Problem Solving Process Skills and 4th Grade English Language Learners

A presentation by

Roxane Y. Cuellar, Ph.D.
Texas State University-San Marcos
San Marcos, Texas

&

Maria G. De la Colina, Ph.D.
Texas State University-San Marcos
San Marcos, Texas

Presented at the Mathematic for English Language Learners (MELL) Conference
Texas State University
San Marcos, Texas
July 7, 2006
Presentation Outline

- Introduction/Review of the Literature
- TAKS Results
- Purpose of the Study
- Research Questions/Data Analysis
- Procedure
- Instrument
- Results
- Implications for Teaching

Facts

- According to U.S. Census Bureau (2000), one fifth of the students enrolled in the public school system are second language learners

- Of these second language learners, Hispanics represented the largest group

- Historically, Hispanic bilingual students have had the lowest levels of education and the highest dropout rate of any ethnic group in the country:
  - 30% for Hispanics
  - 13% for African-Americans
  - 8% for Whites

Purpose of the Study

- Lack of relevant research in the area

- Identification of the specific areas where Hispanic students identified as English Language Learners (ELL) are having difficulties when solving routine three digit subtraction word problems with regrouping in relation to five processes of mathematical problem solving
• Examining the relationship between each of the five processes of mathematical problem solving and the ability of a Hispanic ELL to arrive at the correct final answer to a three-digit subtraction problem with regrouping

• Information is helpful to educators as they work to develop effective teaching strategies that will help all students to succeed

• The performance of students on state and national assessments is continually gaining importance. Therefore, it is necessary for teachers to find ways in which students can improve their performance on these examinations.

Texas Assessment of Knowledge and Skills Results (TAKS)

• In Texas, the majority of students attending public schools are Hispanic (43%)

• 14%+ of students are classified as Bilingual/ESL (approx. 586,146+)

• 2005 TAKS % Students Passing-4th grade
  (Source: Texas Education Agency)

<table>
<thead>
<tr>
<th></th>
<th>All tests</th>
<th>Math</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>African American</strong></td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>4*</td>
<td>14*</td>
</tr>
<tr>
<td><strong>Hispanic</strong></td>
<td>63</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>5*</td>
<td>21*</td>
</tr>
<tr>
<td><strong>White</strong></td>
<td>81</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>14*</td>
<td>39*</td>
</tr>
<tr>
<td><strong>ELL</strong></td>
<td>49</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>3*</td>
<td>14*</td>
</tr>
</tbody>
</table>

*commended performance
Problem Solving Processes for Research Study

- explaining the problem
- estimating the final answer
- representing the problem
- solving the representation
- explaining the final answer

Research Question

1. Which of the following problem solving process skills are problematic for Hispanic bilingual fourth graders when solving routine three-digit subtraction story problems:
   (1) explaining the problem
   (2) estimating the final answer
   (3) representing the problem
   (4) solving the representation
   (5) explaining the final answer

Data Analysis:
Display with the mean score earned and standard deviation for each of the process skills

Research Question

2. Which of the following problem solving process skills serve as predictors for students (Hispanic bilingual fourth graders) being able to arrive at the correct final answer when solving three-digit subtraction story problems with regrouping:
   (1) explaining the problem
   (2) estimating the final answer
   (3) representing the problem
   (4) solving the representation
   (5) explaining the final answer

Data Analysis:
Wilk’s lambda stepwise method
All Possible-Subsets Approach
Procedure

- 74 bilingual fourth grade students
- 2 Independent School Districts in Texas
- Students were individually assessed on two mathematics problems, each involving the five process skills
- Students chose language of assessment
- Students received a score from 0-4 for each process skill based on performance:
  - 0, 1, 2 = below expectations
  - 3, 4 = meets expectations

Results: Question 1
Mean Scores by Problem and Process

Problem A

<table>
<thead>
<tr>
<th>Process</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process 1</td>
<td>3.32</td>
<td>0.85</td>
</tr>
<tr>
<td>Process 2</td>
<td>2.19*</td>
<td>1.26</td>
</tr>
<tr>
<td>Process 3</td>
<td>3.69</td>
<td>0.74</td>
</tr>
<tr>
<td>Process 4</td>
<td>3.55</td>
<td>0.80</td>
</tr>
<tr>
<td>Process 5</td>
<td>3.45</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Problem B

<table>
<thead>
<tr>
<th>Process</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process 1</td>
<td>3.58</td>
<td>0.60</td>
</tr>
<tr>
<td>Process 2</td>
<td>2.27*</td>
<td>1.38</td>
</tr>
<tr>
<td>Process 3</td>
<td>3.64</td>
<td>0.79</td>
</tr>
<tr>
<td>Process 4</td>
<td>3.77</td>
<td>0.61</td>
</tr>
<tr>
<td>Process 5</td>
<td>3.47</td>
<td>0.62</td>
</tr>
<tr>
<td>Process</td>
<td>Wilk's Lambda</td>
<td>F</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>----</td>
</tr>
<tr>
<td>Process 1</td>
<td>0.98</td>
<td>1.86</td>
</tr>
<tr>
<td>Process 2</td>
<td>0.99</td>
<td>0.64</td>
</tr>
<tr>
<td>Process 3</td>
<td>0.60</td>
<td>48.99</td>
</tr>
<tr>
<td>Process 4</td>
<td>0.58</td>
<td>51.55</td>
</tr>
<tr>
<td>Process 5</td>
<td>0.99</td>
<td>0.71</td>
</tr>
</tbody>
</table>
PUBLICATIONS


ISSN: 1447-9494 (print)
ISSN: 1447-9540 (online)