A Pedagogical Foundation for Teaching ELLs Mathematics

Erick Perez
Harbor Heights Middle School
New York City
Crossing the River

Three adults and two children need to cross a river. They have a small boat. The boat can carry either one adult, or one or two children. How many one-way trips will it take for all children and adults to cross the river?
Guiding Principles for Shaping Pedagogy

1. Challenging Mathematical Tasks
2. Multimodal Representation
3. Academic Language Application
Challenging Mathematical Tasks Principle

- Engagement, accessibility, and success
- Introducing the mathematical ideas and challenges in the lesson without lowering the demand
- Questioning students to extend their thinking and promote sense-making
Multimodal Representation Principle

- Giving opportunities for students to use mathematical diagrams, drawings, gestures, physical models, symbols, or technology

- Helping students learn how to diagram mathematically in a way that makes sense
Crossing The River

Key
2 Kids
1 Kid
1 Adult
1 Kid

How many one-way trips does it take for the kids and adult to cross the river?
31 One-way trips.

Keep up to 31 lines.

Pattern:

Two Kids
One Kid
One Adult
One Kid

Key:
= Adults
= Kids
The way that the 3 adults and the 2 children could cross the river is by a pattern that uses 2 children cross the river. And then 1 child stays in the other side of the river. And then the other one cross the river again. And then the children stay and then a adult cross the river. And then the children that was in the other side needs to cross the river. And then he need to go back to get the other children. And then the pattern repeat itself.

By: Nicole Cruz y Daniel Ventura
## Crossing the River

<table>
<thead>
<tr>
<th>Trips</th>
<th>Adults</th>
<th>Kids</th>
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<tbody>
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- Adults: 4
- Kids: 2

1 Children
## Crossing the River

<table>
<thead>
<tr>
<th>Adults with children</th>
<th>Trips</th>
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<tbody>
<tr>
<td>2</td>
<td>9</td>
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<td>3</td>
<td>13</td>
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<td>4</td>
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<td>25</td>
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<td>7</td>
<td>29</td>
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### Equation

\[ y = 4x + 1 \]

### Key

- \( \bigcirc \) = 1 adult
- \( \bullet \) = 1 kid
Academic Language Principle

- Students connect mathematical language to mathematical symbols

- **Prompting** students to use mathematically accurate language

- **providing** students ample **opportunity** to read, write and speak about mathematics

- **Rephrasing students everyday language** with proper mathematical language
Recommendations

- **Teacher collaboration** for planning and inter-visitations
- **Ample Time** to negotiate meaning of tasks and solutions
- **Questioning Techniques** to advance student thinking
- **Rephrasing students everyday language** with proper mathematical language