Mathematics as a Language

Sean Curtain
Illinois Wesleyan University

Leah Nillas, Faculty Advisor
Illinois Wesleyan University

Follow this and additional works at: https://digitalcommons.iwu.edu/jwprc

Part of the Education Commons

https://digitalcommons.iwu.edu/jwprc/2015/ESposters2/4

This Event is protected by copyright and/or related rights. It has been brought to you by Digital Commons @ IWU with permission from the rights-holder(s). You are free to use this material in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/or on the work itself. This material has been accepted for inclusion by faculty at Illinois Wesleyan University. For more information, please contact digitalcommons@iwu.edu.
©Copyright is owned by the author of this document.
Mathematics as a Language
Sean Curtin and Leah Nillas*
Educational Studies, Illinois Wesleyan University

Research Question
How does the implementation of academic language affect student learning?

Literature Review
• Gottlieb and Ernst-Slavit (2013) define academic language as a way to communicate ideas, concepts, and higher thinking processes, but it is used so that students may acquire a greater insight into the materials.
• Marino (2005) emphasizes that pre-planning, open ended questioning, grouping and time all affect the implementation of academic language in the classroom.
• Fry and Villagomez (2013) and Glanfield, Oviatt, and Bazcuk (2006) found positive qualitative results in implementing academic language in relation to student learning.

Methodology
• Twenty-one eighth grade students and two seventh grade students in a high school were the participants of the study.
• Formative and summative assessments, student responses and lesson plans were collected during student teaching and content analyzed.
• Used class discussions/activities to determine the increased and correct use of academic language.

Result and Data Analysis
• There was significant confusion on the direction of the proof (Figure 1) and the difference between transitive property of congruence and the substitution property of equality (Figure 2).
• Students who were not able to justify their work, had difficulty discovering correct solutions (Figure 3).
• Student responses corroborate with student work findings where students shared about having more issues with word problems (mathematical skills and reasoning) than procedural problems.

Conclusion
• There are several clear misconceptions caused by a lack of academic language use in the classroom, however, students also had a better understanding of the material when they were able to use academic language effectively.
• I recommend teachers pay precise attention to the language used in the classroom to benefit student learning.
• There is room for future research on how the implementation of academic language affects the students as they progress through mathematics courses.

Common Mistakes with Language

Figure 1: Student sample work that shows a proof in the opposite direction.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $\overline{AD} \parallel \overline{BC}$</td>
<td>1.) Given</td>
</tr>
<tr>
<td>2. $\angle 2 \cong \angle 3$</td>
<td>2.) Def'n of $\cong \angle$'s</td>
</tr>
<tr>
<td>3. $\angle 5$ and $\angle 2$ are supp.</td>
<td>3.) same side int. angles are supp.</td>
</tr>
<tr>
<td>$\angle 3$ and $\angle 6$ are supp.</td>
<td></td>
</tr>
<tr>
<td>4. $\angle 5 + \angle 2 = 180^\circ$</td>
<td>4.) Def'n of supp. angles.</td>
</tr>
<tr>
<td>$\angle 3 + \angle 6 = 180^\circ$</td>
<td>5.) Subst.</td>
</tr>
<tr>
<td>5. $\angle 5 + \angle 2 = \angle 3 + \angle 6$</td>
<td>6.) Subst.</td>
</tr>
<tr>
<td>6. $\angle 5 + \angle 3 = \angle 2 + \angle 6$</td>
<td>7.) Same side interior angles are supp. in parallel lines.</td>
</tr>
<tr>
<td>7. $\overline{AB} \parallel \overline{CD}$</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: Student sample work includes the confusion between transitive and substitution property.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. $\angle 5$ is supp. $\angle 3$</td>
<td>2.) Consecutive angles</td>
</tr>
<tr>
<td>3. $\angle 2$ is supp. $\angle 6$</td>
<td>3.) Consecutive angles</td>
</tr>
<tr>
<td>4. $\angle 2$ is supp. $\angle 5$</td>
<td>4.) Substitution</td>
</tr>
<tr>
<td>5. $\angle 3$ is supp. $\angle 6$</td>
<td>5.) Substitution</td>
</tr>
<tr>
<td>6. $\angle 5 \cong \angle 6$</td>
<td>6.) Substitution</td>
</tr>
</tbody>
</table>

Figure 3: Student sample works that demonstrates the students mathematical reasoning skills on the topic.

Find $x$ to make $a$ and $b$ parallel. Justify why the lines would be parallel.

a.) $m\angle 7 = x; m\angle 9 = 4x + 20$

$x + 4x + 20 = 180$

$5x + 20 = 180$

$x = 32$

b.) $m\angle 8 = 3x - 12; m\angle 7 = 2x + 10$

$3x - 12 = 2x + 10$

$x = 22$