



Facilitating Access and Equity in 3-5 Mathematics Classrooms: Lessons Learned from Inspirational Teachers

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College of Education
University of Missouri

What Would Hinder...

Your participation in a faculty meeting? Professional development session? If you were a student in a Japanese classroom?



An Image of a Student...

Think about a student that you have observed whose participation was hindered? Focus on that image. What hindered his/her participation?



Participation

What is participation?

What does it look like?

What forms does it take? (e.g., student discourse, student thinking)

What facilitates and hinders participation?

Under which conditions and contexts?



Hermione



Zia's First Sky Jump

- [San Diego\► Girls first Ski Jump.mp4](#)
- What do you notice in this short video filmed by Zia?
- What can we learn from Zia?



Subtin

$$\triangle - 3 = \underline{6\frac{1}{2}}$$

$$10 \triangle 0 = 10$$

$$5 \triangle 3 = 6\frac{1}{2}$$

n



students shared situations that made them feel as though they did not want to participate.

One by one, students voiced their concerns. As a result of our conversation, students realized that they *all* had fears and were reluctant to ask questions. We explored fears about being wrong, about receiving negative responses from classmates, and about not knowing an answer immediately. I was careful to validate each and every concern and to challenge the class to list ways that we could respond to each situation.

NO FEAR

In our classroom, we have no fears about sharing our answers, asking questions, or sharing our thoughts. This is because of the reasons we list below.

- **WHEN WE SHARE AN ANSWER**, we all understand that not everyone is perfect and that wrong answers often help us learn and lead us to the right answer. We are also very proud of our classmates for being kind enough (and brave enough) to share their answers, and we promise to support one another no matter if the answer is incorrect or correct.
- **WHEN WE ASK A QUESTION**, we all get a chance to learn. It gives us a chance to see our classmate's point of view, where it is he or she might be confused, and it gives us opportunities to help him or her be more successful. When our classmates are successful, we all win!
- **WHEN WE SHARE OUR THOUGHTS AND IDEAS**, we all get a chance to become better thinkers. By looking at another way of solving the same problem, we expand our abilities. We begin to see another way and another viewpoint. It makes us appreciate one another's ideas and talents.

We promise to support one another and stay positive with our comments to one another. We understand that not everyone learns the same way or at the same speed, and we will be supportive and patient as we give one another time to find answers. By doing so, we help shape this class into the best it can possibly be. It makes us all part of a winning team.

Students talked about listening to
alternative solutions to the same problem,



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Principles to Action: Access & Equity

An excellent mathematics program requires that all students have access to:

- a high-quality mathematics curriculum,
- effective teaching and learning,
- high expectations, and the
- support and resources needed to maximize their learning potential.



Principles to Action

Equitable access means high expectations, adequate time, consistent opportunities to learn, and strong support that enable students to be mathematically successful. Instead of one-size-fits-all practices and the differential expectations for students who are placed in different academic tracks, equitable access means accommodating differences to meet a common goal of high levels of learning by all students.



Your Role

What role can you play in facilitating the participation of students in mathematics in your classroom? School? District? State?

What role can you play in ensuring the Principles are enacted?





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Disclaimers

- Different Contexts
- Teachers Who Were Willing to Take the Risk and Share the Good, the Bad, and the Ugly



Highlighting Two Cases

Sara (Khisty & Chval, 2002; Morales, Khisty, & Chval, 2003; Chval, 2004; Chval & Khisty, 2009; Razfar, Khisty, & Chval, 2011; Chval & Chavez, 2011; Chval, 2012; Vomvoridi-Ivanovic & Chval, 2014)

Courtney (Chval, Pinnow, & Thomas, 2014; Pinnow & Chval, 2014)



How do teachers' assumptions and beliefs influence how they position ELLs?

Chval: And how would you explain ELL participation in mathematics classrooms?

Mary: Not enough, you know, like we just saw on the video. They're just... I think that they just get use to... I don't understand it and so I am going to just **take a power nap** over here, you know, or **play with my pencil, bug my neighbor**, you know.



How Does It Impact Their Practice?

Chval: Ok, do you think you call on more students this year than last year?

Beth: Yes

Chval: Ok, why do you think that is?

Beth: Um, last year I probably would have never called on Juan because I would be scared of what he says and this year I still am, but I feel more comfortable calling on him and trying to you know and see where we can figure out what he is thinking. I need to figure out what he is thinking so, ...



How do we move beyond awareness?

Beth: They, um, are **scared** to ask questions. They're not confident to come ask. Carlos is the first one that has ever come to me and asked, "What does this word mean, Mrs. Frasier?". So, you know, they are kind of **timid** and they stay back. They don't really just um ask the question and **they wait for you to come to them**. Sometimes it's hard to remember, oh yeah, I need to, you know, or even some of those words that they don't know, I would have never guessed they didn't know those. You know.



Prompt Posed to PSTs

“Imagine it is your first year of teaching. You have taken a position as a third grade teacher. One of your students has just moved to the United States from Central America. What do you think this child will need during mathematics instruction? How will you assess the child’s needs? How will you support this student during mathematics?”



Three Examples

	Child from Central America	Child from China
1	"The child will need <u>one-on-one help</u> and some translation & explanation."	"The child will need me to explain the directions, but based on previous experiences, my Asian students are <u>excellent</u> in math."
2	The child will need <u>extra help</u> maybe from an ESL coach or volunteer.	The student will mostly likely <u>excel</u> at mathematics.
3	The child will need <u>extra help</u> and support during mathematics instruction.	The child will need <u>deeper</u> instruction and manipulatives to work out problems.

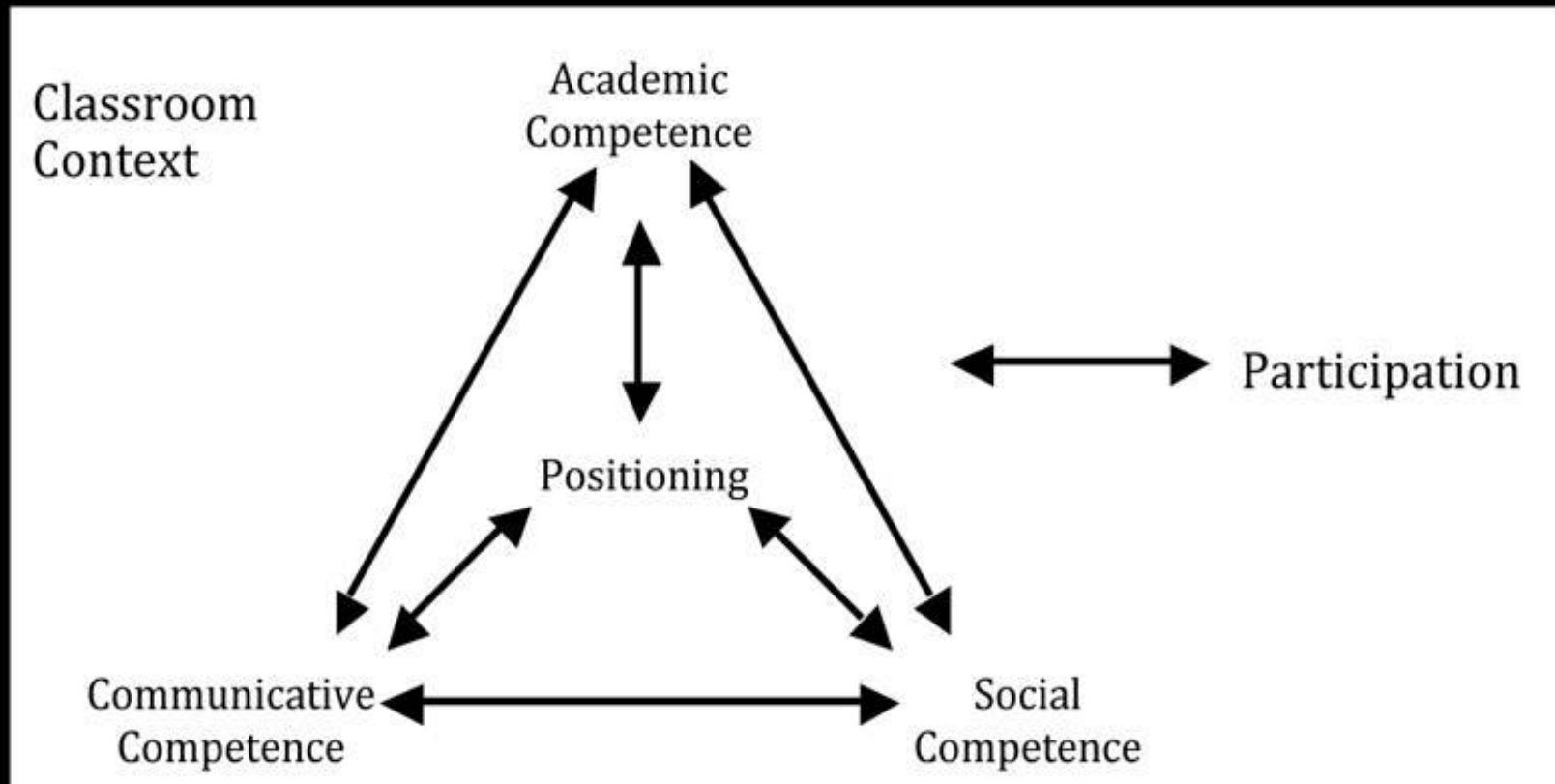


Questions to Consider

- What influences how a teacher positions certain children?
- How does a teacher position her/himself?
- How does a teacher influence how children position their peers?
- Can teachers learn strategies in relation to positioning?
- Why is positioning important?



Teachers must position ELLs for successful interactions!



Sara Positioned Students as:

- Contributors
- Family Members
- Teachers
- Role Models
- Experts



Sara

“So Dalia was asking Alejandro, and Alejandro didn’t know what to do. Alejandro wasn’t participating because he never asked for help. So somebody over here. Anybody. You move around. I’m only one person. Move around quietly and ask each other. You can teach each other. Walk around. Help each other. I can’t help all of you at the same time.”



How does the teacher
position herself?



Need to Consider How To:

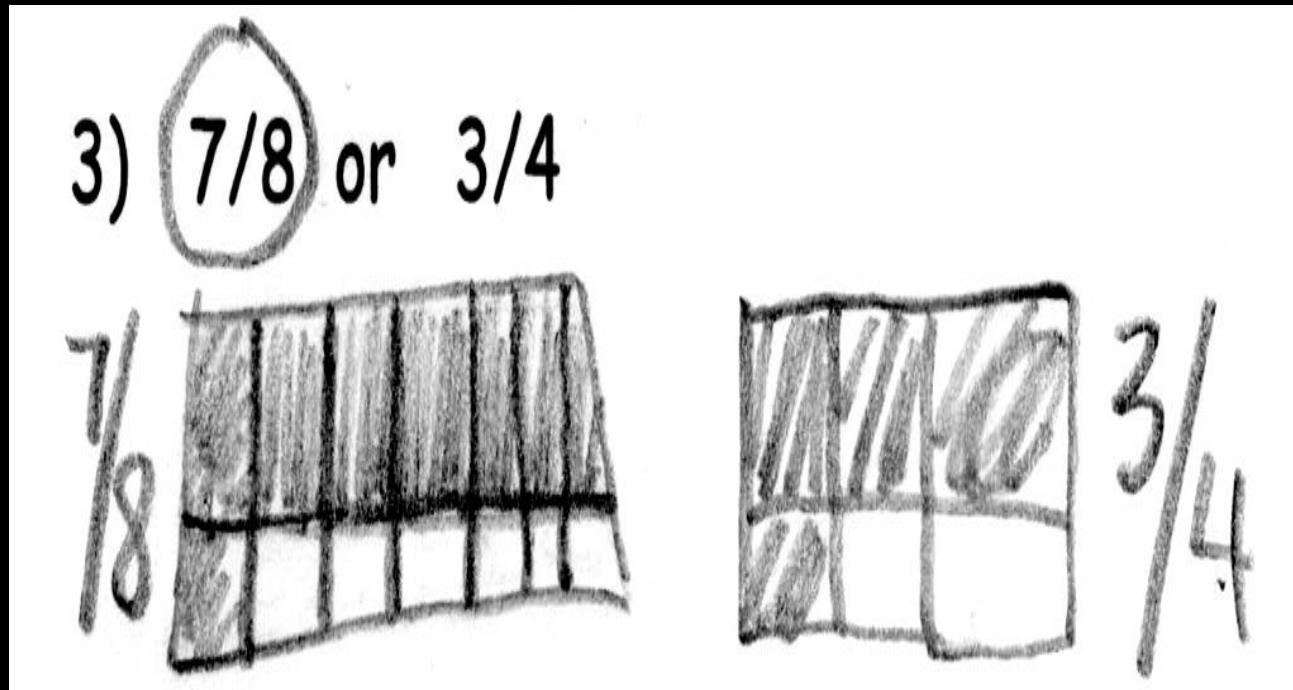
- Support the development of mathematics.
- Support the development of language.
- Enhance curriculum materials.
- Establish, facilitate, and maintain productive classroom interactions (e.g., peer interactions and participation in small group and whole class mathematical discussions as well as independent work).



Support the Development of Mathematics



Maria's Representations



The Mathematics

Maria



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Abigail's Struggle

Abigail





Support the Development of Language



Sara's Practice

Sara created an environment in which talk and listening are valued.

Sara immersed her students in an environment filled with words and interactions.

Sara supported students in academic language and conceptual development.



Sara's Practice

Sara:

- Spoke and wrote sophisticated words;
- Used these words frequently and in the context of solving problems; and
- Built meaning for these words.



Sophisticated Words

- ◆ Verify your results.
- ◆ Combine the areas.
- ◆ What does that number represent?
- ◆ Your work is deteriorating.
- ◆ Use your power of observation.
- ◆ Clarify this example.
- ◆ Next step, check conventions.
- ◆ This procedure does not help me find the missing leg.



Sara's Methods

- Sara's students hear words in the context of solving problems and see the words on the chalkboard and on written feedback.
- Sara uses important mathematical words frequently.



Frequent Use

Word	Number
Area	699
Congruent	143
Hypotenuse	44
Leg	442
Quadrilateral	27
Represent	78
Think	246
Triangle	456
Vertex	20



An Example

Emphasizing the meaning of roll



Strategies in the Research

Emphasize meaning and the multiple meanings of words—students may need to communicate meaning through using gestures, drawings, or their first language while they develop command of the English language and mathematics (Moll, 1988, 1989; Moschkovich, 2002).

Strategies in the Research

- Write essential ideas, concepts, representations, and words on the board without erasing so that students can refer back to it throughout the lesson (Stigler, Fernandez, & Yoshida, 1996).
- Connect language with visual aids (e.g., pictures, tables, and graphs) (Khisty & Chval, 2002).

Strategies in the Research

- Use concrete objects, illustrations, gestures, and demonstrations in classroom conversations (Moschkovich, 2002; Raborn, 1995).
- Discuss examples of students' mathematical writing and provide opportunities for students to revise their writing (Chval & Khisty, 2009).

Listening

Sara develops an environment that values listening.

- Typically, students ignore their peers (Toma, 1991).
- Students look at their teacher when other classmates are speaking (Cazden, 1988).



Sara's Methods

- Sara modeled effective listening.
- She discussed effective features and the importance of listening.
- She explicitly talked about how to do it.
- She made students responsible for articulating reasoning and for working hard to understand the reasoning of others.



Establish, facilitate, and
maintain productive
classroom interactions



Sara and Courtney

- Established Conditions for Success
 - As Individuals, in Pairs, and in Whole Class
 - Eliminated Peer Domination
 - Used Strategic Partnering



Peer Interactions

I could show you endless videos that capture unproductive partner work. For example, the ELL's partner:

- was disrespectful or just down-right mean.
- ignored the ELLs' questions or requests.
- did the math work for the ELL.
- did not understand the ELLs' mathematical misconceptions.



How do you establish a classroom climate
where students know how to compliment
one another?



October 14

Asking Alfredo's Permission

Alfredo One View

Alfredo a Different View



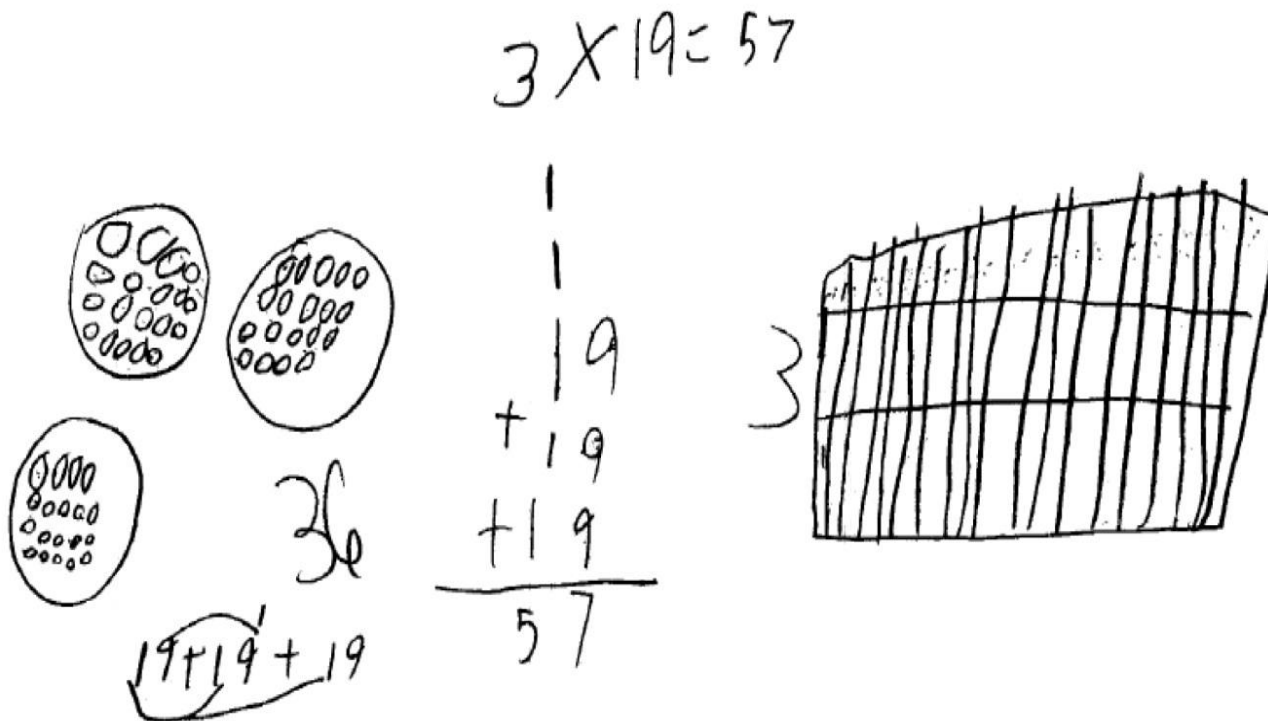
A Teacher's Struggle

“Like physically he was wanting—like if he could have had something to just cover himself up he would have. And I—I thought ok well last year I didn’t want to ask these children [the Latino ELLs] well I would have said that’s fine, you stay hiding. And I—I cannot—I—I—I just refuse to do that now and so I am going to be as encouraging as I can, I cannot let him do that. And so...if he’s got something right we are just going to maximize his experiences and he’s just going to have to come out of hiding.”



Alfredo's Work

1. There are 3 baskets of puppies. There are 19 puppies in each basket.
How many puppies were there in all? 57



December 16

Alfredo



Alfredo Math Test

	Pre-test	Post-test
English	19% $\left(\frac{4}{21}\right)$	95% $\left(\frac{20}{21}\right)$
Spanish	33% $\left(\frac{7}{21}\right)$	86% $\left(\frac{18}{21}\right)$

21 Item Test

11 Multiplication items

4 Division Items

6 Fraction Items




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Stop what you
are doing. You
need to hear
from Lupita



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Enhance Mathematics Curriculum Materials



Strategies in the Research

- Connect mathematics with students' life experiences and existing knowledge (Barwell, 2003; Secada & De La Cruz, 1996).
- Create classroom environments that are rich in language and mathematics content (Anstrom, 1997).

Curricular Enhancements

- Used contexts that were familiar to children or built meaning for those contexts
- Used contexts for a significant period of time
- Summarized different meanings for words
- Emphasized the specific meaning for mathematical context (e.g., round)



Different Problem Situations Involving Remainders

- **Balloon Task**

- A mother had 20 balloons. She wanted to give them to her 3 children so that each child had the same number of balloons. How many balloons will each child get?

- **Bird Task**

- A pet store owner had 14 birds and some cages. She will put 3 birds in each cage. How many cages will she need to use?

- **Cookie Task**

- A father had 17 cookies. He wanted to give them to his 3 children so that each child has the same amount of cookies. How many cookies will each child get?



Excerpt 1 – Introducing the Context of the Mathematical Problems

Balloons



Excerpt 3 – R is for Remainder

- Introduces handout students will use with their partners
- Recognizes students have written number sentences during their elementary years but not involving remainders
- Uses a number sentence involving remainders
 - Discuss the symbol for remainder (i.e., the capital letter R)
- Draws students' attention to the symbol by posing a question



Curricular Enhancements

- Focused on problematic language
- Used visual images and models
- Emphasized mathematical representations and connections among pictures, physical models (i.e., T-shirts), mathematical tools (i.e., place value blocks), and numerals.
- E.g., Crayon Factory, Chocolate Factory, Dollar Store



Lesson from Curriculum Materials

Select an up coming lesson in your book.

1. What specific words may be problematic for ELLs?
2. Which specific contexts may be problematic for ELLs?
3. How could you enhance the lesson for ELLs?



Would you say your Latino students are participating more this year?

Beth: I hope my teaching. I think they feel more comfortable in my classroom. I know that I have used them a lot as examples and they've come up to the board and explained things and I feel like that's just made them grow as a student and helped them blossom out and continue learning and so I feel like that should have something to do with it. They feel comfortable.



Beth's Reflection

Beth: At the beginning I didn't really expect a lot from Javier just because he was so quiet and I wasn't really sure if he knew what was going on for the most part... I never imagined that he would be able to be one of the students that I am going to ask to help other students.



A Change in Thinking

Chval: Why?

Beth: I think that's because of him being Hispanic. I have never had a [Latino] student in my room be able to do that.

Chval: What do you learn from this?

Beth: "That I am wrong."





Talk with Others

What do you see as the greatest challenge in facilitating the participation of all students?

Write Yourself a Note on an Index Card.



Thank you!

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