ATTENDING TO EQUITY IN MATHEMATICS: POLICIES, PRACTICES AND BELIEF SYSTEMS

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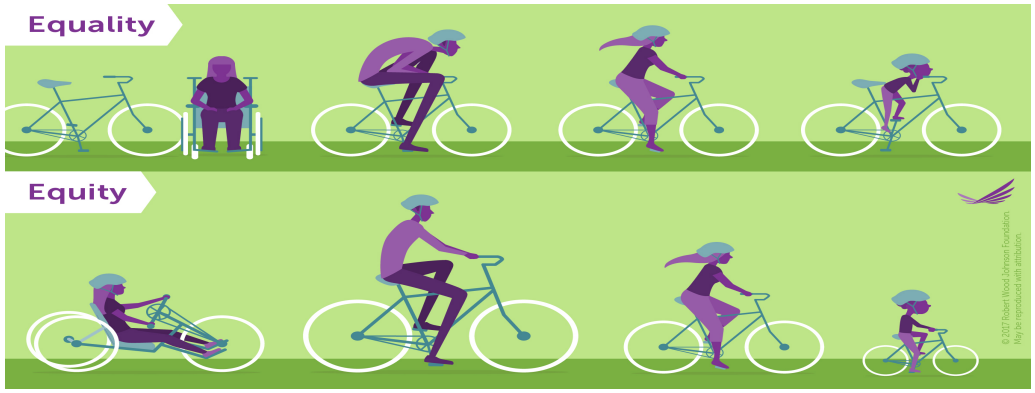
PRE-SERVICE TEACHERS PERSPECTIVES OF EQUITY

- What is equity?
- What are your beliefs about equity?
- What are instructional practices that can be used to promote equity?
- What policies impact equity?



WHAT IS EQUITY?

- "**Fairness** through **making accommodations** for those that need them to ensure they have proper treatment" (PST 3)
- "Equity is making sure that everyone gets the **same opportunities** and is **not left out**." (PST 11)
- "Equity is the making **instruction available to all students** regardless of handicap, ethnicity, sexual orientation, gender identity, or otherwise noted differences. Equity means students that need **additional services** are accommodated as opposed to ignored." (PST 14)

WHAT ARE YOUR BELIEFS ABOUT EQUITY?

- "There is **not enough of it in society** and **it is important** to have especially in schools" (PST 3).
- "My belief is that **everyone should have equitable opportunities to succeed**. Especially since **our country is so diverse** in many ways." (PST 12)
- "I believe that equity is **extremely difficult to achieve**…I believe that educational **research should be readily available for educators** to access to better educate themselves on equitable practice. I also believe that educators have a duty to **continually reassess their beliefs** in practicing equity within the classroom as well as reeducating themselves on equitable strategies so that every student receives the education they are entitled to." (PST 14)

WHAT ARE INSTRUCTIONAL PRACTICES THAT CAN BE USED TO PROMOTE EQUITY?

- **"stations**, **Popsicle sticks** with students names on them" (PST 5)
- "**Progress tracking** rather than performance testing" (PST 7)
- "**Heterogeneous grouping, accommodations** for disabilities, giving students benefit of the doubt in an ethical manner, **treating all students with dignity and respect** no matter who they are or where they come from" (PST 12)

WHAT POLICIES IMPACT EQUITY?

- "Policies that **reward schools with better scores**. This **causes the current students to be rewarded or punished** for previous students performance." (PST 9)
- "Policies such as having to have **written scripts on videos** that are shown in classes for students who have hearing impairments. This is **an example of a good policy**. Policies regarding **school funding and state testing also have an impact on equity**." (PST 10)
- "A policy that impact equity include the **Fourteenth Amendment** that require equal citizen rights regardless of race, culture, or gender which directly affect educational opportunity. Another policy that impacts equity includes **IDEA** which requires schools to accommodate for physical, mental, and learning disabilities." (PST 14)

OUTLINE

- Review policies related to equity
- Examine beliefs and implicit biases that can impact equitable opportunities in mathematics teaching and learning
- Identify strategies that can promote equity

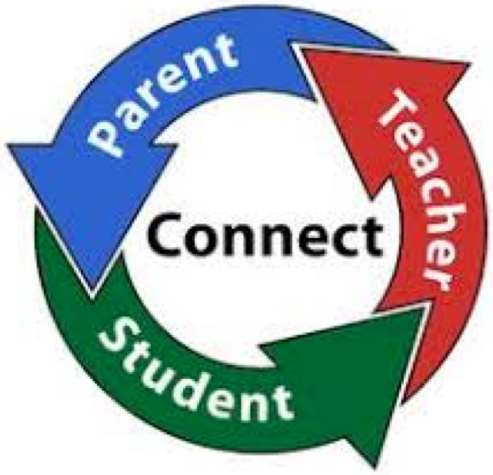
FEDERAL POLICIES THAT PROMOTE EQUITABLE OPPORTUNITIES

Funds

- The Elementary and Secondary Education Act
- Title I

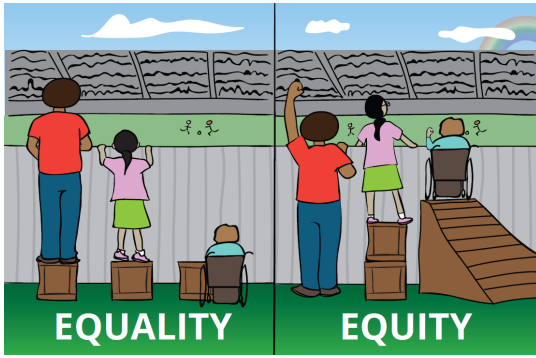
Fairness

- Individuals with Disabilities Education Improvement Act (IDEA)
- McKinney-Vento Homeless Assistance Act



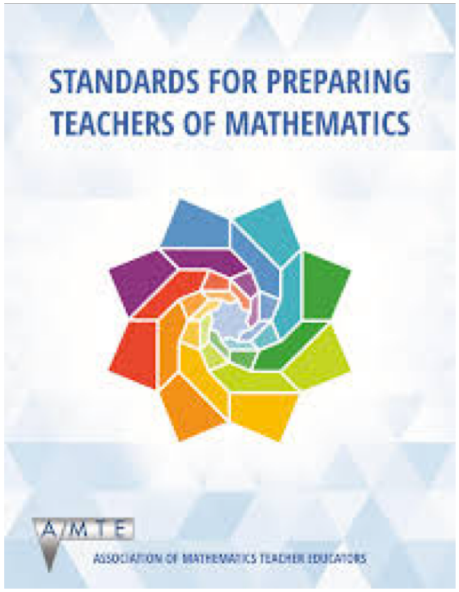
AMTE POSITION: EQUITY IN MATHEMATICS TEACHER EDUCATION (2015)

The Association of Mathematics Teacher Educators (AMTE) defines **equity as access to high quality learning experiences; inclusion for all learners,** mathematics educators, and mathematics teacher educators; and r**espectful and fair engagement with others** (university colleagues, pre-service and in-service teachers, future teacher educators, and P-12 students). This means **actively working toward a more just and equitable mathematics education free of systemic forms of inequality** based on race, class, language, culture, gender, age, sexual orientation, religion, and dis/ability.



https://amte.net/sites/default/files/amte_equitypositionstatement_sept2015.pdf

AMTE (2018) STANDARDS FOR PREPARING TEACHERS OF MATHEMATICS

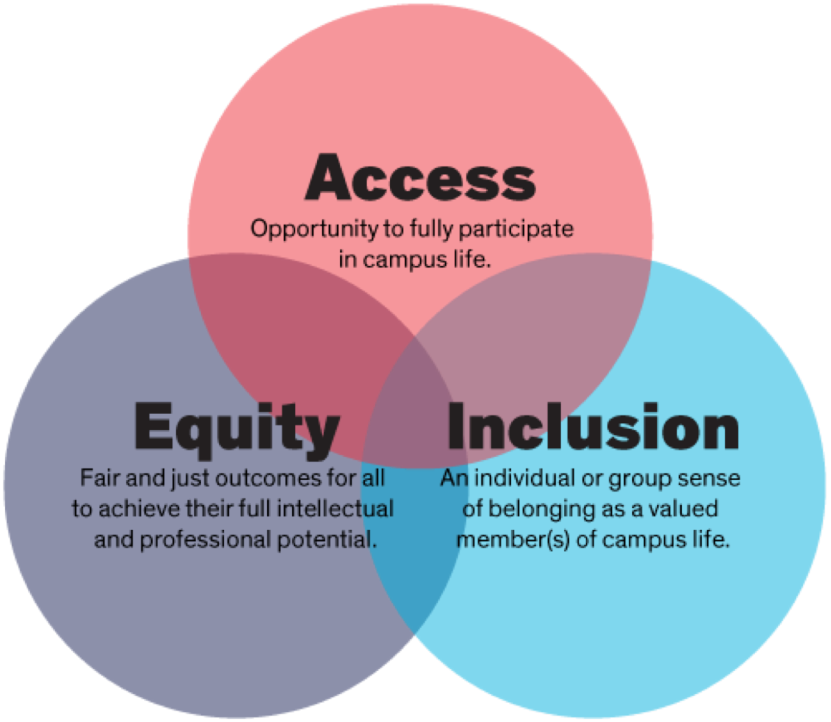


Indicator C.2.1. Promote Equitable Teaching Well-prepared beginning teachers of mathematics structure learning opportunities and use teaching practices that provide access, support, and challenge in learning rigorous mathematics to advance the learning of every student.

NCTM (2014) ACCESS AND EQUITY IN MATHEMATICS EDUCATION

Achieving access and equity requires that all stakeholders—

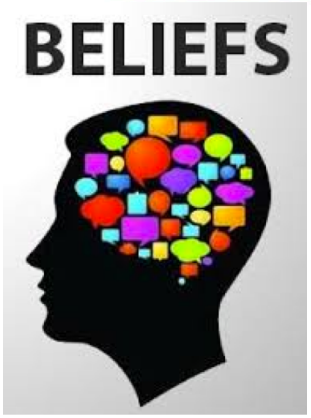
- Ensure that all students have **access to a challenging mathematics** curriculum, taught by skilled and effective teachers who differentiate instruction as needed;
- **Monitor student progress** and make needed accommodations; and
- **Offer remediation** or additional challenges when appropriate.

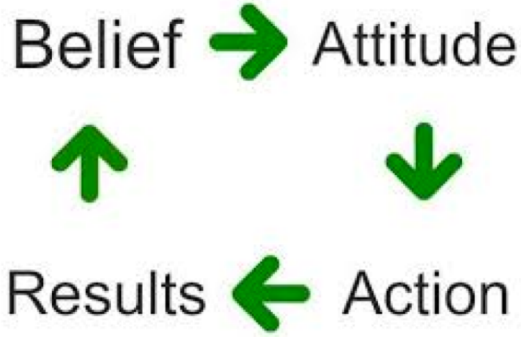


8 Mathematics Teaching Practices (NCTM, 2014)	5 Equity Based Teaching Practices (Aguirre, Ingram & Martin, 2013)	Social Justice Goals (Gutstein, 2006 & 2012)	Culturally Relevant Teaching Components (Ladson-Billings, 2017)
1. Establish mathematics goals to focus learning. 2. Implement tasks that promote 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.	1. Go deep with Mathematics. 2. Leveraging multiple mathematical competencies. 3. Affirm mathematics identities. 4. Challenge spaces of marginality (students' experiences and knowledge are legitimate). 5. Draw on multiple resources of knowledge (math, language, culture, family…).	1. Start slowly and be patient with yourself and students. 2. Engage students in critical mathematics through a pedagogy of questioning. 3. Incorporate students' life experiences directly into the curriculum. 4. See and encourage students to see mathematics in life daily. 5. Help students to develop sociopolitical consciousness. 6. Facilitate student's development of mathematical power (as defined by NCTM (2000). 7. Use problems that motivate students to study and use mathematics. 8. Cultivate students' development of a sense of agency.	1. Student Learning – Demonstrate growth in requisite subject areas. 2. Cultural Competence- Firm grounding in one's culture of origin while acquiring fluency in a least one more culture. 3. Socio-Political Consciousness –Learning to use school knowledge to solve relevant social, cultural, civic, environmental, and political problems.

BELIEFS SURVEYS

- Teaching and Learning Belief Survey (NCTM)
- Common Beliefs Survey (Teaching Tolerance)
- Self Assessment Survey for district administrators, teachers, and students (Colorado Department of Education and the Office of Language, Culture and Equity)
- Project Implicit (religion, sexuality, disability, race, etc., Harvard University)





Beliefs about Teaching and Learning Mathematics

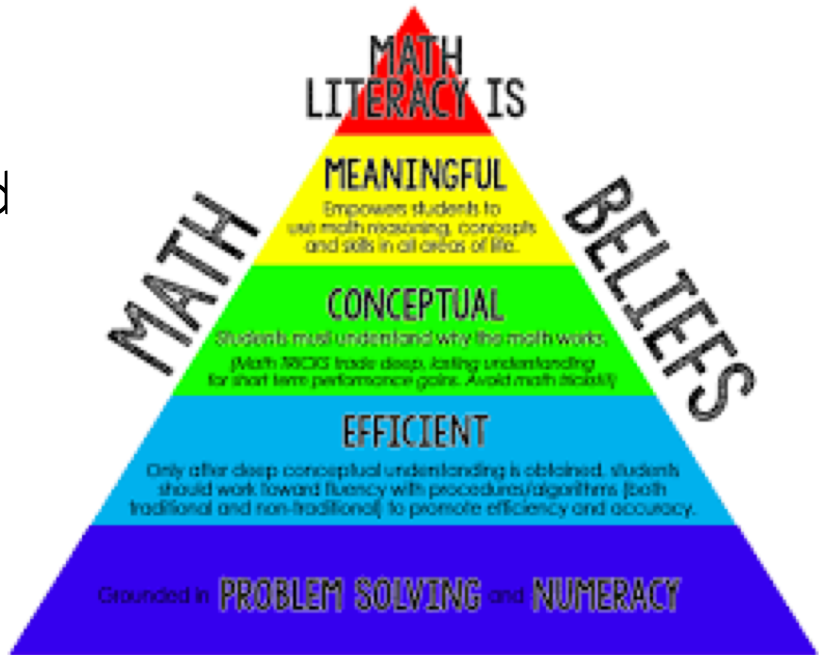
NCTM (2014) Principles to Action, Ensuring Mathematics Success for All, p 11

Unproductive beliefs	Productive beliefs
Mathematics learning should focus on practicing procedures and memorizing basic number combinations.	Mathematics learning should focus on developing understanding of concepts and procedures through problem solving, reasoning, and discourse.
All students need to learn and use the same standard computational algorithms and the same prescribed methods to solve algebraic problems.	All students need to have a range of strategies and approaches from which to choose in solving problems, including, but not limited to, general methods, standard algorithms, and procedures.
Students can learn to apply mathematics only after they have mastered the basic skills.	Students can learn mathematics through exploring and solving contextual and mathematical problems.
The role of the teacher is to tell students exactly what definitions, formulas, and rules they should know and demonstrate how to use this information to solve mathematics problems.	The role of the teacher is to engage students in tasks that promote reasoning and problem solving and facilitate discourse that moves students toward shared understanding of mathematics.
The role of the student is to memorize information that is presented and then use it to solve routine problems on homework, quizzes, and tests.	The role of the student is to be actively involved in making sense of mathematics tasks by using varied strategies and representations, justifying solutions, making connections to prior knowledge or familiar contexts and experiences, and considering the reasoning of others.
An effective teacher makes the mathematics easy for students by guiding them step by step through problem solving to ensure that they are not frustrated or confused.	An effective teacher provides students with appropriate challenge, encourages perseverance in solving problems, and supports productive struggle in learning mathematics.

BELIEF DIMENSIONS

(STIPEK,GIVVIN, SALMON, MACGYVERS, 2001)

- Math as a set of operations versus a tool for thought
- Correct answers versus understanding as primary goal
- Teacher control versus some child autonomy in classroom lessons
- Entity versus incremental view of intellectual ability
- Extrinsic versus intrinsic motivation
- Confidence in teaching math
- Enjoyment of math



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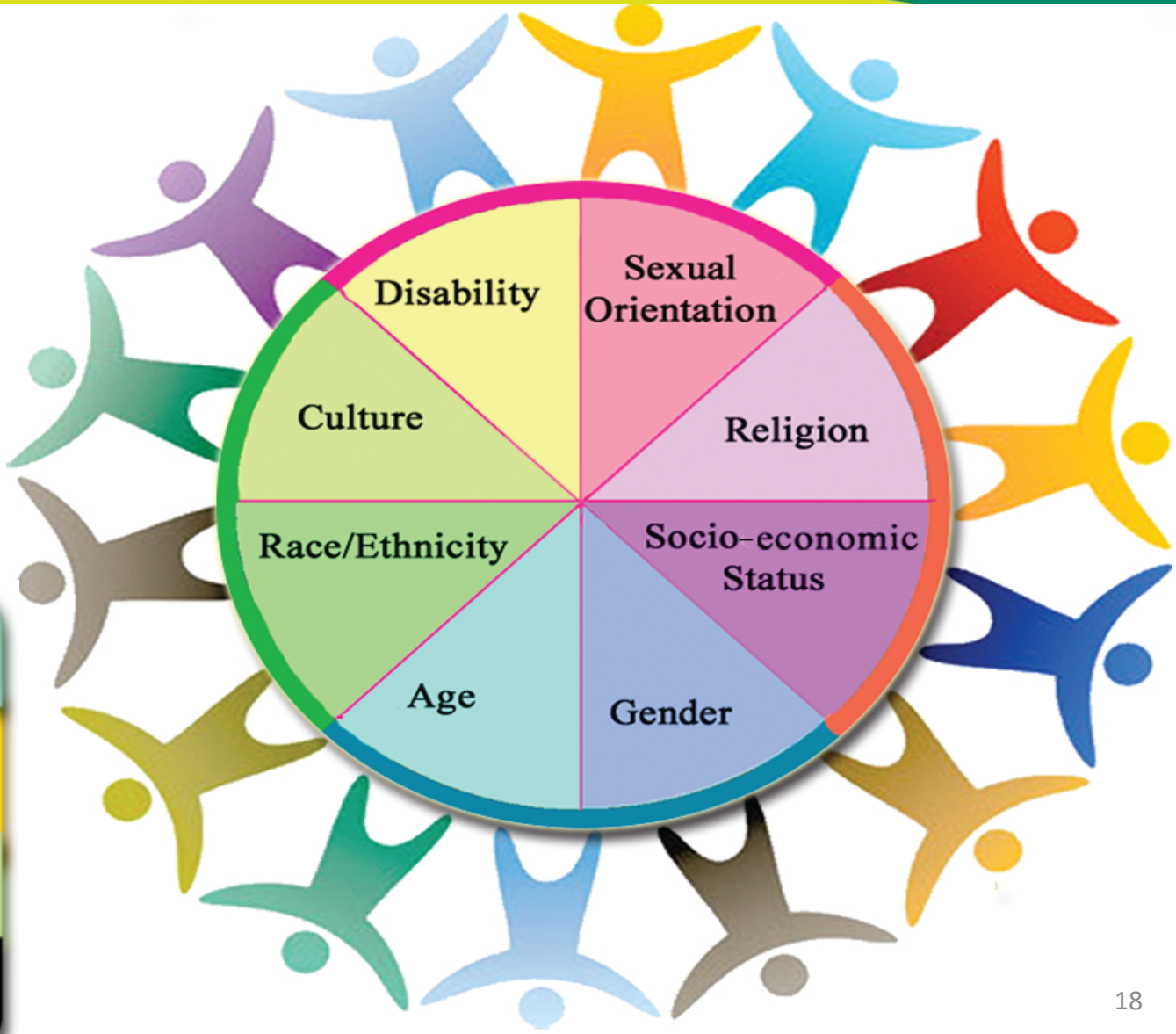
What are the implications of a teacher's belief on the teaching and learning of mathematics?

DIVERSE LEARNERS



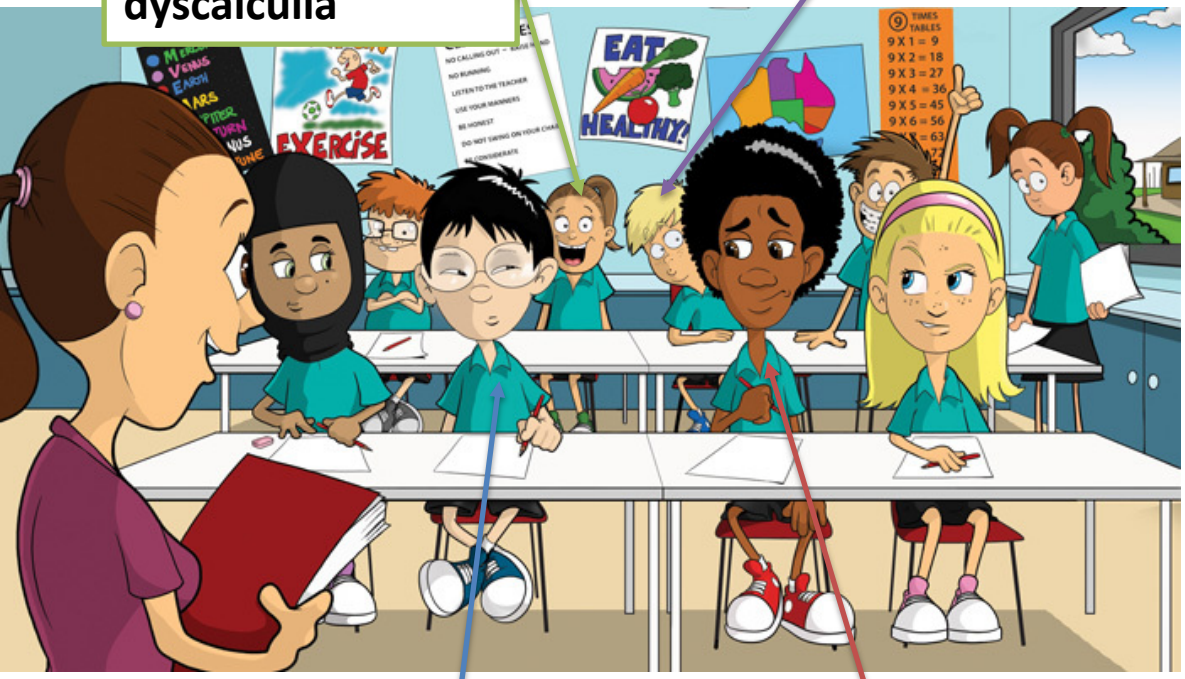
How do you attend to equity within your local setting?

ALGEBRA I

WHO'S IN THE CLASS?

Tina has dyscalculia

Ted wears a hearing aid



Daren is gifted but is not engaged

Huong is an ELL, from China

You are teaching a lesson on linear functions, and intend to assign this problem to your Algebra I class.

Sami installed a 6-foot-tall cylindrical storage tank to collect rainwater from the roof of her house. She used the rainwater to water the lawn and garden during dry spells. Sami recorded the rise in the water level in her storage tank after each of 3 rainstorms. Her results are shown in the table below.

Rainfall (in inches)	Rise of Water Level in Storage Tank (in inches)
1.5	24
0.5	8
2.5	40

Which is the best prediction of the rise of the water level, in inches, in her tank after a storm produced 2.25 inches of rain?

A. 16 inches B. 28 inches
C. 32 inches D. 36 inches

Figure 1. Sample Task 1 (FCAT; Florida Department of Education, 2011)

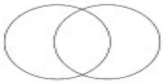
How would you attend to equity?

STRATEGIES TO ENGAGE STUDENTS

- Use body language, gestures, and expressions to convey a message that all students' questions and opinions are important
- Use cooperative learning structures
- Acknowledge all students' comments, responses, questions, and contributions
- Use students' real life experiences to connect school learning to students' lives
- Provide students with the criteria and standards for successful task completion
- Ask higher-order questions equitably of all students
- Provide multiple opportunities to use effective feedback to revise and resubmit work for evaluation
- Explain and model positive self-talk

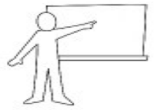
Engagement Strategies

GRAPHIC ORGANIZER
Choose a structure that will help kids compare, sequence, or organize ideas.



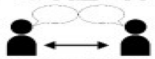
JIGSAW
Assign groups different chunks of information to learn and teach to others.

GALLERY WALK
Students show ideas or work on "wall." Groups rotate to discuss and leave feedback.



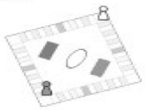
DEBATE
Provide two opposing views for students to choose from and defend.

THINK-PAIR-SHARE
Pose a question. Allow think time. Have students pair up, discuss and share out.

QUIZ-QUIZ-TRADE


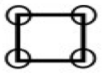
Give each student a question card. Students pair up, "quiz" each other, then trade cards and find a new partner.

GAMES
Use a game format such as Jeopardy, Taboo, or $25,000 Pyramid to review information.



GRAFFITI WALL
Display questions, work or images for groups to observe and discuss. Students rotate and leave written thoughts.

CORNER CALL
Each corner is assigned a response to a question. Students choose and move to their corner for discussion/sharing.



IN-OUT CIRCLE
Split class in half. One group is "inside circle" and other is "outside circle." Shift for new partners.

MIX TO MUSIC
Students move around while music plays and pair up when music stops. Easy for multiple pair ups.

LEARNING COACH


One student tries a skill while the other provides "coaching" and then partners switch.

MIRROR
Teacher acts out concept while students copy and/or repeat.

RATE IT
Partners or groups use rubric or checklist to discuss and rate work.

RESPONSE CARDS
Students hold up cards to show thinking (yes/no, true/false, etc.)

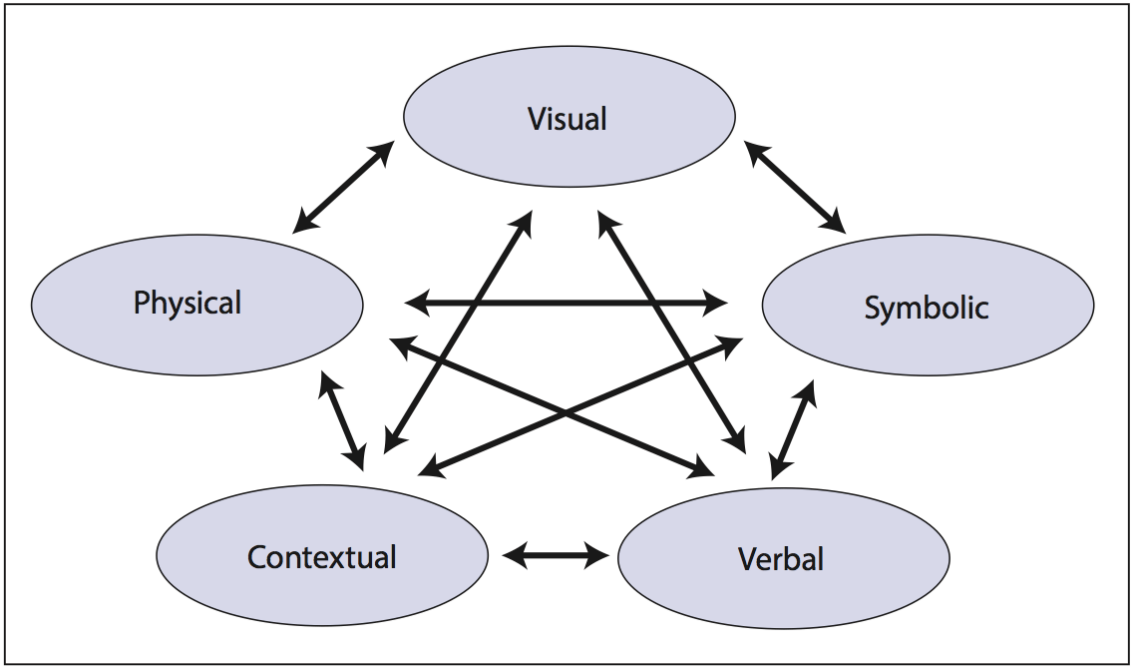
SIMULATION
Teacher provides real-world, interactive experience.

EXPERIMENT
Students test predictions with meaningful investigations.

SONG
Use music or song to learn or practice skills.

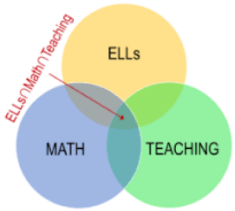
www.teachertrap.com

KINDS OF REPRESENTATIONS
PRINCIPLES TO ACTION



http://www.nctm.org/Conferences-and-Professional-Development/Principles-to-Actions-Toolkit/Equitable-Pedagogy/

STRATEGIES TO HELP ELLS AND IMMIGRANT STUDENTS



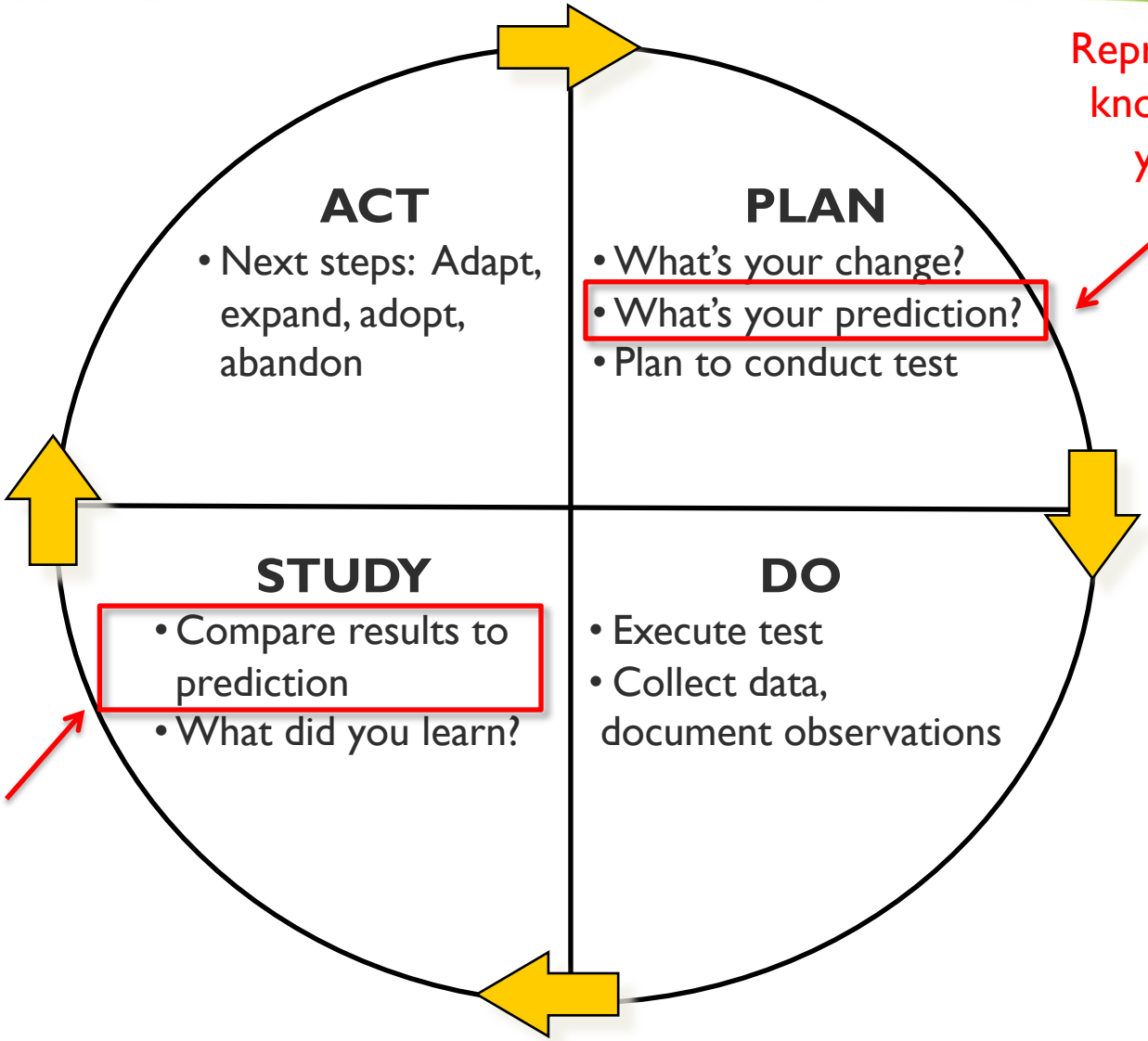
- **Read problems aloud, pausing after each sentence** to allow students time to think about what was said.

  After reading the original version, **restate a problem** to help students build their vocabulary and lighten the cognitive demands of the problem.

  Engage students in a **discussion of the cultural issues presented in a problem** rather than eliminating or ignoring the issues.
- **Use manipulatives to represent the mathematics** and help students explore **mathematical relationships**. **Encourage verbal discussions** as you work with the manipulatives **to link language to the mathematics**.
- Use gestures, facial expressions, and visuals to **provide cues** to the meaning of the problem or vocabulary.
- Encourage **peer-to-per assistance**, either pairing students with similar cultures or languages or pairing native English speakers with ELL and immigrant students.
- Encourage **students to create their own story** or work problems, embedding some element of their own culture.

Wilburne, J. M., Marinak, B. A., & Strickland, M. J. (2011). Addressing Cultural Bias. Mathematics Teaching In The Middle School, 16(8), 460-465.

USE PDSA CYCLES



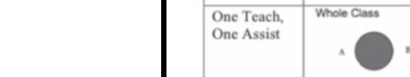
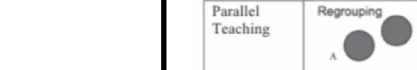
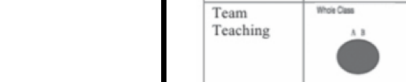
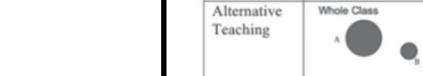
Represents current knowledge about your system

Reveals gaps in current understanding

CO-TEACHING STRATEGIES

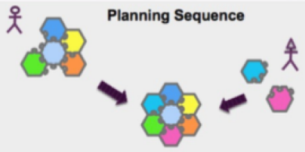
- One Teach, One Observe
- One Teach, One Assist
- Station Teaching
- Parallel Teaching
- Team Teaching
- Alternative Teaching

Co-Teaching Strategies

Approach	*Class Set-up*	*Quick Definition*	*Benefits*	*Notes*
One Teach, One Observe		One of the teachers is in the front of the class leading instruction. **The other is gathering specific information.**	It provides an extra set of eyes in the classroom; provides data about instruction or student learning; easy to implement.	It can easily develop into a habit; **generally effective if the lead teacher and observer agree in advance what is to be observed.**
One Teach, One Assist		One teacher works with the whole class, while the other teacher assists individual students or groups of students. Assistant may also provide assistance with classroom management and a "voice" to articulate student concerns	Provides assistance to individuals throughout the lesson; easy to implement – does not require a lot of planning.	It can easily become a habit, and may cause one teacher to always feel like assistant. Hence **changing roles is essential.**
Station Teaching		Students are divided into three or more small groups to go to stations or centers. Students rotate through multiple stations. Teachers can facilitate individual stations or circulate among all stations	Smaller groups are better for instruction, assessment, and class management; allows for differentiation, movement, and hands-on activity	**Teachers need to be willing to use their space differently**. Both teachers need to plan for their group. Classroom management and transition needs to be structured, and independent station needs to be well planned and self-sufficient.
Parallel Teaching		Both take half the class in order to reduce student-teacher ratio. **Groups may be doing the same or different content in the same or different ways.**	Smaller groups are better for instruction, assessment, and classroom management. It allows teachers to have their own groups.	Teachers need to be willing to use their space differently. **Both teachers need to co-plan for their group**; classroom management and organization needs to be negotiated. Do not switch the groups during a lesson
Team Teaching		Both teachers are in front of the class, working together to provide instruction. This may take the form of debates, modeling information, compare/contrast, or role-playing.	Demonstrates parity and collaboration between teachers; good for modeling; fun for role-playing	**Takes planning and willingness to "share the stage"**. Both teachers need to feel comfortable in front of the class, which means no one is walking around or individualizing at that time.
Alternative Teaching		One teacher works with a large group of students, while the other teacher works with a smaller group providing re-teaching, pre-teaching, or enrichment as needed.	Good for smaller and more specific group work; good for addressing IEP/504 goals	**Need to be sure NOT to always pull the same kids or it becomes a "class inside a class" and can create stigmatizing, especially if small group is "strugglers". Be sure to consider space, noise levels learning gaps, and means to re-assimilate the small group members back into the larger group.**

CO-PLANNING STRATEGIES

One Plans, One Assists



Quick Definition

Each co-teacher brings a portion of the lesson, although one clearly has the main responsibility. The team works jointly on final planning.

Notes	Benefits	Concerns
It provides an opportunity for the intern to contribute resources new to the clinical teacher.	• Better instructional materials • Intern sees how a good lesson can be improved • Final planning done jointly	• Initial planning done separately may not mesh well • Critical that intern not remain in assistant role

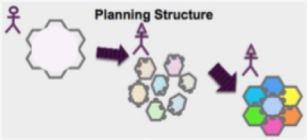
Partner Planning

Quick Definition

Co-teachers take responsibility for about half of the components of the lesson plan. Then they complete the plan collaboratively.

Notes	Benefits	Concerns
Requires that a lesson be visualized as components for which initial planning can be planned independently.	• It is efficient • Each teacher provides initial planning for only part of a lesson	• Pieces of lesson may not mesh well • Requires initial visioning together

One Reflects, One Plans



Quick Definition

Mentor thinks aloud about the main parts of the lesson and the intern writes the plan.

Notes	Benefits	Concerns
For the mentor, thinking aloud requires articulating what may be automatic. The mentor must ask, *"How do I know how to plan?"*	• Lesson content is a reasonable fit • Intern is not planning blindly • Provides transparency early in planning process	• May be a gap between what the mentor spoke out loud and what the intern heard. • Excessive use of this strategy may not support intern development.

One Plans, One Reacts

Quick Definition

One co-teacher plans and the other makes suggestions for improvement.

Notes	Benefits	Concerns
Planning feedback is perhaps the approach most used in traditional mentor-intern settings. One teacher provides a lesson and the other gives feedback on it.	• Provides opportunity for good feedback and discussion of lesson plan elements, primarily for the intern • Gives interns space for creativity in initial plans	• Provides response after the fact instead of in real time • Initial approach may be off base • One may feel like an assistant

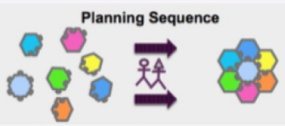
Parallel Planning

Quick Definition

Each member of the co-teaching team develops a lesson plan and the two bring them together for discussion and integration.

Notes	Benefits	Concern
Parallel planning provides an opportunity for teachers to learn from one another.	• Allows for compare and contrast of examples and points of emphasis • Gives both teachers opportunity for creativity in planning	• Duplicate work done • Teachers may become heavily invested in their own plan, making collaboration difficult

Team Planning



Quick Definition

Both teachers actively plan at the same time and in the same space with no clear distinction of who takes leadership.

Notes	Benefits	Concerns
At any given time, either teacher may take the lead in suggesting tasks, questions, flow of the lesson, etc.	• Resulting lesson plan may be better than a plan done independently by either • May be more efficient because feedback and collaboration happen in real time	• One co-teacher, likely the intern, may be less prepared to contribute than the other • Requires a very high level of trust and communication

EQUIP: A FREE WEB APP TO PROMOTE EQUITABLE TEACHING IN MATH CLASSROOMS

EQUIP BETA
EMPOWERED TEACHERS, EQUITABLE CLASSROOMS
ABOUT HELP PRESS RESEARCH LOG IN

About EQUIP

EQUIP (**E**quity **QU**antified **I**n **P**articipation) was created in a joint and equal effort by Dr. Daniel Reinholz and Dr. Niral Shah. We believe that teaching is hard, complex work, and that teachers deserve support. Our vision is that EQUIP will empower teachers, professional developers, and researchers to build more equitable classrooms for more students.

If you care about equity in schools, EQUIP was made for you.

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EQUIP

EQUIP is a customizable observation tool for tracking patterns in student participation. The goal is simple: to empower teachers in building more equitable classrooms. EQUIP can be used in real-time or with videos of classroom teaching. After completing an observation, EQUIP generates instant analytics that teachers can use to improve their practice.

EQUITABLE CLASSROOM PRACTICES OBSERVATION CHECKLIST

Equitable Classroom Practices Observation Checklist

Equitable Classroom Practices is a checklist of 27 specific, observable teacher behaviors that reflect culturally responsive teaching through examples. This tool can be used as self-reflection or by an external observer to become more aware of incorporating equitable practices. Please note that the statements in red offer more definitive guidance regarding the equitable classroom practice. This guide is not an all-inclusive description of best instructional practices.

Teacher		Observer		Subject		Date/Time	

Equitable Classroom Practice	Observed (1 point)	Not Observed (0 points)
1. Welcomes students by name as they enter the classroom *Asks students for correct pronunciation of their names; correctly pronounces students' names*		
2. Uses eye contact with all students *Makes culturally appropriate eye contact with all students*		
3. Uses proximity with all students equitably *Circulates around student work areas to be close to all students*		
4. Uses body language, gestures, and expressions to convey a message that all students' questions and opinions are important *Smiles, Nods head in affirmation; Leans toward students; Turns toward students who are speaking to show interest*		
5. Arranges the classroom to accommodate discussion *Arranges seating to facilitate student-student discussion; Seating to facilitate teacher-student discussion*		
6. Ensures bulletin boards, displays, instructional materials, and other visuals in the classroom reflect the racial, ethnic, and cultural backgrounds represented by students *Displays and uses materials (supplemental books) that reflect all students' racial, ethnic, and cultural backgrounds year round; Displays products and props from students' home and community background*		
7. Uses a variety of visual aids and props to support student learning *Uses multiethnic photos, pictures, and props to illustrate concepts and content; Uses appropriate technology to illustrate concepts and content*		
8. Learns, uses, and displays some words in students' heritage language *Posts some content words or phrases in students' heritage languages; Uses some words or phrases from students' heritage language in the classroom*		
9. Models use of graphic organizers *Uses a variety of graphic organizers during instruction; Encourages students to identify and use the task appropriate graphic organizer by modeling*		
10. Uses class building and teambuilding activities to promote peer support for academic achievement *Structures academic and social interactions between students*		
11. Uses random response strategies *Uses random response strategies (i.e., numbered heads, color-coded cards, equity sticks, calling sticks)*		
12. Uses cooperative learning structures *Structures opportunities for students to learn with and from their peers (i.e., Think-Pair-Share, Teammates consult, Jigsaw, Pairs Check, Partner A and B, Boggle, Last Word)*		
13. Structures heterogeneous and cooperative groups for learning *Uses random grouping methods to form small groups; Explicitly teaches collaborative learning skills to students; Provides opportunities for cooperative groups to process/reflect on how well they accomplished the task*		
14. Uses probing and clarifying techniques to assist students to answer *Rephrases the question; Asks a related question; Gives student a hint, clue, or prompt*		
15. Acknowledges all students' comments, responses, questions, and contributions *Uses affirming, correcting, or probing to acknowledge all students' responses*		
16. Seeks multiple perspectives *Validates all perspectives with responses such as: "That's one idea. Does anyone else have another?"; "That was one way to solve the problem. Who did it another way?"; "Who has an alternative view?"*		
17. Uses multiple approaches to consistently monitor students' understanding of instruction, directions, procedures, processes, questions, and content *Uses a variety of approaches to monitor students' understanding throughout instruction (Thumbs Up, Unison response, One Question Quiz, Envelope Please)*		
18. Identifies students' current knowledge before instruction *Uses a variety of methods to assess students' knowledge before instruction such as: Word Splash, K-W-L, Anticipation Guide, Brainstorming, Webbing*		
19. Uses students' real life experiences to connect school learning to students' lives *Asks students to reflect upon and discuss the following: "What events/situations occur in your family or neighborhood that require some knowledge of ___?" How does knowing about ___ benefit your interactions in your family, neighborhood, or school?";Uses examples that are reflective of students' lives to support learning*		
20. Uses Wait Time *Pauses at least 3-5 seconds to consider the student's response before affirming, correcting, or probing; Pauses following a student's response to allow other students to consider their reactions, responses and extensions*		
21. Asks students for feedback on the effectiveness of instruction *Asks students to indicate the learning activities that are effective in helping them to learn; Uses interviews, surveys, and questionnaires to gather feedback from students; Uses exit cards to gather feedback about instruction*		
22. Provides students with the criteria and standards for successful task completion *Evaluates student work by providing performance criteria (i.e. rubrics, exemplars, anchor papers)*		
23. Gives students effective, specific oral and written feedback that prompts improved performance *Confers with students to provide feedback to improve performance; Provides opportunities for students to use peer reviews; Provides written feedback that allows students to revise and improve their work*		
24. Provides multiple opportunities to use effective feedback to revise and resubmit work for evaluation against the standard *Allows students to revise work based on teacher feedback; Encourages and structures opportunities for students to provide feedback to peers based on an established standard*		
25. Explains and models positive self-talk *Explains the importance of positive self-talk; Shares examples of how positive self-talk leads to positive outcomes*		
26. Asks higher-order questions equitably of all students *Asks analysis questions; Asks synthesis questions; Asks evaluation questions; Poses higher order questions and uses a random method for calling on students; Provides think time for all students before asking for responses*		
27. Provides individual help to all students *Ensures all students receive individual help*		
Total Points:		

Comments:

Adapted from *"A Resource for Equitable Classroom Practice" 2010*
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http://laspdg.org/files/Equitable%20Classroom%20Practices%20Observation%20Checklist.pdf

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What are additional strategies that could be used to support equity?

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