Mathematics for ELs: Foundational Skills for Equity, Access, and Academic Achievement

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CABE 2019

CABE 2019 Theme: Imagine, Inspire, and Ignite.

- Celebrate Bilingualism – Guidelines of Proposition 58
- Pursue of Vision of Global California 2030
- Go deeper into the implementation of the EL Roadmap Policy
  - Principle #2 of the California English Learner Roadmap Policy
  - Foster English proficiency
  - Integrate ELD across the curriculum
  - Use native language for instruction or for scaffolding
  - Provide opportunities to develop proficiency in a second language

Jan Gustafson-Correa (CABE CEO), Elodia Ortega-Lampkin (CABE Pres.)

Agenda

1. Revisit practices that impact on equity and access in mathematics.
2. Review principles and practices that have the highest impact on student learning.

Academic Vocabulary Buddies

Your Name: _______________________

Directions: Write the name of a different person in each space to the right. Then add your name on your partner’s paper on the same word.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Circle</td>
</tr>
<tr>
<td>2</td>
<td>Cone</td>
</tr>
<tr>
<td>3</td>
<td>Polygon</td>
</tr>
<tr>
<td>4</td>
<td>Pyramid</td>
</tr>
</tbody>
</table>
**Culturally Responsive Mathematics Classes Ensure Equity and Access**

- Interactive activities are used to facilitate a safe but risk-taking classroom environment
- Everyone is expected to participate
- All ideas are respected and supported
- Participants celebrate mistakes and risk taking
- Multiple strategies are valued, the focus is less on answers
- Questions are used to encourage deep thinking

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**Equity & Access**

**Quick Write**

Handout #2

Write 5 adjectives that describe ACCESS:

________________________________

________________________________

Write 5 adjectives that describe EQUITY:

________________________________

________________________________
What is equity

Equity is differentiating instruction, services, and resource distribution, to respond effectively to the needs of all students. Equity in schooling is reflected in four broad areas:

a) Resource distribution,

b) Programs,

c) School climate, and

d) Achievement.

(California Department of Education, 2019)

Equitable Learning and Success

Ensuring equitable learning and success includes careful unit and lesson planning in both Integrated ELD and Designated ELD, addressing both language standards and relevant content standards.

✓ Check - ELs placed in mainstream math courses (IELD) with language support = equitable.

✓ Check - ELs placed in remedial math classes, for targeted instruction (DELD) and with targeted support = equitable.

Equity and Access

Initial Identification, Placement, & Reclassification

Placement in challenging math courses is based on primary language and mathematics background. Teachers provide:

➢ More time to learn and practice

➢ Scaffolding to increase participation in rigorous math

➢ Smaller instructional groupings and engaging cooperative learning strategies

Equity and Access

Initial identification, Placement, & Reclassification

Placement in challenging math courses is based on primary language and mathematics background. Teachers provide:

➢ Instruction in procedural and conceptual understanding, and the academic language of mathematics

➢ Staff trained in both mathematics content and second language acquisition
What does it look like?
Equitable classroom instruction for ELs is planned so that:
- Language (code) switching is supported
- Support is given to understand and attempt word problems
- Students participate in all aspects of mathematical reasoning
- Students acquire both written and oral communication skills

Quick Write
Handout #2
- Return to your Quick Write on equity, access and engagement.
- Review, add 1-2 more statements or edit your responses.
- Go to your Rectangle AVB and discuss your observations make additional changes.

Access in Mathematics
Mathematics knowledge is one of the significant gatekeepers in modern society. Demonstrating understanding of mathematics in high school opens doors to college ... passing college mathematics classes increases the likelihood that students will actually earn a degree.

Students need to achieve three goals:
1. Knowing what to do (Conceptual Competence)
2. Knowing how to do it (Procedural Competence)
3. Knowing when and where to do it (Mathematical Reasoning Competence)
Access in Mathematics

• Only 12% of English Learners met or exceeded math standards on the California Assessment of Student Performance and Progress – compared to 43% of EO students and those assessed or reclassified as Fluent English Proficient.

• (Education Trust-West 2018)

• Nationwide there is a 31% attainment gap in math for ELs. (USDE)

• Lowered expectations and less rigorous courses have often left ELs unable to catch up to their peers and unprepared for college or training programs. (Californians Together, 2010)

People Search – True or False

Handout pg. 2

1. At your table, individually respond to the five T-F questions. Indicate whether they are true or false.

2. When you finish, walk around and find 5 different buddies to share your answers.

3. Share one answer with each buddy and get a signed off. Continue until you secure 5 different signatures.

Effective Instruction for ELs

• For students beyond basic English proficiency, effective strategies for ELs are broadly effective for English-proficient student as well. (Cheung & Slavin, 2005, 2012; Goldenberg, 2013)

• Mathematical language supports for ELs are effective instructional strategies for all mathematics language learners. (Sommons, 2018)

• The intended outcomes of the math and ELD standards are connected to social and emotional competencies. (Martinez, 2014)

Content Standards & SEL Competencies

Effective Principles and Strategies

<table>
<thead>
<tr>
<th>Effect size (E.S. ≥ 0.40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverage prior knowledge 0.65</td>
</tr>
<tr>
<td>Classroom discussion 0.82</td>
</tr>
<tr>
<td>Cooperative VS individualized learning 0.59</td>
</tr>
<tr>
<td>Worked examples 0.57</td>
</tr>
</tbody>
</table>

1. Begin a lesson with a short review of previous learning. Daily reviews strengthen previous learning and can lead to fluent recall.
Think-Share-Compare
Personal Finance

1. Rising interest rates are beneficial to…
2. John is buying a car.

Discuss with your Partner, and Solve the Problem

John is buying a car:
one costs $20,000 and
the other $18,000.
If sales tax is 8 percent and
he is financing the entire
purchase at 10 percent simple
interest for one year, what is
the actual difference in cost
of these two cars?

A. $2000
B. $2160
C. $2360
D. $2376

Think-Share-Compare
Handout pg. 3

A Review about interest rates
(Oral Math)

1. Rising interest rates are most
   beneficial to:

Placemat Strategy
Handout pg. 4
Reflect

• How does this process help English Learners?

• What skills are they learning when they are having academic conversations?

Math is different from other content areas, adding difficulty for many English Learners

• The structure, text features, and language of mathematics are unlike other subject areas.

• In narrative text, the main idea often comes at the beginning of a paragraph.

• In mathematics, the main idea or question comes at the end of the word problem.

Consider …

*Mathematics knowledge is one of the significant gatekeepers in modern society.*

Demonstrating understanding of mathematics in high school opens doors to college … passing college mathematics classes increases the likelihood that students will actually earn a degree. (Hattie, Fisher, Frey 2017)

Pablo will earn $500 a month bagging groceries, $100 running errands for neighbors, and $20 allowance from his parents. He is ready to create his spending plan. He wants to save 25%, assign 12% for specific goals like a new computer and clothes, and allocate 40% for monthly commitments. And keep the rest of his total monthly funds for discretionary spending.

*How much money will he allocate to each category?

Math texts include vocabulary, symbols, graphics and procedures.

*Vocabulary* – words may have different meanings in mathematics contexts (relationship); two different words sound the same (sine and sign); or more than one words is used to describe the same concept (sum, total, aggregate, addition).

*Symbols* - may be confusing either because they look alike (division or square root √) or because different representations may be used to describe the same process (multiplication ×, ÷, ( ), *).

*Graphic representations* may be confusing because of formatting variations such as bar graphs versus line graphs; or graphics are not read in the same direction.
Language & Symbols in Mathematics

B Slice

1. Write in words:
   Time: 12:15 P.M.
   Height: 5’ 7”
   Measurement: 1 lb and 4 oz.

2. Express in symbols:
   Price: Three boxes at $7.49 each
   Measurement: Twelve and a half miles
   Height: Six yards, two feet, and nine inches

3. Write as an algebraic expression:
   The square of a is increased by the sum of twice a and 3.


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**Content Standards & SEL Competencies**

<table>
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<tr>
<th>Effective Principles and Strategies</th>
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<tbody>
<tr>
<td>Construct viable arguments and critique the reasoning of others (SMP. 3)</td>
<td>Teacher clarity 0.75</td>
</tr>
<tr>
<td>Model with mathematics (SMP. 4)</td>
<td>Feedback 0.75</td>
</tr>
<tr>
<td>Part I: Interacting in Meaningful Ways: A. Collaborative, B. Interpretive (CA ELD)</td>
<td>Concept mapping 0.60</td>
</tr>
<tr>
<td>Students use Social Awareness to take others’ point of view, as well as Relationship Skills to work collaboratively (SEL Principle)</td>
<td>Multiple representations 0.50</td>
</tr>
<tr>
<td>2. Present new material in small steps with student practice after each step.</td>
<td>Organizing and transforming notes 0.85</td>
</tr>
<tr>
<td>3. Ask a large number of questions and check the responses of all students.</td>
<td></td>
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**Placemat Strategy**

Handout pg. 4

**Content Standards & SEL Competencies**

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<tbody>
<tr>
<td>Use appropriate tools strategically (SMP. 5)</td>
<td>Teacher clarity 0.75</td>
</tr>
<tr>
<td>Attend to precision (SMP. 6)</td>
<td>Feedback 0.75</td>
</tr>
<tr>
<td>Look for and make use of structure (MP.7)</td>
<td>Concept mapping 0.60</td>
</tr>
<tr>
<td>Part I: Interacting in Meaningful Ways: A. Collaborative, B. Interpretive (CA ELD)</td>
<td>Problem solving teaching 0.61</td>
</tr>
<tr>
<td>Students use Decision-Making skills to responsibly solve problems, as well as use Self-Management skills to persevere in the process and monitor progress towards final completion (SEL Principle)</td>
<td>Transforming conceptual knowledge 0.85</td>
</tr>
<tr>
<td>4. Provide models</td>
<td>Class discussion 0.82</td>
</tr>
<tr>
<td>5. Guide student practice</td>
<td></td>
</tr>
<tr>
<td>6. Check for student understanding: Checking for student understanding at each point can help students learn the material with fewer errors.</td>
<td></td>
</tr>
</tbody>
</table>
Joe and Mary want to calculate the average height of students in their school. Which of the following groups of students would produce the least amount of bias?

A. Every student in the 8th grade.
B. Every student on the school basketball team.
C. Randomly selected group of students in the halls.
D. Joe & Mary’s friends.

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**Video Discussion**

**Discuss with your Placemat Strategy Buddy**

1. The structure and characteristics of this math class
2. The academic focus and SEL competencies being taught and practiced
3. The impact this instructional practice has on the teacher, students and especially ELs

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**How to Teach Math as a Social Activity**

https://www.youtube.com/watch?v=kZxNldBEU6o
**Video Discussion**

Discuss in your teams of three:

1. The structure and characteristics of this math class
2. The academic focus and SEL competencies being taught and practiced
3. The impact this instructional practice has on the teacher, students and especially ELs

**Language Support in Math Class**

**ELLs Count on Language Support in Math**

by Laura Varlas.

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**How many squares do you see**

**Handout #8**

1. Work individually and determine how many squares you see.
2. After a few minutes, we will call time.
3. Go find your Polygon AVB.
4. Discuss how many squares each one of you counted and share your thinking how you reached that conclusion.
## Long Term English Learners (LTELs)

LTELs arrive in secondary schools with academic language issues:
1. **Have high functioning social language, very weak academic language.**
2. **Have been “stuck” at Intermediate levels of English proficiency or below and cannot be reclassified.**

LTELs have significant gaps in academic background knowledge, poor learning skills, with deficits in reading and writing skills.

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### Content Standards & SEL Competencies

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<th><strong>Effective Principles and Strategies</strong></th>
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<tbody>
<tr>
<td>Attend to precision (MP. 6)</td>
<td>7. Students obtain high success during classroom instruction.</td>
<td>Teacher expectations of students’ learning 1.62</td>
</tr>
<tr>
<td>Look for and make use of structure (MP. 7)</td>
<td>8. Teachers provide temporary supports and scaffolds to assist students with difficult tasks.</td>
<td>Self-reported grades/student 1.44</td>
</tr>
<tr>
<td>Look for and express regularity in repeated reasoning (SMR. 8)</td>
<td>9. Teachers plan and monitor independent work for skills and knowledge to become automatic and transfer.</td>
<td>Teacher credibility 0.90</td>
</tr>
<tr>
<td>Part I: Interacting in Meaningful Ways:</td>
<td>10. Students engage in weekly and monthly reviews and extensive practice.</td>
<td>Student-teacher 0.72</td>
</tr>
<tr>
<td>A. Collaborative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Interpretive (CA ELD)</td>
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<td>Students use Decision-Making skills to responsibly solve problems, as well as use Self-Management skills to persevere in the process and monitor progress towards final completion (SEL Principle)</td>
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### Long Term English Learners (LTELs)

In general, LTELs have poor social emotional learning habits such as non-engagement, passivity and invisibility in school.

In general, there is a lack of understanding with students and parents that these academic deficits and poor preparation will pose significant barriers in their attempt to access college and career training programs.

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### Mental Math Skills

Solving basic math problems in your head helps your understanding of concepts and mastering higher level math courses such as Algebra, statistics, and calculus. Other lifelong benefits include:

- a competitive edge in school and work
- an active and sharp mind at any age
- an improve performance on tests
- a variety of methods to solving problems
**Number Heads Together**

1. Number **one to four** to form a group.
2. Remember your number.
3. Teacher will provide a problem for the group to solve together. **Everyone should know the answer** and how to solve the problem.
4. The teacher sets the time limit.
5. The teacher randomly selects a number and they stand up. That person **provides the answer** when called on.

**Mental Math**

1. Two partners will try to solve all or part of the problem without writing anything.
2. The other two partners will do the operation on 3x5 cards or note paper.
   
   - **What is 25 times 45?**
   - **What is 742 times 300?**
   - Will 4821 divided by 9 have a remainder?

**Universal Access**

- The effective practices presented provide opportunities to improve access to rigorous mathematics for all students.
- The standards call for a shift so that all students are active participants in their learning, not only by solving problems but also by discussing, listening, explaining, demonstrating, reading, writing, representing, and presenting.

**THANK YOU!**

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