

Equitable and Ambitious Teaching of Mathematics

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Plan

- Rights of the learner
- Jennifer Kick's Class
- Situated Mediate Identity Theory
- Shalunda Schackelford's Class
- Equitable & Ambitious Teaching
- Closing and Wrap-up

“Truly Wonderful and Getting Better”



Four Rights of the Learner in the Mathematics Classroom

1. **The right to be confused and to share their confusions with each other and the teacher** (Productive struggle and perseverance).
2. **The right to claim a mistake.** Making mathematical errors is part of the learning process. Student should explore for themselves the boundaries and assumptions of their own understanding about mathematics
3. **The right to speak, listen and be heard.** Teachers must create structures to engage in conversations, ask questions, share ideas, and listen to the thinking of others.
4. **The right to write, do, and represent only what makes sense to you.** The use of representation is about sense-making and students should justify their representation, thinking, and solution strategies.

Kalinec-Craig, C. A. (2017). The Rights of the Learner: A Framework for Promoting Equity through Formative Assessment in Mathematics Education. *Democracy and Education*, 25 (2), Article 5. URL: <https://democracyeducationjournal.org/home/vol25/iss2/5>

Jennifer Kick's Class

- Teacher: Jennifer Kick
- First Grade
- Whole Number Story Problem
 - Mrs. Kick bought 4 seed packets. Each packet contains 11 seeds. How many seeds did she buy in all?

Jennifer Kick's Class

- Write the ways you notice students (individually and collectively) are participating (3 to 5 notices).
- How do the forms of participation move the students forward in their thinking about the mathematics?
- In what ways does the teacher use the forms of participation in her teaching practices?

Jennifer Kick

- Ms. Kick has 4 seed packets there are 11 seeds in each packet. How many seeds does she have in all?
 - First Grade
 - March of the School Year
 - 22 students

Jennifer Kick's Class



Reflect & Discuss

Positioning students as participatory is a way of positioning them as competent.

- What does the statement mean in the context of Jenn's class?

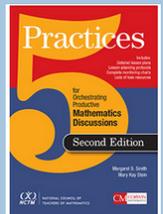
Identity & Positioning

Jennifer Kick positioned her students as capable contributors to mathematical discussions.

- Questions or compliments
- Status
- Participatory

Orchestrating Productive Mathematics Discussions

1. **Anticipating** likely student responses to challenging math task
2. **Monitoring** students' actual responses to the task (while students work on the task)
3. **Selecting** particular students to present their mathematical work during whole group discussion
4. **Sequencing** student responses that will be displayed in a specific order
5. **Connecting** different students' responses and connecting to key mathematical ideas.



Situated-Mediated Identity

The situated-mediated identity framework:

1. Situated Identity
2. Positionality
3. Agency (Murrell, 2007, 2009).

Situated Identity

- Situated identity implies that our identities are fluid and situationally determined.
- Students identities are mediated from classroom to classroom
 - Socially & Emotionally Safe Environments
 - Different situations elicit different modes of interactions and behaviors.

Mathematical Identity

Aguirre, Mayfield-Ingram, and Martin (2013) define mathematical identity “as the dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the contexts of their lives” (p. 14).

Positionality

- Positionality refers to the tension between individual representations of self and the ascriptions made of the individual by wider society.
- How individuals are positioned in a context depends on both the way they wish to be represented and their perceptions of how others view them.
 - In mathematics, I assume all students want to be positioned as “smart.” How do our instructional practices position students as smart?

Mathematical Agency

- Agency refers to the expression of one's identity (Murrell 2007).
 - Agency is one's identity in action.
- In mathematics classrooms, agency is expressed in the ways that students engage in **productive struggle, take risks to make their mathematical thinking visible, and understand that learning results when they successfully leverage an approach that works for them.**

Authority

Too often, authority in mathematics classrooms lies primarily with the teacher or curriculum in which students are **compelled to accept without question the mathematical ideas and understandings of these resources.**

Students rarely develop their own ideas, engage in discourse in which ideas are exchanged, or question the reasoning of the ideas presented to them.

Authority

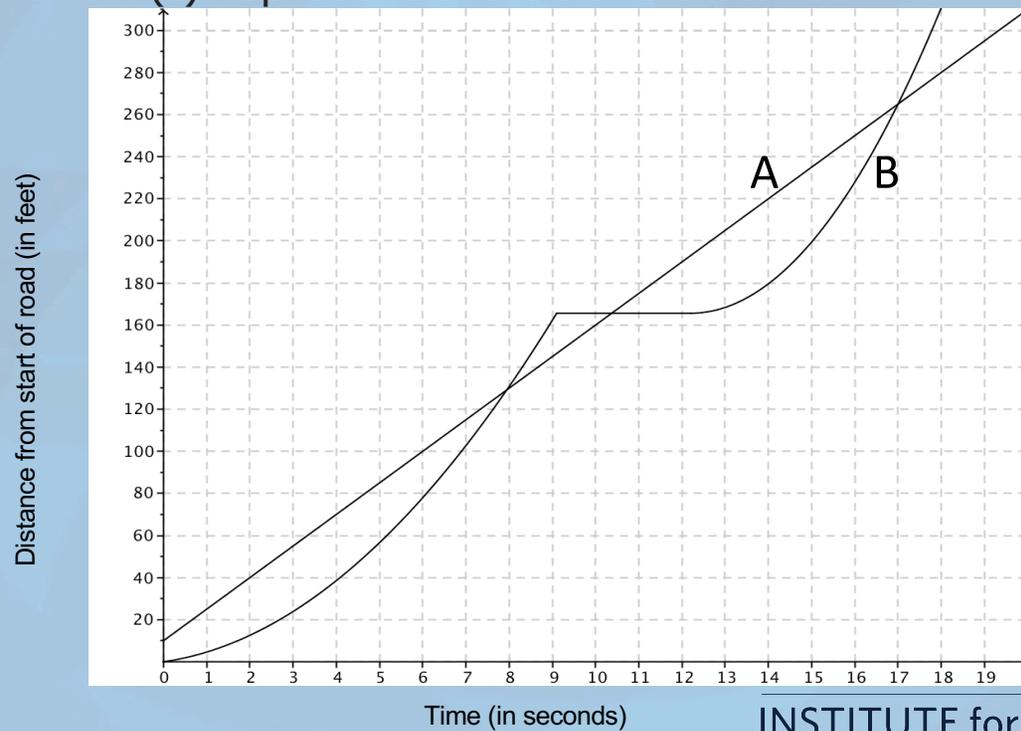
In classrooms where authority is shared, we find that teachers create opportunities for **students to take ownership of their ideas and question the reasoning of concepts presented**, resulting in students with a shared understanding of the mathematical ideas and a positive identification with mathematics.

Shalunda Shackelford

- School: Tyner Academy
- Teacher: Shalunda Shackelford
- Class: Algebra 1
- Curriculum: IFL Lessons *Creating and Interpreting Functions*
- Class Size: 26
- At the time the video was filmed, Ms. Shackelford was a teacher at Tyner Academy in the Hamilton County School District. The lesson occurred in April in an Algebra 1 class.

Bike and Truck Task

A bicycle traveling at a steady rate and a truck are moving along a road in the same direction. The graph below shows their positions as a function of time. Let $B(t)$ represent the bicycle's distance and $K(t)$ represent the truck's distance.

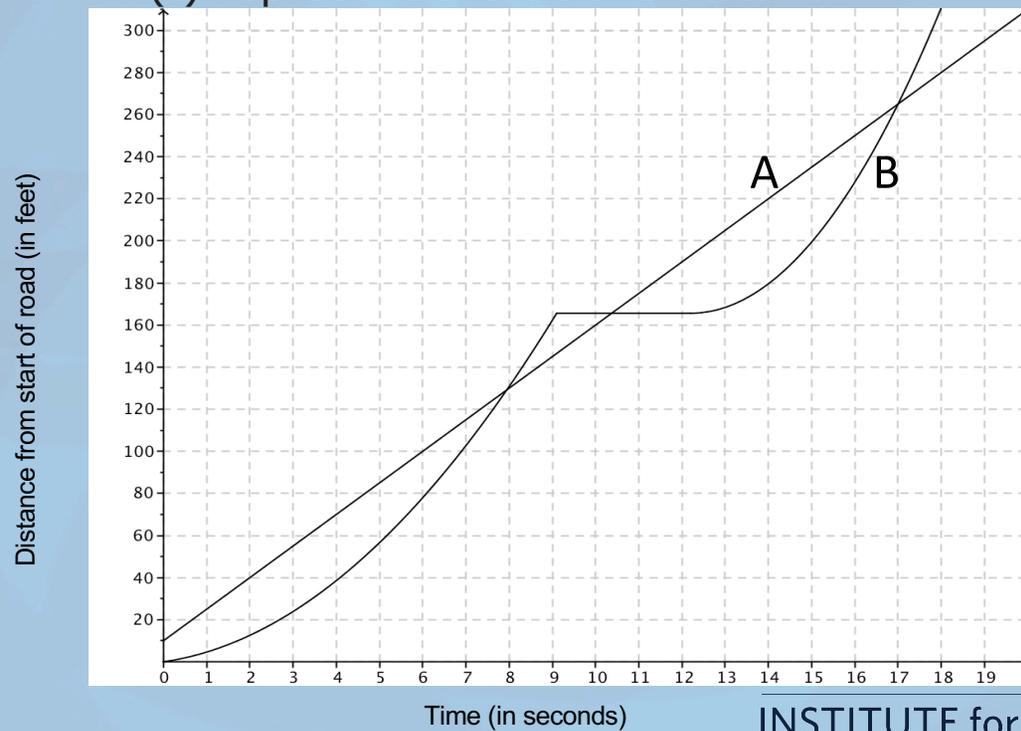


Bike and Truck Task

1. Label the graphs appropriately with $B(t)$ and $K(t)$. Explain how you made your decision.
2. Describe the movement of the truck. Explain how you used the values of $B(t)$ and $K(t)$ to make decisions about your description.
3. Which vehicle was first to reach 300 feet from the start of the road? How can you use the domain and/or range to determine which vehicle was the first to reach 300 feet? Explain your reasoning in words.

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Ms. Shackelford

- During the video
 - Write the ways you notice students are participating.
- After the video
 - How do the forms of participation move the students forward in their thinking about the mathematics?
 - In what ways does the teacher use the forms of participation in her teaching practices?

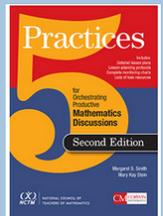


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Reflect & Discuss

Imagine this same task unfolding in a different classroom in which the discussion is not orchestrated in such way that students can come to understand the connections among their reasoning.

- How might Jacobi and Charles' identities be similar or different in other classrooms?
- Discuss Ms. Shackelford's instructional routines as supportive of mathematical identities.

Reflect & Discuss

Positioning students as participatory is a way of positioning them as competent.

- What does the statement mean in the context of Ms. Shackelford's class?
- When and where are students' positioned as smart or brilliant?

Math, Men, & Mission

Teachers are identity builders who position learners as being mathematically and socially competent by creating time and space for learners demonstrate their agency.



Summer 2016

Mathematics Teaching Practices

NCTM identified a core set of eight research-informed effective teaching practices in *Principles to Actions: Ensuring Mathematical Success for All* (NCTM 2014).

Mathematics Teaching Framework

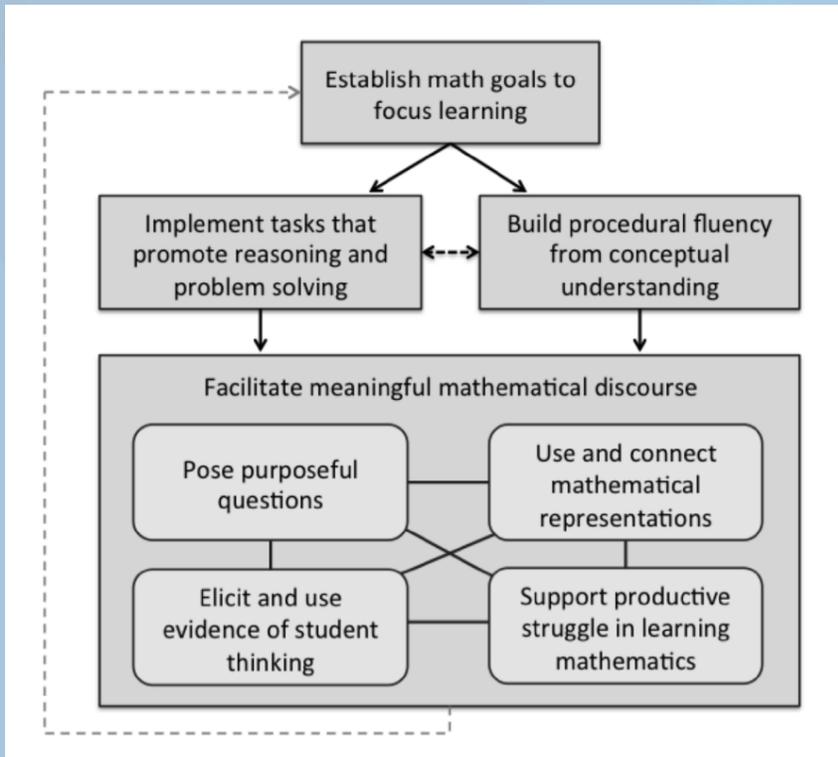
While the list provides a common professional language for discussing important elements of teaching, it is the interconnections among the teaching practices that support equitable teaching.

Mathematics Teaching Framework

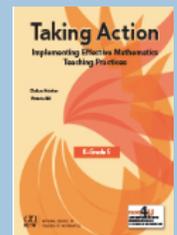
The authors of the *Taking Action* Series developed the Mathematics Teaching Framework diagram to illustrate how the eight teaching practices form a coherent framework for equitable and ambitious teaching of mathematics (Boston, Dillon, Smith, and Miller 2017, p. 215; Huinker and Bill 2017, p. 245; and Smith, Steele, and Raith 2017, p. 194)



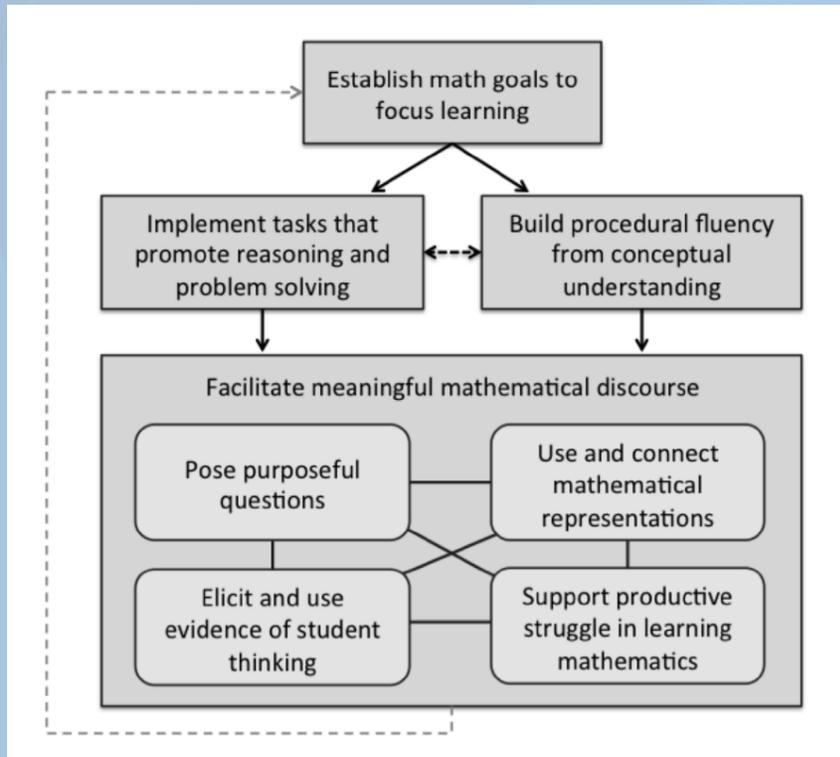
Effective Teaching Practices



- The eight effective mathematics teaching practices are a **coherent and connected set of instructional pedagogies** that when implemented together create a classroom learning environment that supports the vision of mathematics teaching and learning advocated by NCTM.



Effective Teaching Practices



- Ambitious teaching requires thoughtful and thorough lesson planning that is driven by clear mathematics goals for student learning and demands considerable thought in anticipating what students are likely to do in response to a task and what teachers can do and provide as supports to ensure students wrestle productively with the challenging mathematical aspects of a task.
- Instruction must be equitable by ensuring each and every student learns mathematics with deep understanding.

Equitable Mathematics Teaching

Equitable mathematics teaching provide every student with access to meaningful mathematics by:

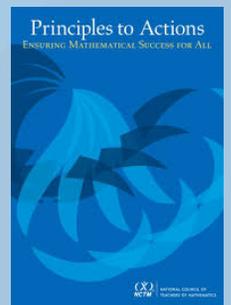
- leveraging students' strengths,
- situating students as mathematical competent,
- drawing on students as resources of knowledge, and
- challenging spaces of marginality.

Equitable Mathematics Teaching

Classroom communities of collaboration and coherent discourse position each and every student to make sense of mathematics and develop positive mathematics identities.

Eight Mathematics Teaching Practices

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.



Equitable & Ambitious Teaching

- 1. Establish mathematics goals to focus learning.** Establishing **norms for participation** involves creating structures to position each and every student as a full participant in mathematics and recognizing that **participation builds agency**.
- 2. Implement tasks that promote reasoning and problem solving.** Tasks that require reasoning, problem solving, and modeling result in a **positive orientation toward mathematics** and oneself as a **doer of mathematics**.
- 3. Use and connect mathematical representations.**
 - The use of **multiple representations** allows students to **draw on multiple sources of knowledge**.
 - Drawing on **multiple sources of knowledge** acknowledges the mathematical, social, and cultural resources that students bring to mathematics.
- 4. Facilitate meaningful mathematical discourse.** Through discourse, students realize that their **work and thinking serve an important role** in the study of mathematics, thus positioning themselves and others as mathematically competent and reducing hierarchical status in mathematics classrooms.

Equitable & Ambitious Teaching

5. **Pose purposeful questions.** Students who are consistently asked questions requiring them to **explain their reasoning are positioned differently** from students who are consistently asked questions **not requiring explanation.**
6. **Build procedural fluency from conceptual understanding.** Mathematics instruction that focuses **solely on memorization convey the message that mathematics is not about knowing and doing** but about memorizing.
7. **Support productive struggle in learning mathematics.**
 - **Grappling** with ideas provides opportunities for students to develop a **sense of agency** by taking ownership of their mathematical thinking.
 - Teachers allow time for students **to engage with mathematical ideas** and provide purposeful questioning to **support perseverance and identity development.**
8. **Elicit and use evidence of student thinking.**
 - Eliciting mathematical ideas from students who are perceived as always giving the **right answer positions correctness as more valuable than mathematical thinking.**
 - Teachers who make a practice of eliciting and using evidence of students' mathematical thinking **position each and every student as mathematically competent.**

Equitable & Ambitious Teaching

Eight Mathematics Teaching Practices

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Equitable Teaching Practices

1. Draw on students' funds of knowledge
2. Establish classroom norms for participation
3. Position students as capable
4. Monitor how students position each other
5. Attend explicitly to race and culture
6. Recognize multiple forms of discourse and language as a resource
7. Press for academic success
8. Attend to students' mathematical thinking
9. Support development of a sociopolitical disposition

| Equitable Practices | Examples of the Practices |
|---|--|
| 1. Draw on students' funds of knowledge | <ul style="list-style-type: none"> • Build on community and cultural knowledge and practices • Recognize students' cultural and linguistic resources • Have robust knowledge of students, validate shared ideas and experiences, and connect instruction to students' experiences and interests |
| 2. Establish classroom norms for participation | <ul style="list-style-type: none"> • Recognize that student voice has implications for power and authority and builds agency • Set up and guide discussions so that students from nondominant backgrounds develop strong mathematical identities • Connect pedagogical practices to student participation • Question whose participation norms are valorized |
| 3. Position students as capable | <ul style="list-style-type: none"> • Construct social structures that enable students to “develop strategies that help maintain certain positions and reduce others” • Challenge and counteract societal stereotypes and inequities to which students and communities are subjected • Attend to how the curriculum may influence perceptions of students • Share power in the classroom by allowing students to provide meaningful input in making decisions about classroom practices, curriculum, and assessment |

| Equitable Practices | Examples of the Practices |
|--|---|
| 4. Monitor how students position each other | <ul style="list-style-type: none"> • Assign competence to support students' repositioning of one another • Attend to reification of existing status structures so as to reposition some students with their peers • Position students to use one another as mathematical resources |
| 5. Attend explicitly to race and culture | <ul style="list-style-type: none"> • Make connections to students' mathematical, racial, and cultural identities • Recognize that certain groups have been positioned as anti-intellectual |
| 6. Recognize multiple forms of discourse and language as a resource | <ul style="list-style-type: none"> • Facilitate respect among students by cultivating culturally responsive relationships among students and validating possible differences in their language practices • Co-construct resources with students in moment-to-moment interactions around mathematics • Consider linguistic choices and acknowledge home language as a valid language of mathematics • Bridge language practices through affirming students' home languages, modeling code switching, and fostering interactional patterns familiar to students |

| Equitable Practices | Examples of the Practices |
|---|---|
| 7. Press for academic success | <ul style="list-style-type: none"> • Assess student learning, build on student strengths, explicitly communicate expectations for students, and communicate the teachers' responsibility in student success • Have high academic expectations while maintaining students' cultural and psychological well-being rather than accept deficit views about students' intellectual potential |
| 8. Attend to students' mathematical thinking | <ul style="list-style-type: none"> • Recognize, understand, and build from children's understanding of mathematics • Respond to developmental needs so as not to expect a student to do mathematics they are not developmentally ready for |
| 9. Support development of a sociopolitical disposition | <ul style="list-style-type: none"> • Incorporate critical texts, discuss controversial topics, serve the community, and allow social issues to drive instruction • Provide opportunities to explore sociopolitical topics using mathematics • Engage students in conversation about real-world problems and how mathematics can be used to examine them |

Framing Identity, Positionality, and Agency

Tasks supporting Impasse

Decision-making

Multiple Entry Points

Instructional Routines

Noticing & Wondering

Rough Draft Talk

Two drafts/One Sheet

5 Practices for Orchestrating Productive Discourse

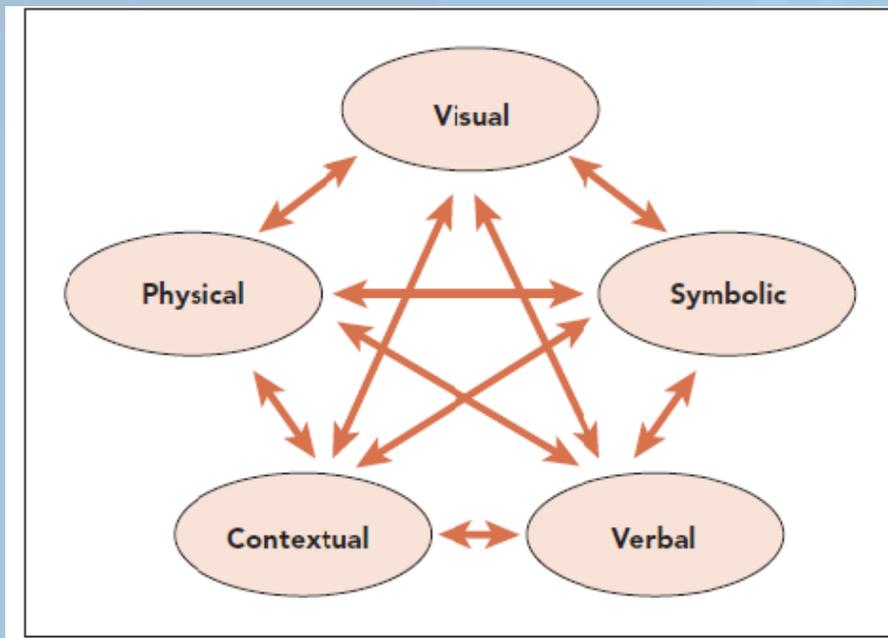
Identity, Agency, & Positionality

Risk-taking

Competence

Affirming Identities and Positionality

Representations (Think Rights of Learners)

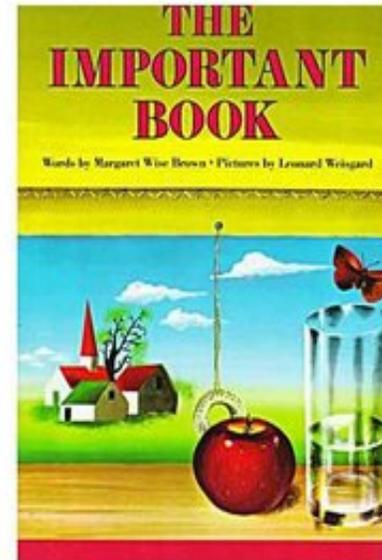


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The Important Book

- The important thing about rain is that it is wet.
It falls out of the sky,
and it sounds like rain,
and makes things shiny,
and it does not taste like anything,
and is the color of air.
- But the important thing about rain is that it is wet.

Margaret Wise Brown, *The Important Book*



The Important Thing

The important thing about identity, agency & positionality is

-
- Really great detail #1
 - Really great detail #2
 - Really great detail #3

But the most important thing about identity, agency & positionality is _____