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BEYOND THE NUMBERS

OBSERVING MATH NARRATIVES IN ACTION

BRANCHED



A Higher Standard

Suggested Citation:
TBD



Beyond the Numbers: Observing Math Narratives in Action— August 2025.

Published by Branch Alliance for Educator Diversity, an imprint of M.E.B. Alliance for Educator Diversity, Inc., 100 World Drive, Suite 101, Peachtree City, GA 39269 (<https://www.educatordiversity.org>).

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BranchED

BranchED is a professional services organization and a collective of university faculty and leaders advancing educational excellence by expanding individual capacity, enabling supportive relationships, boosting institutional effectiveness, and collaborating with communities. We believe every student deserves access to caring, adaptive, and well-prepared teachers; every teacher deserves preparation that fuses quality with diversity, and every person benefits when we create a higher standard of education together. We are committed to achieving programmatic transformation leading to improved outcomes for diverse educators who, by extension, benefit all students by preparing them to thrive in our heterogeneous society.

Our work is guided by the BranchED Framework for the Quality Preparation of Educators, which guides the development and enhancement of high-quality educator preparation programs.¹

The Framework



BranchED's Framework is the lens through which the organization looks at, provides feedback to, supports continuous improvement efforts of, and innovates with Educator Preparation Providers (EPPs). It is the bedrock of all the organization's activities.

BranchED's Framework is unique, in that it does not focus on candidate competencies nor philosophical orientation. Rather, it focuses on six design principles that high-quality EPPs implement to ensure graduates are competent and confident educators able to leverage, not fear or ignore, the differences among their students. Two of these design principles (Community of Learners and Data Empowerment) provide the foundation for the remaining design principles: Practice-Based Approach, Inclusive Instruction, Equitable Experiences, and Intersectional Content).

This toolkit is situated within two of the Framework's six design principles: Practice-Based Approach and Data Empowerment. It provides opportunities for authentic experiences that engage teacher candidates and in-service teachers in critical reflection to increase knowledge, develop skills, clarify values, and build the capacity to foster

positive math identity through math narratives. In addition, the toolkit supports Data Empowerment by offering structured look-fors and evidence-gathering tools that help educators make informed instructional decisions, track growth over time, and use data as a catalyst for improving both teaching practices and student learning experiences.

The Need

Research consistently shows that teachers' positive dispositions, mindsets, and beliefs about teaching and learning mathematics are essential for effective instruction and overall success. Yet, teacher preparation and professional learning programs have faced persistent challenges in cultivating, evaluating, and improving teacher candidates' mindsets. A promising approach focuses on *enacted beliefs*—beliefs expressed through teachers' narratives—that can be observed, studied, and practiced promoting meaningful pedagogical change.

The Math Narratives Project (MNP) has generated research identifying and demonstrating the utility of a set of narrative messages as beneficial to math learning. These messages shape how students see themselves as math learners. Too often, students carry harmful stories like “I’m just not a math person” or “mistakes mean I’m bad at math.” These beliefs create barriers to engagement, persistence, and confidence, especially when math gets more complex in middle and high school. Research from the Math Narrative Project shows that emotions, identity, and values are connected to how students experience mathematics. By intentionally creating positive math narratives, teachers can help students make math relevant to their own lives, affirm the value of mistakes in a math classroom, and encourage students to seek help; all of which help build a sense of belonging in the secondary math classroom.

For teachers, embedding math narratives does not mean adding something “extra” to an already full plate; it means being mindful of the stories we tell. When we highlight multiple ways to solve a problem, celebrate effort, share our own struggles with math, or introduce real-world applications, we’re shaping new narratives that affirm every student’s potential. Doing so not only improves students’ willingness to engage with math content, but it also challenges the old story that only some students are “math people.” In short, math narratives help transform the classroom into a place where all learners can see themselves as doers of mathematics.

To that end, BranchED convened a group of secondary math scholars and practitioners from university and secondary math contexts to develop professional learning tools, resources, and strategies that can be used to shape teacher-talk about mathematics in positive and effective ways with students.

Intended Users

This toolkit is designed for teacher educators, whether in higher education, school districts, or professional development programs, who want to integrate math narratives into their context. The tools provided are intended to support teacher educators as they work with teacher candidates and in-service teachers to deepen understanding and application of math narratives in the secondary math classroom.

Overview of the Toolkit

The tools in this toolkit follow the Pre Observation, Observation, and Post Observation (POP) Cycle, a process designed to make teacher observations intentional and focused on professional growth. By following the POP Cycle, observations become collaborative opportunities for continuous improvement rather than one-time evaluations. Each tool includes concrete ways to notice and strengthen math narratives. The tools focus on three core math narratives: making math relevant, affirming the value of mistakes, and encouraging help-seeking.

Making Math Relevant	Affirming the Value of Mistakes	Encouraging Help-Seeking
Communicating to students credible, meaningful connections between higher-level mathematics and their lives, futures, and real-world goals, so they see value in engaging with difficult math.	Normalizing errors as a meaningful and necessary part of learning, such that students see mistakes as opportunities to grow rather than signs of failure.	Cultivating student confidence to ask for assistance when needed and communicating that seeking help is a normal, useful step in learning mathematics.

By using this toolkit, teacher educators can more easily observe and reflect on math narratives with their teacher candidates and in-service teachers. In this way, math narratives move from being abstract ideas to actionable practices that teachers can weave into their daily routines.

Learning about Math Narratives

Prior to implementing the observation tool, it is essential for teacher candidates or in-services teachers to examine their own beliefs about learning mathematics and learn about how math narratives that positively impact student learning and success in the math classroom. After instruction, we recommend implementation of the self-efficacy tool and the Reflection Template.

Self-Efficacy Tool

The pre-observation process begins with the self-efficacy tool, which allows teacher candidates or in-service teachers to assess their confidence or sense of self-efficacy in using math narratives in secondary mathematics classrooms. Self-efficacy is the belief in one's ability to successfully carry out specific tasks which plays a powerful role in shaping one's motivation, persistence, and effectiveness in the classroom. When teachers develop strong self-efficacy, students benefit through increased learning, stronger engagement, and improved behavior. See [Appendix A](#) for the self-efficacy tool.

Reflection Template

Building on the survey, the reflection template asks teacher candidates and/or in-service teachers to provide specific examples of how they would demonstrate each statement in their classroom setting. Because individuals often overestimate their competencies on self-assessments, this reflective process promotes more thoughtful and accurate self-evaluation. See [Appendix B](#) for the reflection template.

Implementation Recommendations

Allowing a one-to-two-week time lapse between completing the self-efficacy survey and the reflection template can make the process even more effective, encouraging teacher candidates or in-service teachers to revisit their initial ratings with a fresh perspective. It is not uncommon for self-efficacy scores to decrease over time, as teachers often become more aware of the complexity of teaching as they critically reflect on their teaching practices.

Observation Process

Pre-Observational Tool

The observation process begins with a pre-observation where the teacher educator utilizes the pre-observation tool to review the submitted lesson plan and provides feedback prior to the observation itself using the pre-observational tool. The pre-observational tool examines how the lesson incorporates math narratives, using teacher and student look-fors as evidence. These look-fors are not intended to be exhaustive but serve as illustrative examples. Each look-for is also connected to the NCTM Principles to Action Standards or the Standards of Mathematical Practice, ensuring feedback is tied to widely recognized mathematical professional frameworks. Because lesson plans vary across districts in both format and level of detail, teacher candidates or in-service teachers may need to explicitly point out where math narratives are embedded so that

the observer can accurately recognize and analyze them. See [Appendix C](#) for the pre-observational tool and [Appendix D](#) for the PAS and SMP standards.

Through this pre-observation process, teacher candidates and in-service teachers have the opportunity to reflect on their instructional practice while also receiving targeted feedback. This feedback establishes clear goals and focus areas for the upcoming observation, ensuring that the observation is purposeful, aligned to professional standards, and directly connected to the teacher's growth and development.

Observation

The observational tool is used to provide a structured framework for teacher candidates or in-service teachers to examine their use of math narratives in the classroom, teaching practices, and student engagement. This tool can be applied across multiple contexts, including live classroom observations, recorded lessons, or within a mixed reality simulation environment. Its purpose is to guide teacher educators in collecting objective, evidence-based data that highlights how math narratives are being integrated into instruction and how students are responding.

At its core, the tool is designed to make visible the ways teacher candidates or in-service teachers use math narratives to connect content to students' lives, affirm the value of mistakes, and encourage help-seeking behaviors. Each observation is anchored in a set of teacher and student look-fors that illustrate what effective practice might sound like, look like, or feel like in the classroom. These look-fors are not intended to be exhaustive but serve as illustrative examples. They are directly aligned to nationally recognized standards, such as the NCTM Principles to Action Standards (PAS) and the Standards for Mathematical Practice (SMP) ensuring observations are not only practical but also grounded in research and professional expectations. See [Appendix F](#) for the PAS and SMP standards.

The tool prompts observers to capture evidence of both instructional moves (e.g., posing purposeful questions, connecting representations, facilitating discourse) and student actions (e.g., persevering through challenges, making sense of problems, explaining their reasoning). Rather than focusing on evaluative judgments, the emphasis is on descriptive notes that can later be used to spark reflection and dialogue during the post observation discussion.

Flexibility is another key feature of this tool. Teacher educators can use it during formal observations, in peer-to-peer learning contexts, or as part of professional development cycles. In teacher preparation programs, the tool helps teacher candidates practice integrating narratives into lesson design and delivery. In school districts, it supports

ongoing in-service teacher growth by providing administrators and coaches with a method for observing and discussing math narratives.

Ultimately, the observational tool transforms classroom visits from one-time compliance checks into collaborative learning opportunities. By focusing on evidence of practice, it opens the door for rich post observation conversations where teacher candidates and/or in-service teachers can celebrate successes, identify growth areas, and plan concrete next steps. In this way, the tool strengthens both individual teaching practice and broader programmatic efforts to embed math narratives meaningfully into instruction. See [Appendix E](#) for the observational tool.

Post Observation

The post-observation phase is intentionally designed to move beyond compliance feedback and instead foster meaningful dialogue that deepens the integration of math narratives into teaching practice. During this stage, the focus shifts from checking whether strategies were used to engaging in reflective, evidence-based conversations that highlight strengths, uncover challenges, and identify growth opportunities. This process emphasizes both the technical aspects of instruction and the relational elements that shape how students experience mathematics. By combining evidence-based observation with reflective coaching strategies, the post-observation conversation helps build trust, affirm teacher agency, and inspires a commitment to continuous improvement. See [Appendix F](#) for a detailed post-observation protocol that outlines guiding questions, feedback structures, and strategies for supporting teacher growth in the use of math narratives.

Appendix A: Self-Efficacy Tool

Directions: Teacher candidates or in-service teachers should carefully read each statement. For each item, indicate how confident you are in your knowledge or ability.

(Estimated completion time: 10 minutes)

Making Math Relevant					
		Not confident	Somewhat confident	Confident	Very confident
1.	I ask students about their needs, interests, and goals for my class, and integrate their responses into my planning.				
2.	I get to know students personally early in the school year so I can help them see how learning math is relevant to their lives, both through their personal interests and through broader real-world applications.				
3.	I provide answers that are credible and motivating when students ask, "Why do I have to learn this?"				
4.	I plan my lessons with real-world connections to the content being taught.				
5.	I help students see that learning higher-level math like algebra is useful and beneficial to them.				
6.	I adapt the examples of my instruction to meet the interests, concerns, and needs of my students and their community.				
Affirm the Value of Mistakes					
		Not confident	Somewhat confident	Confident	Very confident
7.	I help students understand that mistakes are a normal part of the learning process.				
8.	I create an environment where my students feel comfortable asking questions when they need help.				
9.	I feel well equipped to help reduce my students' stress and potential embarrassment around asking questions and making mistakes.				



10.	I encourage students to keep trying when they feel like giving up on a difficult math task.				
11.	I make sure students know that mistakes provide important learning opportunities.				
Encourage Help Seeking					
		Not confident	Somewhat confident	Confident	Very confident
12.	I make sure students know that asking questions and getting help are important parts of learning something new and challenging.				
13.	I create an environment where my students feel comfortable seeking help from peers.				
14.	I ask my students about how they would like to get help when they are feeling stuck.				
15.	I pose purposeful questions and encourage students to ask questions of me and each other.				
16.	I encourage students to ask for help when they feel frustrated, confused, or overwhelmed.				
17.	I respond positively and with appreciation when students ask me questions				
18.	I provide a variety of ways for my students to get help when they need it (e.g., ask a friend, use their classroom notes, or look for help online in videos or apps).				

Appendix B: Reflection Tool

Directions: Teacher candidates or in-service teachers should use the space on the right as an opportunity to reflect on their practice and share a brief example of what this would look like in their practice.

Making Math Relevant		What would this look like in my practice?
1.	I ask students about their needs, interests, and goals for my class, and integrate their responses into my planning.	
2.	I get to know students personally early in the school year so I can help them see how learning math is relevant to their lives, both through their personal interests and through broader real-world applications.	
3.	I provide answers that are credible and motivating when students ask, "Why do I have to learn this?"	
4.	I plan my lessons with real-world connections to the content being taught.	
5.	I help students see that learning higher-level math like algebra is useful and beneficial to them.	
6.	I adapt my instructional approach to meet the needs of my students.	
Affirm the Value of Mistakes		What would this look like in my practice?
7.	I help students understand that mistakes are a normal part of the learning process.	
8.	I create an environment where my students feel comfortable asking questions when they need help.	
9.	I feel well equipped to help reduce my students' stress and potential embarrassment around asking questions and making mistakes.	
10.	I encourage students to keep trying when they feel like giving up on a difficult math task.	
11.	I make sure students know that mistakes provide important learning opportunities.	
Encourage Help Seeking		What would this look like in my practice?



12.	I make sure students know that asking questions and getting help are important parts of learning something new and challenging.	
13.	I create an environment where my students feel comfortable seeking help from peers.	
14.	I ask my students about how they would like to get help when they are feeling stuck.	
15.	I pose purposeful questions and encourage students to ask questions of me and each other.	
16.	I encourage students to ask for help when they feel frustrated, confused, or overwhelmed.	
17.	I respond positively and with appreciation when students ask me questions	
18.	I provide a variety of ways for my students to get help when they need it (e.g., ask a friend, use their classroom notes, or look for help online in videos or apps).	



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Appendix C: Pre-Observational Tool

Directions: Observers should review the lesson plan provided by the teacher candidate or in-service teacher and identify areas of strength and growth for each indicator listed below. The look-fors are color-coded by math narrative: **making math relevant**, **affirming the value of mistakes**, and **encouraging help-seeking**.

Planning			
Process of setting goals and anticipating actions and resources needed to achieve desired outcomes, creating a structured approach that guides teaching and learning.			
Indicator	Teacher Look Fors	Student Look Fors	Notes
Instructional Clarity & Purpose	Instructional plans ensure access to learning experiences that reflect and value students' interests, goals, and lived experiences. (PAS#:2,5)	Explains what is being learned and why it matters to their everyday lives and futures. (SMP#:1,3) Connects mathematical ideas to their own interests and goals. (SMP#:1,4)	
Real World & Project-Based Learning	Assessments are designed to assess relevant and real-life problem solving. (PAS#:2,3,4,8)	Applies mathematical reasoning to solve relevant and real-world problems through project-based assessments. (SMP#:2,4)	
Mathematical Reasoning & Discourse	Lessons are designed to encourage mathematical reasoning and encourage discussion around mathematical definitions and/or concepts. (PAS#:2,4,5)		



Student Agency & Feedback	Plan opportunities within the lesson for students to provide input and feedback on the math content. (PAS#:4,8)
Addressing Misconceptions	Plan for opportunities for students to evaluate misconceptions they may have on a specific topic. (PAS #2,7)
Collaborative Learning	Plans include collaborative work for students to investigate new concept and Ideas while applying previous knowledge. (PAS#:2,3,4,7)

Appendix D: Alignment of Look-Fors to Standards

Teacher Look-Fors (PAS)

PAS #1: Establish math goals to focus learning

PAS #2: Implement tasks that promote reasoning and problem solving

PAS #3: Use and connect mathematical representations

PAS #4: Facilitate meaningful mathematical discourse

PAS #5: Pose purposeful questions

PAS #6: Build procedural fluency from conceptual understanding

PAS #7: Support productive struggle in learning mathematics

PAS #8: Elicit and use evidence of student thinking

Student Look-Fors (SMP)

SMP #1: Make sense of problems and persevere in solving them

SMP #2: Reason abstractly and quantitatively

SMP #3: Construct viable arguments and critique the reasoning of others

SMP #4: Model with mathematics

SMP #5: Use appropriate tools strategically

SMP #6: Attend to precision

SMP #7: Look for and make use of structure

Appendix E: Observational Tool

Directions: As observers watch the lesson, use the observational tool below to identify areas of strength and growth for each indicator listed. The look-fors are color-coded by math narrative: **making math relevant**, **affirming the value of mistakes**, and **encouraging help-seeking**.

Instruction Process of engaging with mathematics through purposeful actions taken by teachers and students, emphasizing interaction, exploration, and meaning making during learning.			
Indicator	Teacher Look Fors	Student Look Fors	Notes
Lesson Goals & Relevance	Articulates lesson goals as they pertain to both mathematics and real life (PAS #1)	Explains lesson goals in terms of both mathematics and real-life (SMP #1)	
Context & Modeling	Uses authentic contexts and messy real data that support mathematical modeling (PAS #2, 8)	Creates and uses models to represent and solve real-life quantitative relationships (e.g., finance, authentic problems)	
Mistakes & Feedback	Invites students to identify/correct mistakes (PAS #4, 5, 8) Celebrates mistakes as learning opportunities (PAS #1, 3)	Shares thinking confidently, engages with feedback, and views mistakes as part of learning math	



Student Thinking	Generates math learning opportunities from student-suggested contexts and thinking (PAS #7, 8)	Demonstrates curiosity and ownership in exploring peer- or self-suggested math ideas
Dialogue & Collaboration	Invites/supports student dialogue (PAS #4, 5, 8) Invites students to answer classmates' questions (PAS #4, 8) Group students strategically for collaboration (PAS #4, 7, 8)	Engages in peer-to-peer dialogue; responds to classmates' questions; collaborates to build understanding
Relevance & Application	Gives real-life and career-oriented examples during instruction. (PAS #1,2) Facilitates discussions where students apply reasoning to community or social justice issues.(PAS #1,2) Invites guest speakers who explain how they use math in their careers. (PAS #1,2) References college and career concepts when connecting math topics. (PAS #1,4) Demonstrates how math applies to everyday adult tasks (e.g., budgeting, scheduling). (PAS #2,3)	Asks genuine questions about why a topic is relevant to real life. (SMP #1,4) Shares personal examples that relate to the math concept. (SMP #4) Creates math problems based on real-life situations. (SMP #2,4) Uses real-world examples in explanations to peers or teacher. (SMP #3,4)



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Assessment

Process of determining the impact of instruction through iterative opportunities for drafting, revising, and reflecting on thinking, where mistakes are recognized as learning opportunities. It incorporates formative, summative, peer, and self-assessment to provide ongoing feedback and guide continuous learning.

Indicator	Teacher Look Fors	Student Look Fors	Notes
Mistakes as Learning	Facilitates whole-class or small-group error analysis. (PAS #2,4,7,8) Thinks aloud to show how they learn from a mistake. (PAS #7) States explicitly that mistakes are normal and valuable for learning. (PAS #7)	Revises written work or explanations after feedback or challenges. (SMP #1,7,8) Explains errors and new understanding to peers or teacher. (SMP# 1,3,6) Volunteers to share their thinking, even when uncertain. (SMP #3) Raises questions to clarify confusion with teacher or peers. (SMP #1,3) Says aloud, “I don’t understand” or similar statements comfortably. (SMP #1)	
Feedback, Revision, Reflection	Provides formative assessments that include opportunities for retakes or corrections. (PAS #7,8)	Describes what they know, what is confusing, and what they want to learn.	



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	Points out specific strengths in student work during feedback. (PAS #8) Asks students to revise their work based on feedback given. (PAS #1,7,8) Schedules or structures time for multiple draft–revise–reflect cycles. (PAS #7,8) Reflects on how relevant assessments were to students and how well they measured real-life problem solving. (PAS:2,3,4,8)	Revises work after feedback is given. Talks about the changes they made and why. (SMP #1,3) Reflects on what was learned and why it matters. (SMP#:1,3)
Support & Resources	Says aloud that needing help is normal during learning. (PAS #7) Points students to available resources (school supports, after-school help, online tools). (PAS #7) Shares helpful resources with families (PAS #1,7)	Uses provided resources (e.g., online tool, study guide) while working. Approaches teacher or peers to seek help.

Appendix F : Post Observation Protocol

Directions: Use the following protocol to reflect on overall areas of math narrative strength and growth, drawing on evidence collected from both the pre-observation and the observation.

Step 1: Create a Supportive Space

- Begin by affirming the teacher's effort and intentions.
- Share observations using objective evidence (not judgments).
- Use language that builds trust by acknowledging strengths before addressing challenges.

Step 2: Revisit Goals

- Remind the teacher candidate or in-service teacher of the focus areas set in the pre-observation stage.
- Ask: *"How do you think today's lesson reflected your goals around math narratives?"*

Step 3: Explore Teacher Reflection

- Use open-ended, non-judgmental questions such as
 - Where did you notice students making math meaningful or connecting it to their lives?
 - How did you normalize mistakes or hesitation?
 - How did you affirm students' struggles?
 - How might today's strategies build students' confidence and belief in their math potential?
 - If you could re-teach one moment, what might you do differently?

Step 4: Identify Next Steps

- Collaboratively determine 1–2 actionable goals for the next lesson.
- Ask: *"What's one adjustment you'd like to try?"*
- Establish accountability for those next steps (e.g., peer feedback, follow-up observation, or journaling).

Step 6: Close with Encouragement

- Reaffirm the teacher's growth and commitment to students.
- Highlight evidence of impact on student engagement with math narratives.
- End with a forward-looking prompt: *"What are you excited to try next?"*