activities’ relevance to themes

<table>
<thead>
<tr>
<th>Math-Talk Themes</th>
<th>Matrix Activity</th>
<th>Board Work</th>
<th>Partner Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questioning</td>
<td>+</td>
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<tr>
<td>Explaining</td>
<td>+</td>
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<tr>
<td>Source of Ideas</td>
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<td>Responsibility for Learning</td>
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Figure 1. The extent to which implemented activities accomplished goals or themes.

Results and Data Analysis
• Matrix Activity: By design, this writing activity required justification and encouraged questioning because students’ interactions were limited to writing. This activity reinforced concepts.
• Board Work: Students’ work and explanations demanded precision. Through reflection, I noted students’ reluctance to question or be incorrect in front of peers. Board work activities reinforced and assessed understanding.
• Partner Work: Students were more comfortable exploring and asking questions during group work. This activity reinforced concepts.

Conclusion
• Continuing to draw from literature as inspiration and modifying lessons I’ve implemented, there are a number of activities that allow students to practice using math as a language.
• Activities that require written explanations and oral justifications help students develop “fluency.”
• Given more time, I would use levels described in the Math Talk framework to quantify progress across themes.
• In the future, I want to determine through assessment which activities help achieve certain learning goals.