TEACHER-TESTED PRACTICE GUIDES
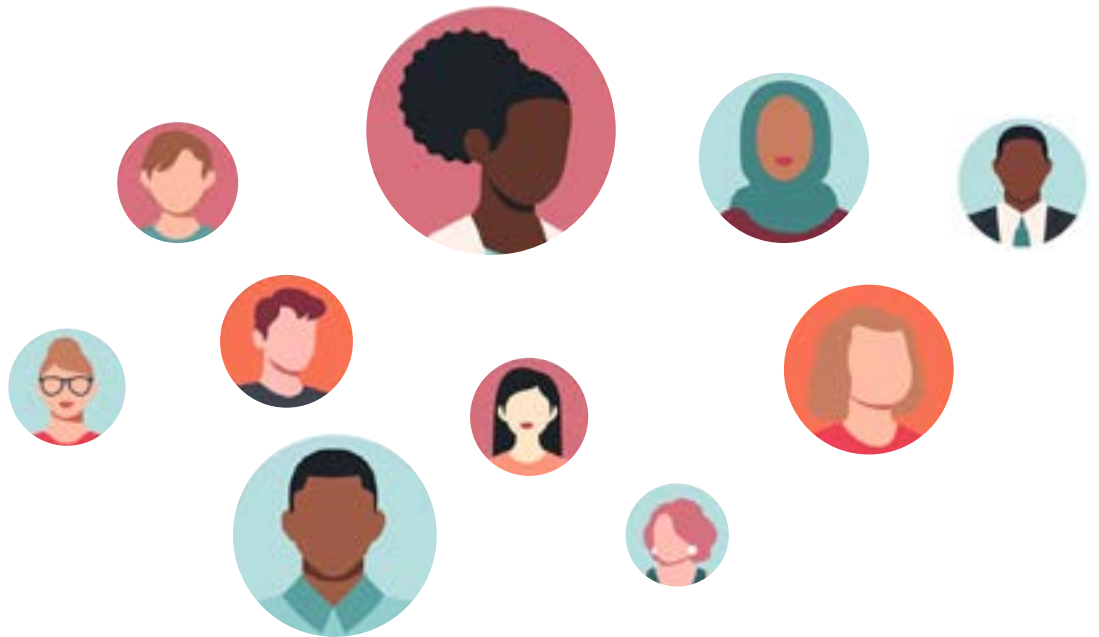
Surfacing and Addressing Misconceptions:
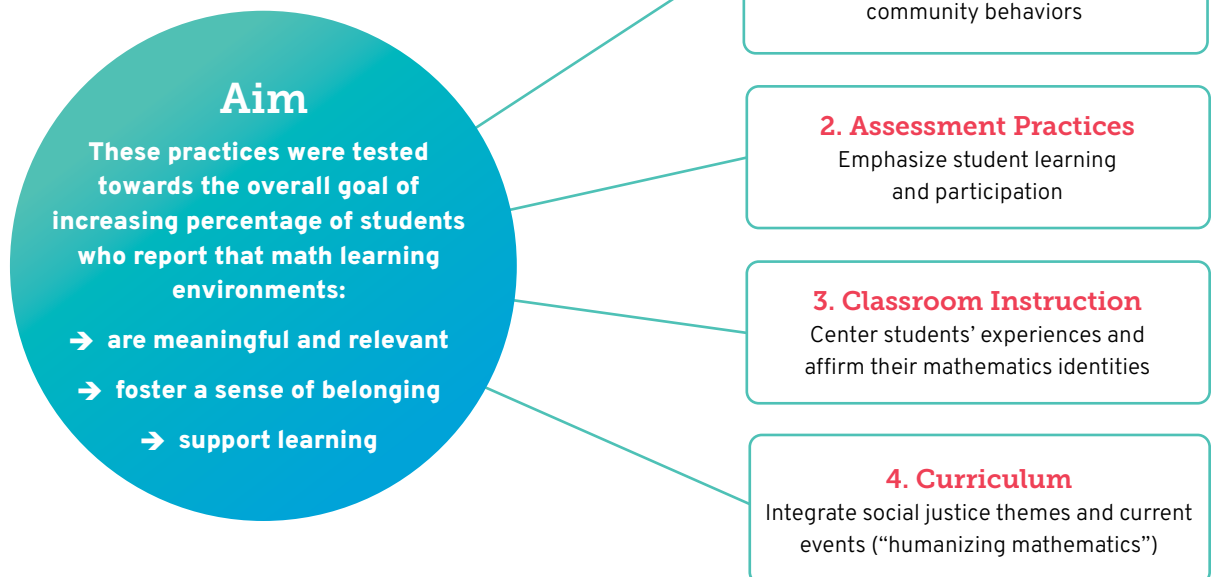## *My Favorite Mistake*

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.

Drivers

Aim
These practices were tested towards the overall goal of increasing percentage of students who report that math learning environments:

➔ **are meaningful and relevant**

➔ **foster a sense of belonging**

➔ **support learning**

THIS PRACTICE IMPACTS:

1. Class Environment
Develop positive social / academic community behaviors

2. Assessment Practices
Emphasize student learning and participation

3. Classroom Instruction
Center students' experiences and affirm their mathematics identities

4. Curriculum
Integrate social justice themes and current events ("humanizing mathematics")

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.

Surfacing and Addressing Misconceptions:
My Favorite Mistake

1. What it is

Addressing student confusions and misconceptions is a continuous cycle that flows before, during and after each class period. The teacher plans curriculum and instruction designed to elicit or highlight common student mistakes, providing multiple different opportunities in class to surface, discuss, and address them. Teachers identify and address these misconceptions in warm-ups, while circulating during pair or group work, and during whole-class discussions.

The core of this change idea is being able to highlight common mistakes and misconceptions that have surfaced through student work, or are known to the teacher from experience. The primary activity is "My Favorite Mistakes" where 3 sample student responses are presented to the class, who are then invited to identify the mistake(s), correct it, and explain what the example work got right and wrong.

2. Why do it

Why I do this change

➤ It demonstrates the power of voicing and working through mistakes and reminds us, **"not everyone knows everything"**

➤ It **"depersonalizes" mistakes** from being associated with a particular student in a particular moment. Teachers know they have the misconception, students (often) know, but not putting them on the spot positively impacts students' willingness to make mistakes and reduces student "hiding" in class

➤ It **provides safe ways for students to ask questions** or say "they don't know" or "they need help" without losing their 'status' (social belonging) among peers

➤ **Models productive and proactive ways to get help.** Provides opportunities for student voice, agency, and identity as they help each other

➤ **Demonstrates teacher care** and knowledge, students seen, heard and known

➤ **Students hold foundational misconceptions about mathematics** that impacts their ability to understand and use increasingly rigorous concepts and procedures

3. How to do it

Getting Started

1. Pick a source of misconceptions: a prior activity of assessment

2. Identify the most common misconceptions across students

3. Pick a problem and/or place in the upcoming lesson: warm-up or activity or whole-class discussion

4. Write the problem and the prompt that highlights the misconception and prompts the students to identify it and correct it

5. Identify another formative opportunity (e.g. Exit Ticket) to check for recurrence of mistakes

6. Reassess for new mistakes and repeat activity

> "I appreciated during inequalities that I could see how another student might think and how I might think. I notice some of the mistakes are ones I make sometimes, but it's nice to not feel called out!"

AN EXAMPLE FROM LINEAR INEQUALITIES

This is a good example because it highlights the most common mistakes:
• Wrong slope   • Wrong y-intercept   • Wrong shading

My favorite mistake   (Turn off Student-Paced)

Students were asked to graph the inequality below. Identify what they did well and also identify each of their mistakes. Be specific and use vocabulary!

Inequality→ $y \geq x - 1$

Student A   Student B   Student C

Se pidió a los estudiantes que representaran gráficamente la siguiente desigualdad. ¿Puedes encontrar cada uno de sus errores?
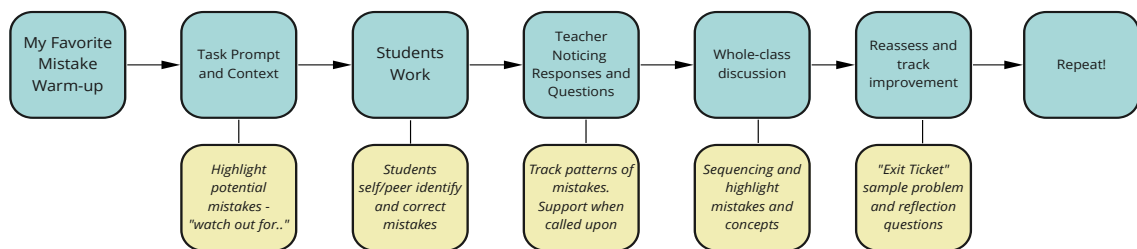
Learning from teacher testing

When testing integrating social justice data from trusted diverse sources in math curricula in the classroom it is important to keep this framework centered:

• Identity safety   • Growth mindset

• "I Notice / I Wonder" and similar routines

Lessons learned from testing

➤ Use the natural outputs of formative assessments (answer a problem on a notecard in class, submit)

➤ Use your Knowledge of Content ➜ Common Misconceptions / Mistakes students make when working towards course objectives. Many of these common issues are known to the math teacher and repeat themselves every year (and sometimes, over the course of years):

• Flipping the sign   • Issues distributing/factoring

• Confusing slope and y-intercept   • Dealing the rational numbers

➤ What started out as a single activity illuminated the larger ecosystem of opportunities running throughout the lesson cycle for surfacing and addressing student confusions and misconceptions.

My Favorite Mistake Warm-up	→	Task Prompt and Context	→	Students Work	→	Teacher Noticing Responses and Questions	→	Whole-class discussion	→	Reassess and track improvement	→	Repeat!

| | *Highlight potential mistakes - "watch out for.."* | *Students self/peer identify and correct mistakes* | *Track patterns of mistakes. Support when called upon* | *Sequencing and highlight mistakes and concepts* | *"Exit Ticket" sample problem and reflection questions* | |

Possible adaptations and decisions based on class context

➤ Placement within lesson plan flow

  • Warm-up

  • Class discussion

  • Exit Ticket

➤ Individual/Partner/Group

➤ Prompts

➤ "Size" and sources of mistakes

➤ Time given

➤ Platform (e.g. Peardeck) for creating interaction comment and collecting data

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.
> This activity works best when you have established trust with your students; take time to build out these activities over the term and take regular pulses.

Suggested Measures

➤ Track "% frequency and recurrence of student mistakes"

➤ Identify a small set (4-5) of common student misconceptions at the start of a unit

➤ Pick strategic "before and after" activity problems to give snapshots of patterns (hopefully reductions!) of common mistakes over time

Connection to the Theory of Change

Driver 1: Classroom social/academic dynamics emphasize and prioritize developing a positive identity as a math learner within that community

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

Want to learn more about other drivers and changes?

[Change Package](#)   [Theory of Change](#)

shift

Thank You

References

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