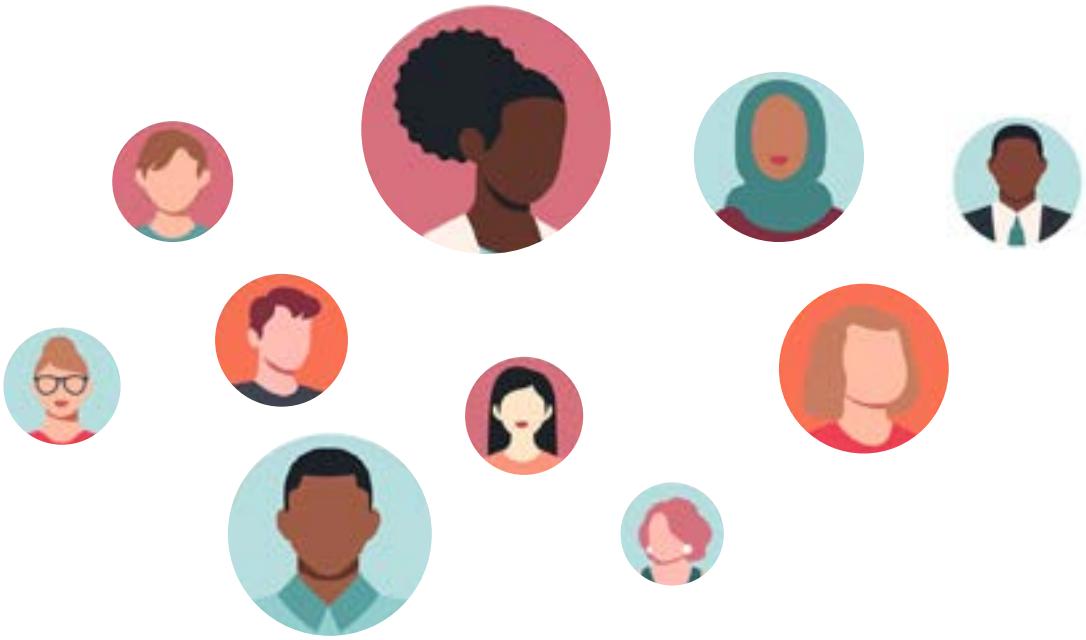
TEACHER-TESTED PRACTICE GUIDES

Multiple Entry Points and Strategies



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Why This Work Matters

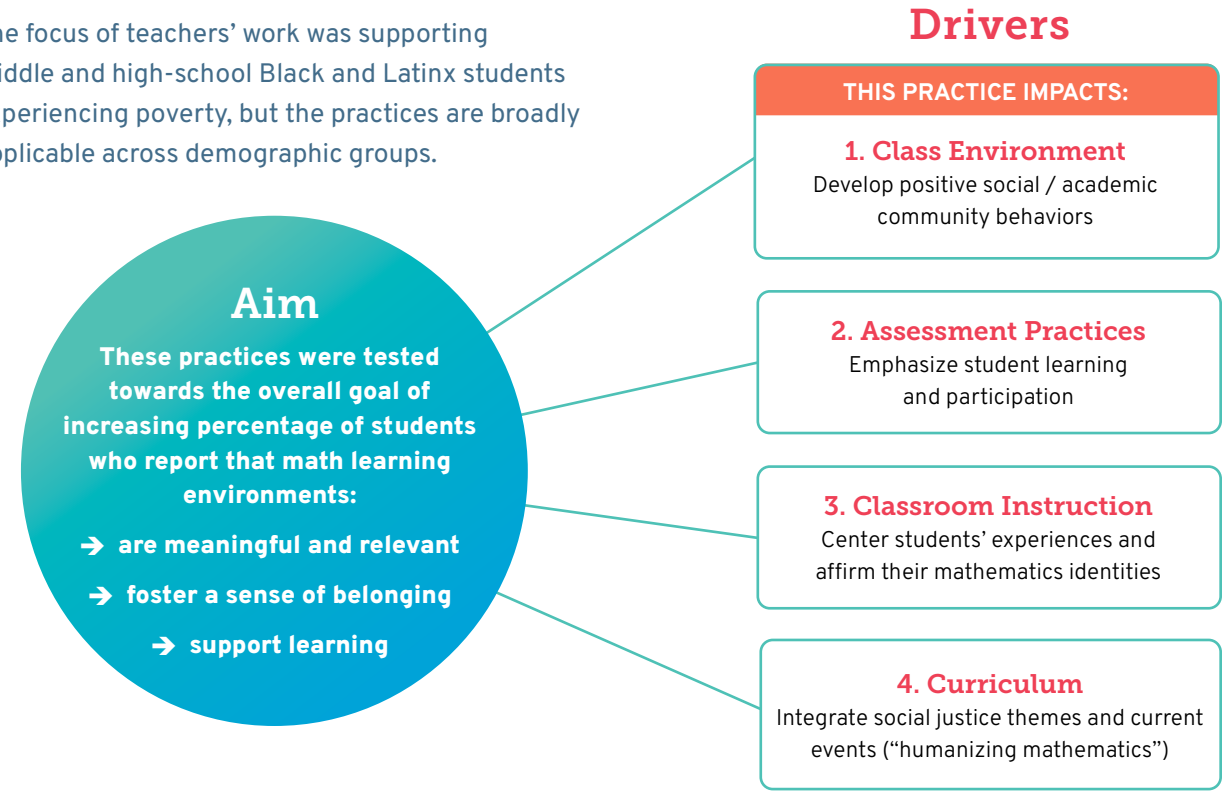
An imperative to center students' experiences in math education

Research points to numerous factors that are instrumental in positive academic outcomes for all students. These include: a positive racial/ethnic identity[1], a sense of belonging[2], and beliefs about their academic abilities[3]. Teachers' expectations are one of the most powerful influences, and these have been found to be lower for Black, Latinx, and Indigenous students due to teachers' biases[4]. Asset-based pedagogy ensures that teachers develop essential knowledge and behaviors that sustain high expectations and promote student identity[5].

This is particularly important in mathematics[6] where some of the most stubborn inequities persist[7]. Special attention is necessary because this subject area has disproportionately negatively impacted students from historically marginalized backgrounds via high-stakes testing, a hyperfocus on skill development, and the abstract nature of the subject disconnected from their day-to-day lives.

However, equity-focused mathematics teachers are innovating and improving ways to support students' identity as math learners, sense of belonging, and beliefs about their academic ability. To learn more about how these practices can be applied in the classroom, Shift partnered with educators across the country to develop a theory of change describing key levers for improving students' experiences in their math classrooms, and to build and test a few of the potentially high-leverage practices they identified. **The purpose of these resources is to provide educators with concrete examples and guidance from educators that have put these strategies into practice in their context.**

The focus of teachers' work was supporting middle and high-school Black and Latinx students experiencing poverty, but the practices are broadly applicable across demographic groups.



Multiple Entry Points and Strategies

*Special credit and appreciation goes to **Xiao Wen Chen** of **Mastbaum High School** who tested this idea in her class Spring 2022, and contributed to this document.*

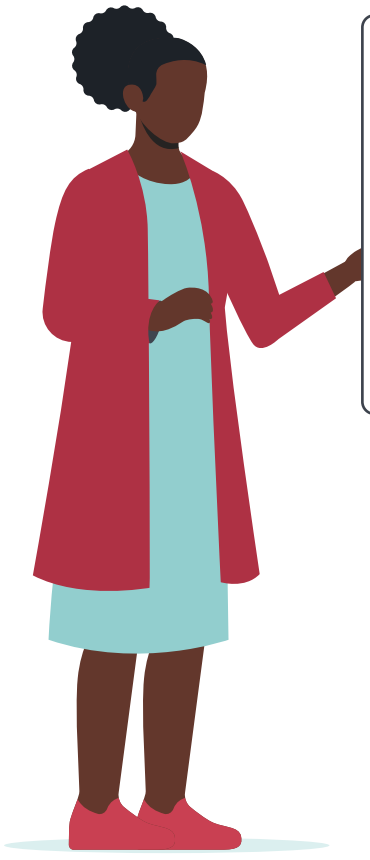
1. What it is

Teachers intentionally scaffold and support the use of multiple methods such that students can navigate across a wide variety of problem framings and methods. Sometimes in math, students need to use a specific method to solve a problem and sometimes there are multiple methods possible.

Using the practice of teaching multiple entry points and strategies, students are taught the differences between various methods for solving specific mathematical procedures and what types of problems are more easily solved one way or another. Students learn how to read and interpret math problems, select an appropriate method and reliably get the right solution.

This strategy helps students be flexible with math and connect concepts in different ways and use multiple skills to solve problems. This helps students see math as a coherent "problem-solving toolkit" with multiple connected tools that can be adapted based on the problem at hand. They can build conceptual understanding between methods and see math as a "whole system" instead of disconnected parts.

2. Why do it



Why I do this change

"This change helps students to see the value in other students' approaches and learn from each other. After trying these activities in my class, over 80% of students agreed that:

- 'Students have a voice in what happens in this class', and
- 'Students are encouraged to express opinions in class'"

3. How to do it

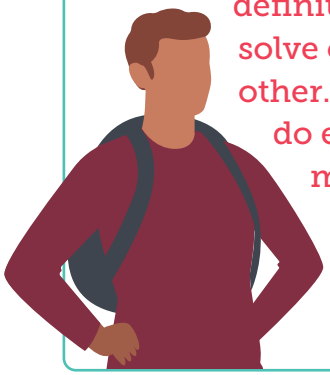
Teacher Prep

1. Review lesson objective(s)
2. Identify problem(s) and methods that highlight/ require multiple entry points or methods.
3. Determine class structure(s) for:
   - modeling or direct instruction
   - independent think time
   - partner/group/whole-class processing/sharing thinking across students
4. Prepare class materials and scaffolds

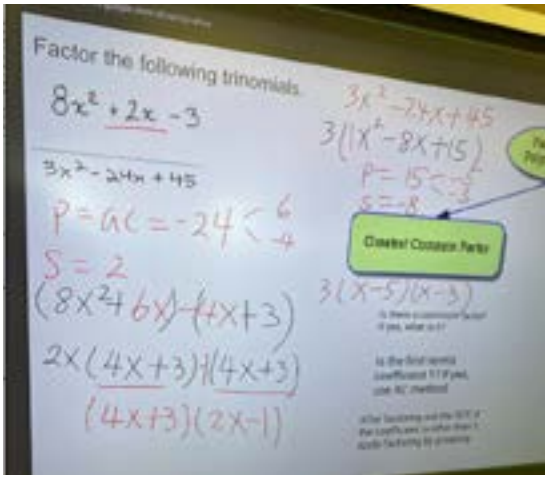
Class Routine

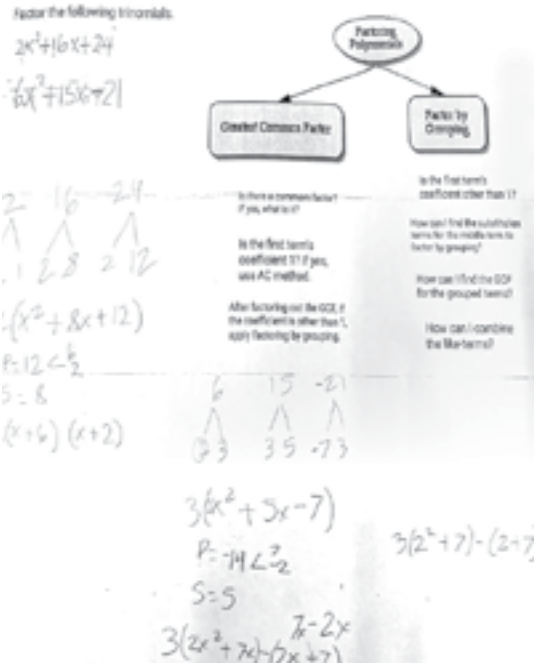
1. Group students by method first to build shared understanding and proficiency and then regroup students so they can share their methods with each other (i.e. a "jigsaw" grouping structure)
2. Conduct brief individual check-ins asking students about the method they chose and why

"Seeing other students' methods helped me see that some problems are definitely easier to solve one way or the other. I never could do elimination method, but Jose's explanation of it made it click!"



AN EXAMPLE FROM FACTORING TRINOMIALS





Learning from teacher testing

When testing this idea in the classroom it is important to keep the following concepts and frameworks centered..

- Pedagogical Content Knowledge (PCK)
- Orchestrating Mathematical Discussions
- Multiple Representations

Teacher Impact Narrative

"One time, when sharing student work with classmates by posting it on the wall, students were able to look at the multiple strategies and see that they came the same conclusion. I heard students saying, 'Oh yeah this is easier,' which demonstrated the power of looking at each others' work. Later, when we were doing state test prep and working on eliminating answers, students came up saying they were able to use the strategies and not get stuck in the long math like they used to. They were better able to identify the key components and quickly solve the problems. Ultimately, they came out of these tests with a positive attitude where they felt more power over the test by being more deliberate and purposeful."

"Incorporating more students' involvement in instruction instead of me standing in front and teaching content felt good. When I go back to do more of this next year, I'm going to integrate more opportunities to learn "how students feel" about the work and invite more conversations about their wellbeing in addition to their grades."

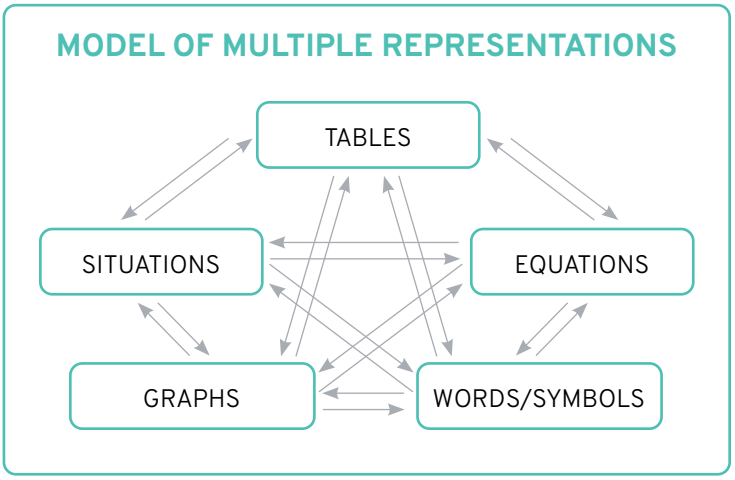
Possible adaptations and decisions based on class context

- Have students build their own visual concept maps or flowcharts, or put an existing one in their own words
- Consider using student note-taking templates (with important graphs, textboxes, or shapes pre-drawn) or reference sheets
- Introduce information processing tools, such as annotation strategies for problems (e.g. circling known/unknown, key terms, etc.)
- Create Class "Decoration" on Walls and Board (concept maps, procedural steps, flowcharts, word walls, etc.)
- Use a document camera or other technical resources for large group discussion

Learning from teacher testing

Lessons learned from other perspectives

- Sometimes you want students to have choice over the method they apply and other times you want to know whether or not students can solve certain problems using a specific procedure or method
- Consider **avoiding "grading" students** on whether they can or cannot use a specific method on demand on summative assessments
- Having a **model of multiple representations** can be helpful for teacher and student ("if I start with a graph, table, or equation; can I create other ways of representing the information?")



Sample Planning Sequence (Functions)

- **Week 1:** Introduce students to idea of multiple pathways on problems. Encourage students to challenge their comfort zones by trying a different method of learning math.
- **Week 2:** Offer students two choices of writing the exponential function equations starting from a table and a graph, practicing identifying and labeling the function's constant terms in each representation.
- **Week 3:** Compare and contrast how to multiply polynomials using the distributive property and combining like terms in the table and how to expand special binomials through identifying patterns.

Learning from teacher testing

SEASONALITY:
This is an activity that can be deployed at any time (you can do it tomorrow) and benefits best when developed into a regular routine.
It can be particularly useful towards the ends of units as students are consolidating and reviewing what they know.

Suggested Measures

- Pick a problem or set of problems to calculate a baseline percent of students that can use various methods and procedures, provide student opportunities to pracitce, pick a strategic problem to reasses the percent, repeat, and track the percent over time
- Check the percent of students that chooseor gravitate toward a particular strategy to determine which strategies may need to be reviewed and highlighted again
- Assess the student perception of value and utility of different methods and their confidence in using them, and the degree to which they'relearning from understanding other students' approaches
- Have students track the time it takes to apply different methods and procedures fluently (once they can do it at all)

Connection to the Theory of Change

Driver 1: Class environment (social/academic dynamics) emphasizes and prioritizes developing a positive identity as a math learner.

Change Concept: Normalizing mistakes and creating a culture of inquiry.

Want to learn more about other drivers and changes?

Change Package

Theory of Change

Defining Our Terms

Theory of Change

A Theory of Change is a description of how we believe change (or improvement) will happen; illustrating how our collective actions will lead to the desired outcomes.

Aim

An Aim is a shared goal of an improvement initiative that is 'SMARTIE', i.e. specific, measurable, actionable, realistic and time-bound as well as inclusive (with whom) and equitable (for whom).

Drivers

Drivers describe the main factors, leverage points, and/or ideal conditions that would need to be present to accomplish the aim of an improvement initiative.

Change Ideas

Change Ideas describe how you might create the conditions described in your drivers in order to accomplish the aim.

Change Package

A Change Package is both a collection of consolidated learning arising from testing change ideas in a theory as well as a resource for those who wish to test and adapt these change ideas.

Thank You

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