

**MathHistory**, which is a mathematics autobiography, focusing on key moments experienced as a student of mathematics.

**As you wait for the session to begin name 3 moments in your MathHistory on the notecard at your table.**

# MathHistories, Mathematics Teacher Efficacy, and Reconciling Relationships with Mathematics in an Elementary Mathematics Methods Course

Dr. Joel Amidon, The University of Mississippi

Dr. Ann Monroe, The University of Mississippi

Dr. Candies Winfun-Cook, Oxford School District

Kathryn Amidon, The University of Mississippi

# MathHistory

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Why do these moments with mathematics stand out?

What is it about these moments that continue to resonate, that continue to give you either joy or discomfort?

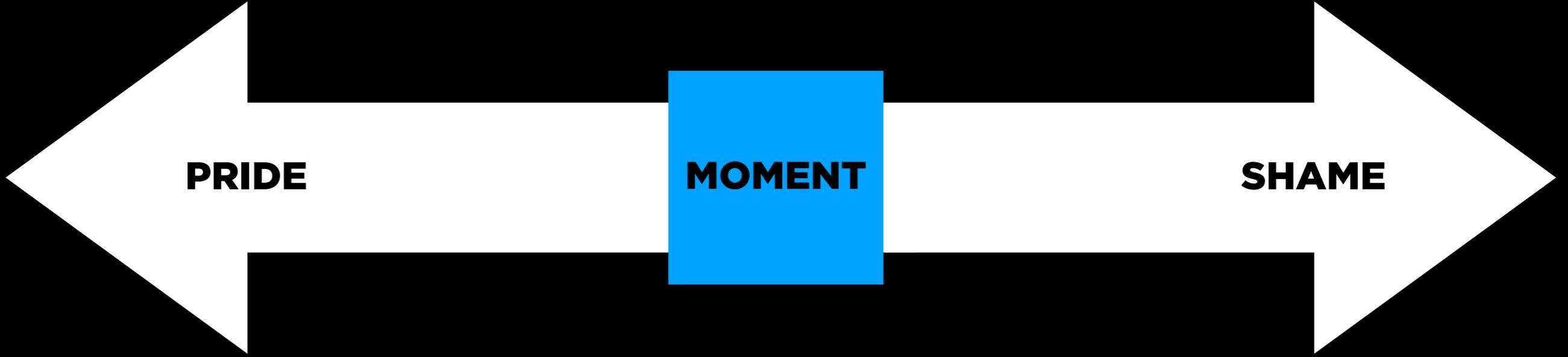
What role did your parents, teachers, siblings, friends, and others play in shaping your current disposition about mathematics and your mathematical achievements? Talk about specific challenges and supports.

**MOMENT**

**PRIDE**

**MOMENT**

**SHAME**



# **SHAME**

is a feeling of diminished self-worth accompanied by a need to hide an exposed weakness.

Kaufman, 1992; Nathanson, 1992

# Pathways of Shame

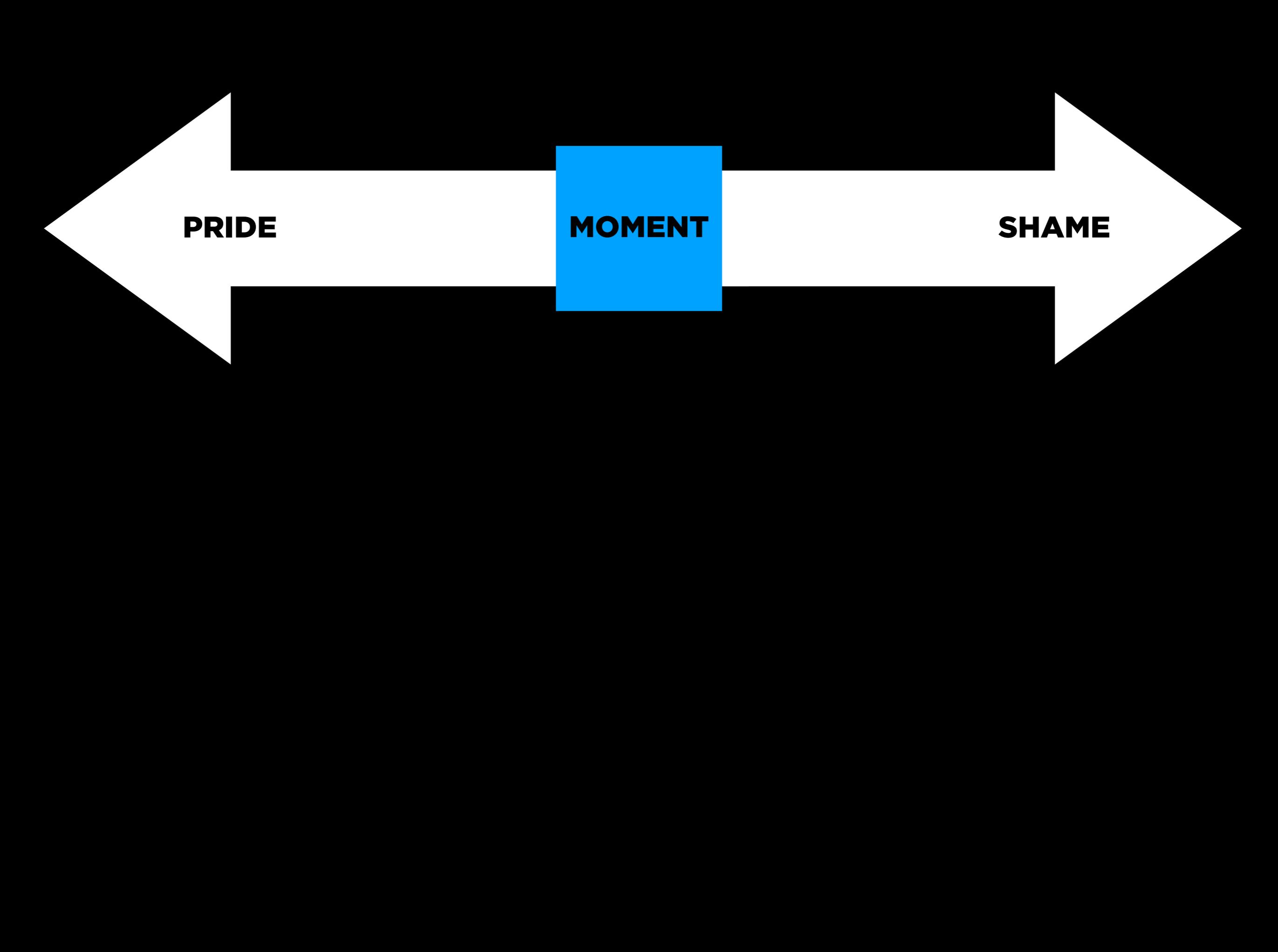
isolating oneself  
running and hiding

blaming  
lashing out



self put-down  
masochism

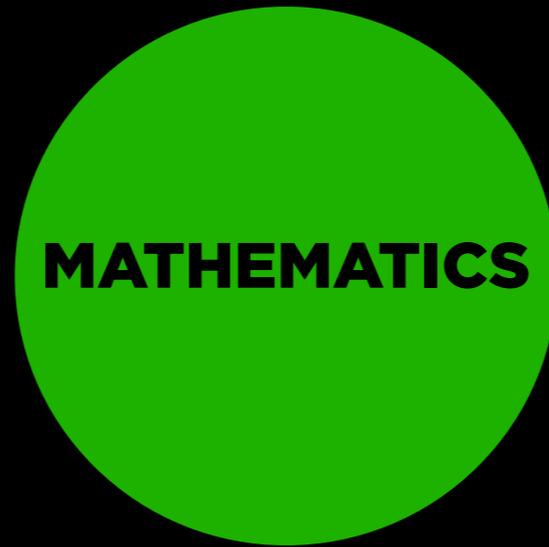
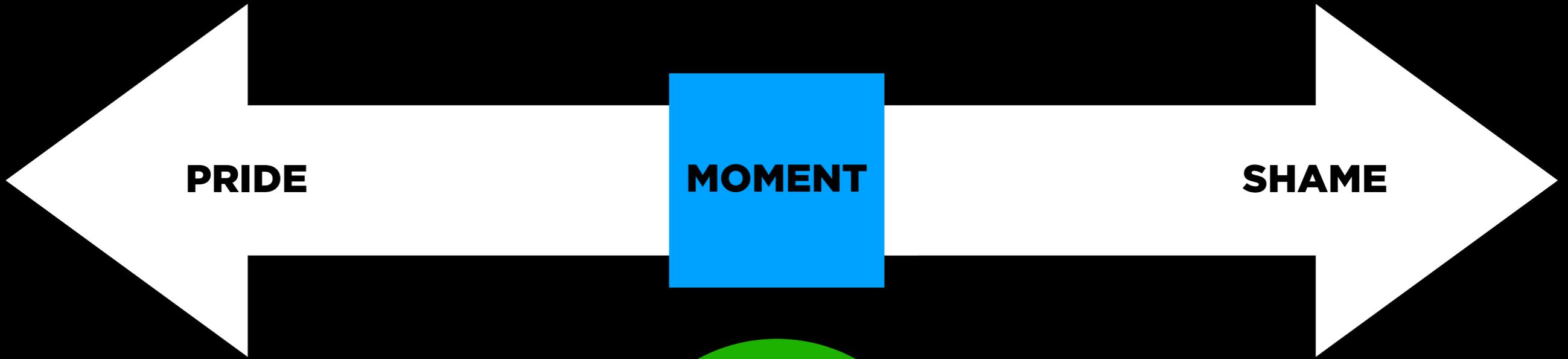
denial  
distraction



**PRIDE**

**MOMENT**

**SHAME**

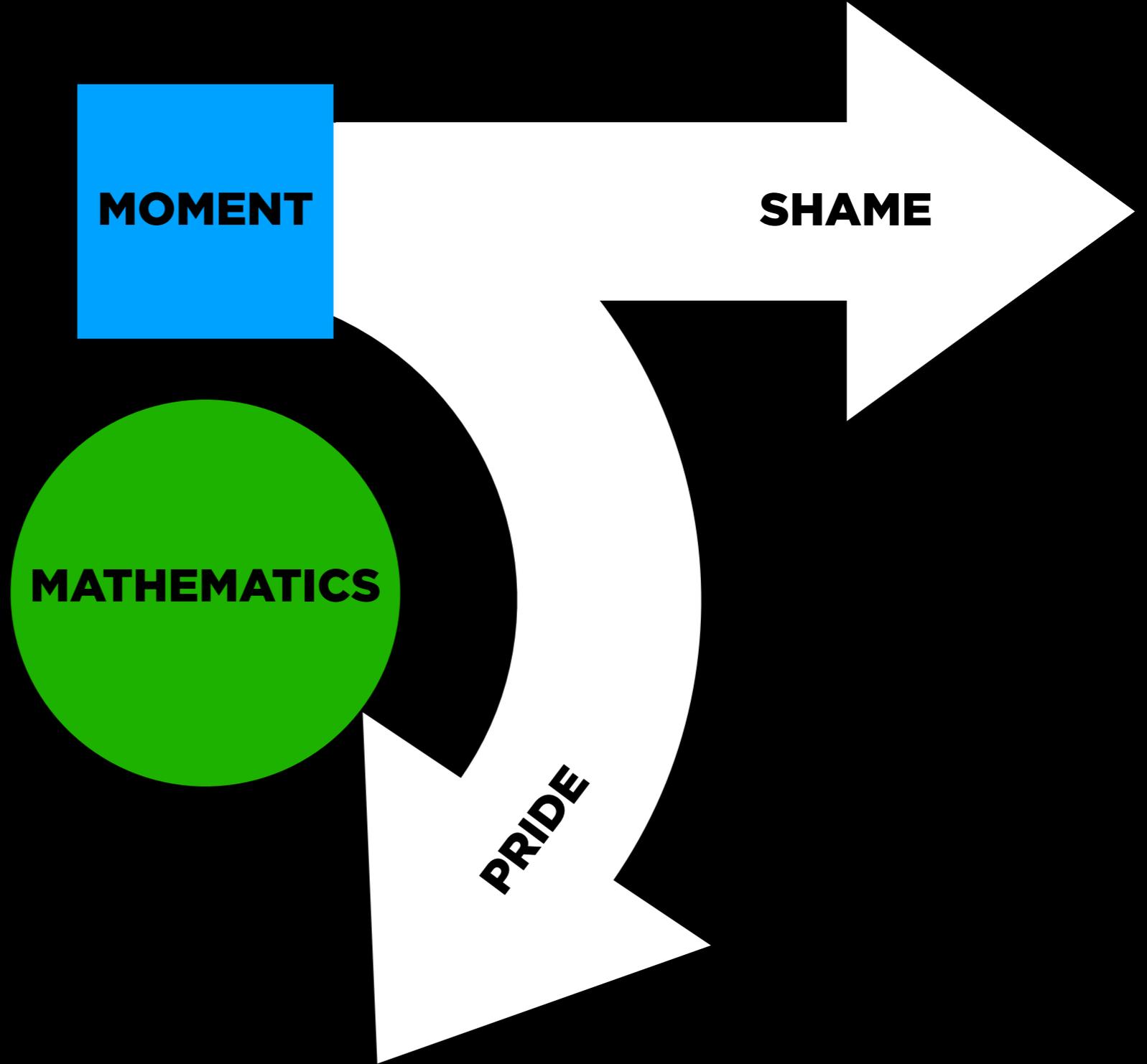


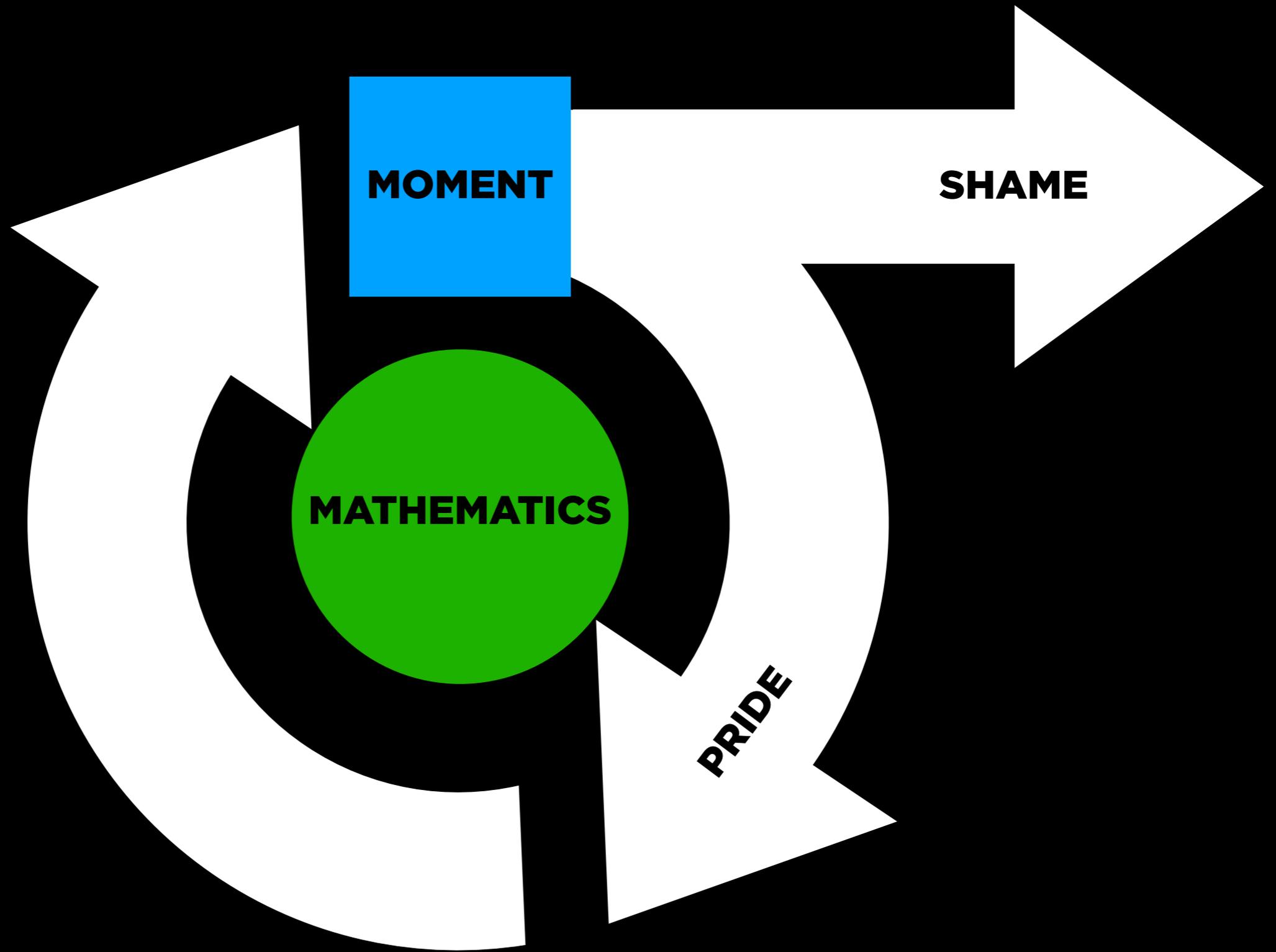
**MOMENT**

**SHAME**

**MATHEMATICS**

**PRIDE**





**MOMENT**

**SHAME**

**MATHEMATICS**

**PRIDE**

# SHAME, SHAME, GO AWAY: FOSTERING PRODUCTIVE STRUGGLE WITH MATHEMATICS

by Joel Amidon, Ann Monroe, David Rock, and Candies Cook



# **SHAME, SHAME, GO AWAY:** FOSTERING PRODUCTIVE STRUGGLE WITH MATHEMATICS

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**Expand what it means to be a doer of mathematics**

**Utilize authentic, developmentally appropriate tasks**

**Adopt cooperative learning structures**

**Employ knowledge of learning trajectories**

**Redefine homework (traditional classroom practices)**

# Research Questions

What is the nature of the relationship between shame/pride experiences with mathematics and the teaching efficacy of future teachers of elementary mathematics?

What can be learned from such an examination in informing the preparation of teachers of mathematics?

How can relationships between mathematics and potential future teachers of mathematics be reconciled?

# Methods

## **Setting**

2 sections of Elementary Math Methods  
Large mid-South institution

## **Participants**

51 Pre-Service Teachers

## **Data**

Mathematics Teacher Efficacy Belief Instrument  
(MTEBI)

Mathematics Autobiography (MatHistory)

## Establishing Factorial Validity of the Mathematics Teaching Efficacy Beliefs Instrument

Larry G. Enochs  
Oregon State University

Phillip L. Smith and DeAnn Huinker  
University of Wisconsin-Milwaukee

*The Mathematics Teaching Efficacy Belief Instrument (MTEBI) for preservice teachers resulted from the modification of the Science Teaching Efficacy Belief Instrument STEBI-B. The MTEBI consists of 21 items, 13 items on the Personal Mathematics Teaching Efficacy (PMTE) subscale and eight items on the Mathematics Teaching Outcome Expectancy (MTOE) subscale. Possible scores on the PMTE scale range from 13 to 65; MTOE scores may range from 8 to 40. The first version of the MTEBI had 23 items like the STEBI-B; however, subsequent analysis in this validation required two items be dropped. Reliability analysis produced an alpha coefficient of 0.88 for the PMTE scale and an alpha coefficient of 0.75 for the MTOE scale (n = 324). Confirmatory factor analysis indicates that the two scales (PMTE and MTOE) are independent, adding to the construct validity of the MTEBI.*

The purpose of this study was to establish factorial validity of the newly developed Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) for preservice elementary teachers. Several efficacy beliefs instruments have been developed by modifying the original Science Teaching Efficacy Beliefs Instrument (STEBI-A). Each of these instruments were subject specific and had factorial validity established by way of traditional factor analysis. The MTEBI discussed here, however, was subjected to a more rigorous confirmatory factor analysis, utilizing a structural modeling program called EQS.

Over the past 10 years, several adaptations of the original Science Teaching Efficacy Beliefs Instrument (Riggs & Enochs, 1990) have been modified to address subject-specific teaching. Several of these adaptations relied on already established validity. Because validity assessments are ongoing and never ending, the authors formally assessed the Mathematics Teaching Efficacy Beliefs Inventory used in the Huinker and Madison (1997) study to provide a formal check of validity for this instrument.

### Background

"All our efforts to make the mathematics curriculum consistent with the National Council of Teachers of Mathematics (NCTM) standards will fail if teachers beliefs about mathematics do not become aligned with those of the reform movement" (Battista, 1994, p. 470). Haney and Lumpe (1995), Borko and Putnam (1995), and Haney, Czerniak, and Lumpe (1996),

indicated that the use of effective and innovative science (mathematics) instruction, promoted by recent national reform efforts, hinges on the teachers' self-efficacy beliefs about science (mathematics) teaching and knowledge about the reform effort itself. De Mesquita and Drake (1994) demonstrated a direct relationship between the perceived levels of teacher efficacy and attitudes toward innovative reform practices. It is not sufficient to prepare teachers of mathematics in areas of content and pedagogy. Borko and Putnam further stated that "... they must acquire richer knowledge of subject matter, pedagogy, and subject-specific pedagogy; and they must come to hold new beliefs in these domains" (1995, p. 60).

### Theoretical Framework

Beliefs are part of the foundation upon which behaviors are based. Several studies investigating teacher efficacy beliefs indicate that these beliefs may account for individual differences in teacher effectiveness (Armor et al., 1976; Berman & McLaughlin 1977; Brookover et al., 1978). Beliefs have been closely associated with behavior in Bandura's (1981) theory of social learning. Bandura suggested that people develop a generalized expectancy concerning action-outcome contingencies based upon life experiences. In addition, they develop specific beliefs concerning their abilities to cope with change. Bandura (1986) called this self-efficacy (1986). Behavior is enacted when people not only expect specific behavior to result in desirable outcomes (outcome expectancy), but

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## Mathematics Teacher Outcome Expectancy Subscore (MTOE)

The belief that effective teaching of mathematics will have a positive effect on student learning

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## Personal Mathematics Teaching Efficacy Belief Subscore (PMTE)

The belief in one's ability to teach mathematics effectively.

*Write your MathHistory, a mathematics autobiography, focusing on key moments that you have experienced as a student of mathematics. Consider these questions as you write:*

- *Why do these math moments stand out? What is it about these math moments that continue to resonate, that continue to give you either joy or discomfort?*
- *What role did your parents, teachers, siblings, friends, and others play in shaping your current disposition about mathematics and your mathematical achievements? Talk about specific challenges and supports.*
- *In the paper, be specific about the role of particular teachers that contributed to your development as a doer of mathematics.*

*The write up should be typed, 3-4 pages, double-spaced.*

# Analysis

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## **Holistic Coding of MathHistories**

Nature of the Relationship with Mathematics

# Analysis

## Holistic Coding of MathHistories

Nature of the Relationship with Mathematics

### **Positive**

Overwhelming evidence of a positive relationship with mathematics

### **Negative**

Overwhelming evidence of a negative relationship with mathematics

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### **Conflicted**

Mixed evidence on the nature of the relationship with mathematics

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### Nature of the Relationship with Mathematics

#### **Positive**

Overwhelming evidence of a positive relationship with mathematics

#### **Negative**

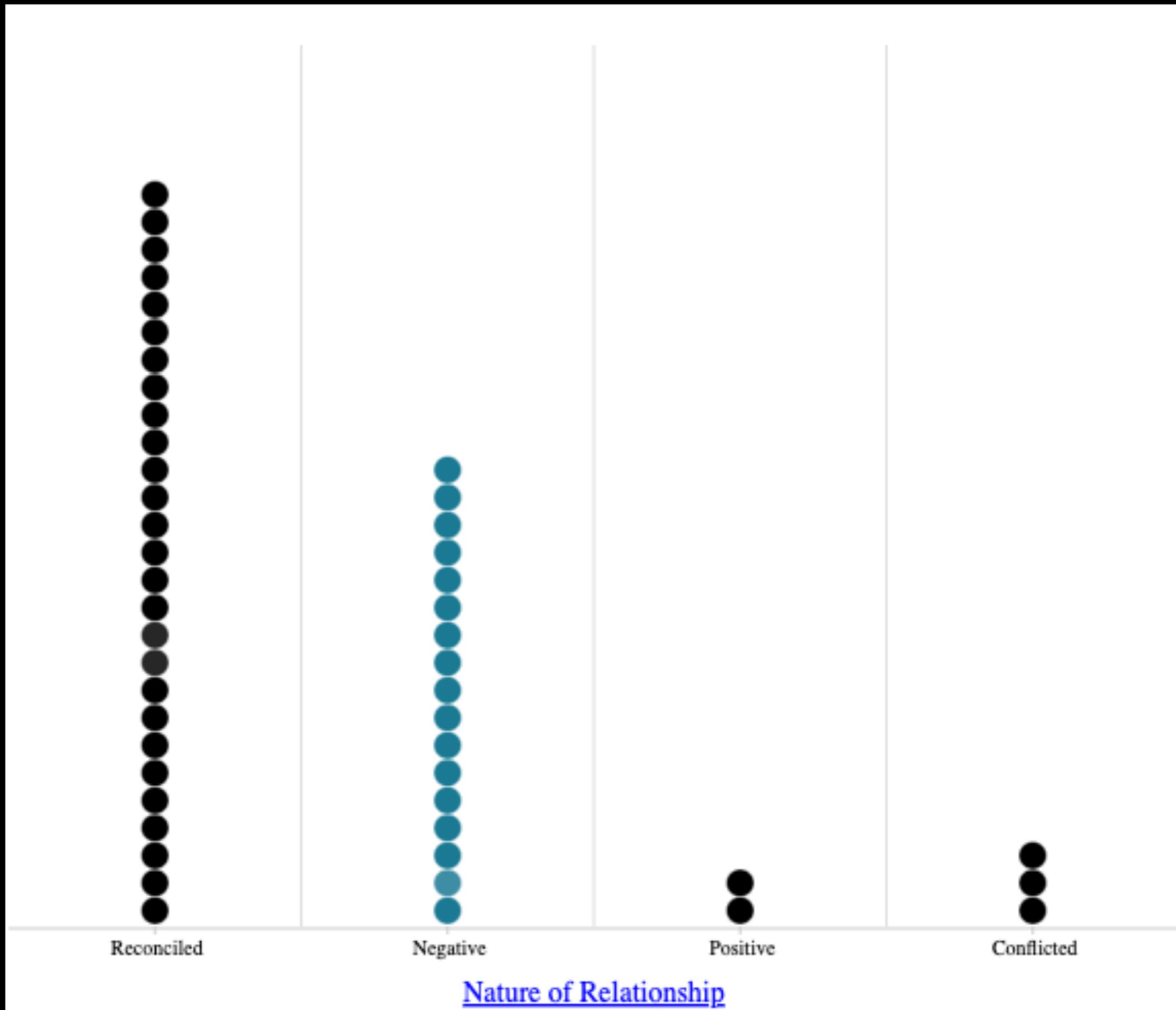
Overwhelming evidence of a negative relationship with mathematics

#### **Conflicted**

Mixed evidence on the nature of the relationship with mathematics

#### **Reconciled**

Began with a negative relationship with mathematics but ended with a positive relationship



# Analysis

## **Holistic Coding of MathHistories**

Nature of the Relationship with Mathematics

## **Provisional Coding of Shame/Pride Events**

Emotion, Trigger, Pathway

**MOMENTS**

**MOMENTS**

**EMOTION**

**MOMENTS**

**TRIGGER**

**EMOTION**

**MOMENTS**

**TRIGGER**

**EMOTION**

**PATHWAY**

When I think back on my mathematical experiences, they are not fond memories; instead I would describe them as painful. They include a lot of self doubt, insecurities, and anxiety. This negative way of feeling and thinking about math started when I was in the first grade. First grade was the year where we would have timed multiplication tests, where we were given a minute to complete as many multiplication problems on the worksheet as possible. This memory in particular stands out to me the most because it is also tied to the anxiety of taking timed tests. Both have stuck with me from then to this day.

Like clockwork I prepare well and in advance for a test. Comprehensively and completely I know and understand the material. But once the test is in front of me, I have trouble focusing or getting through the material. My mind can only think about how much time I have remaining and that it is ticking down.

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**MOMENTS**

**TRIGGER**

**EMOTION**

**PATHWAY**

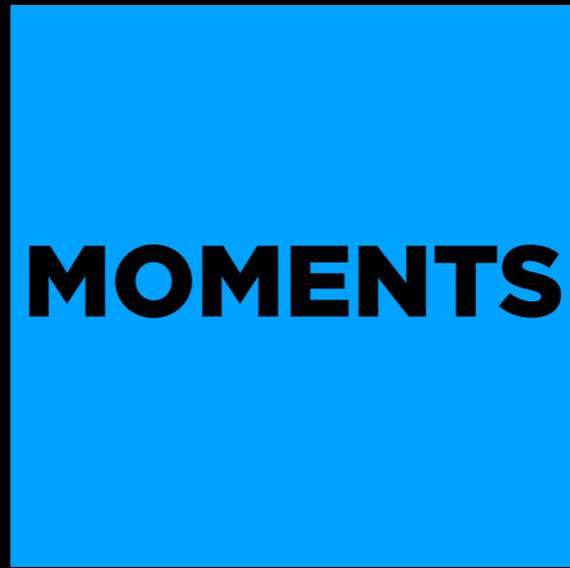
**Code your own** **MOMENTS**

**TRIGGER**

**EMOTION**

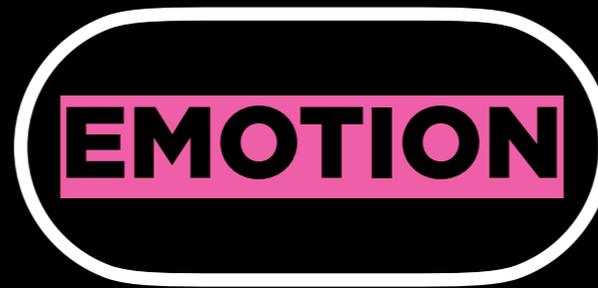
**PATHWAY**

**Code your own** **MOMENTS**



**TRIGGER**

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**PATHWAY**

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**Code your own**

**MOMENTS**

**TRIGGER**

**EMOTION**

**PATHWAY**

**What moment stood out as a  
emotion, trigger, and pathway?**

# Analysis

## **Holistic Coding of MathHistories**

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Emotion, Trigger, Pathway

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Triggers

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Collapsing Categories of Triggers

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Collapsing Categories of Triggers

## **Comparison**

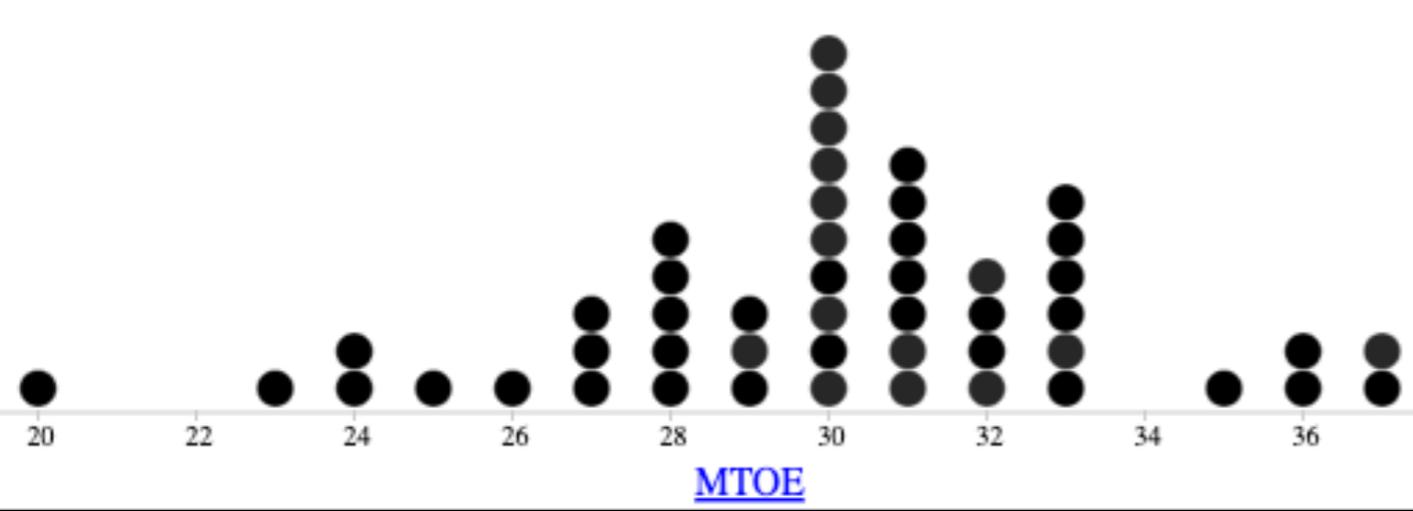
Holistic Codes and MTEBI Subcategory  
Groupings

**Mathematics Teacher  
Outcome Expectancy  
Subscore  
(MTOE)**

# **Mathematics Teacher Outcome Expectancy Subscore (MTOE)**

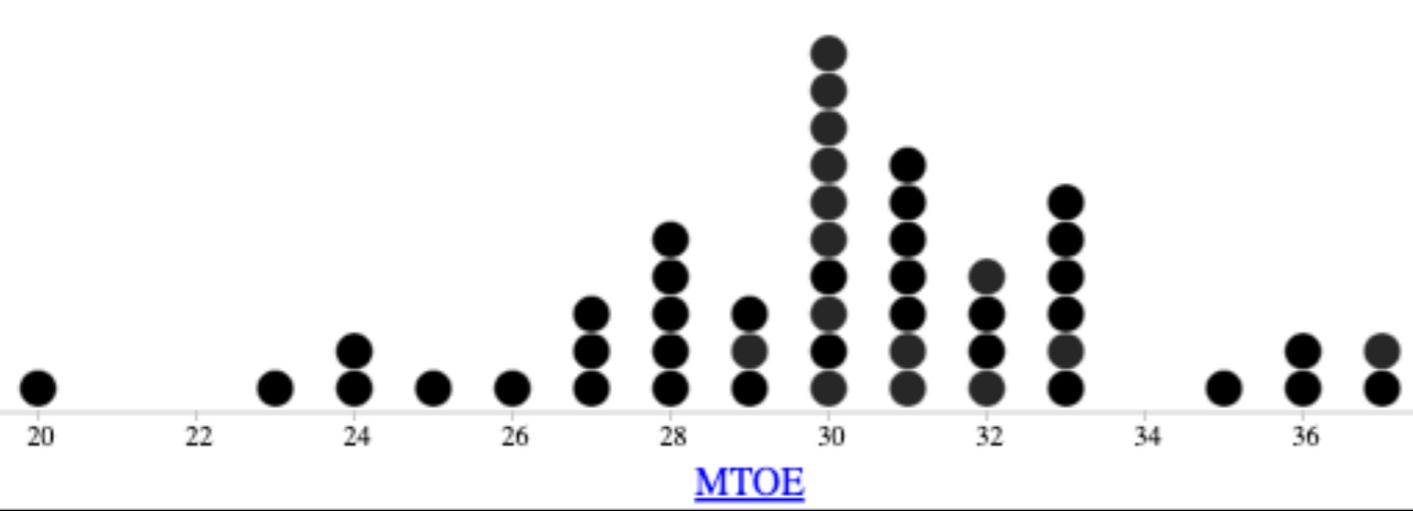
The belief that effective teaching of mathematics will have a positive effect on student learning

# Mathematics Teacher Outcome Expectancy (MTOE)

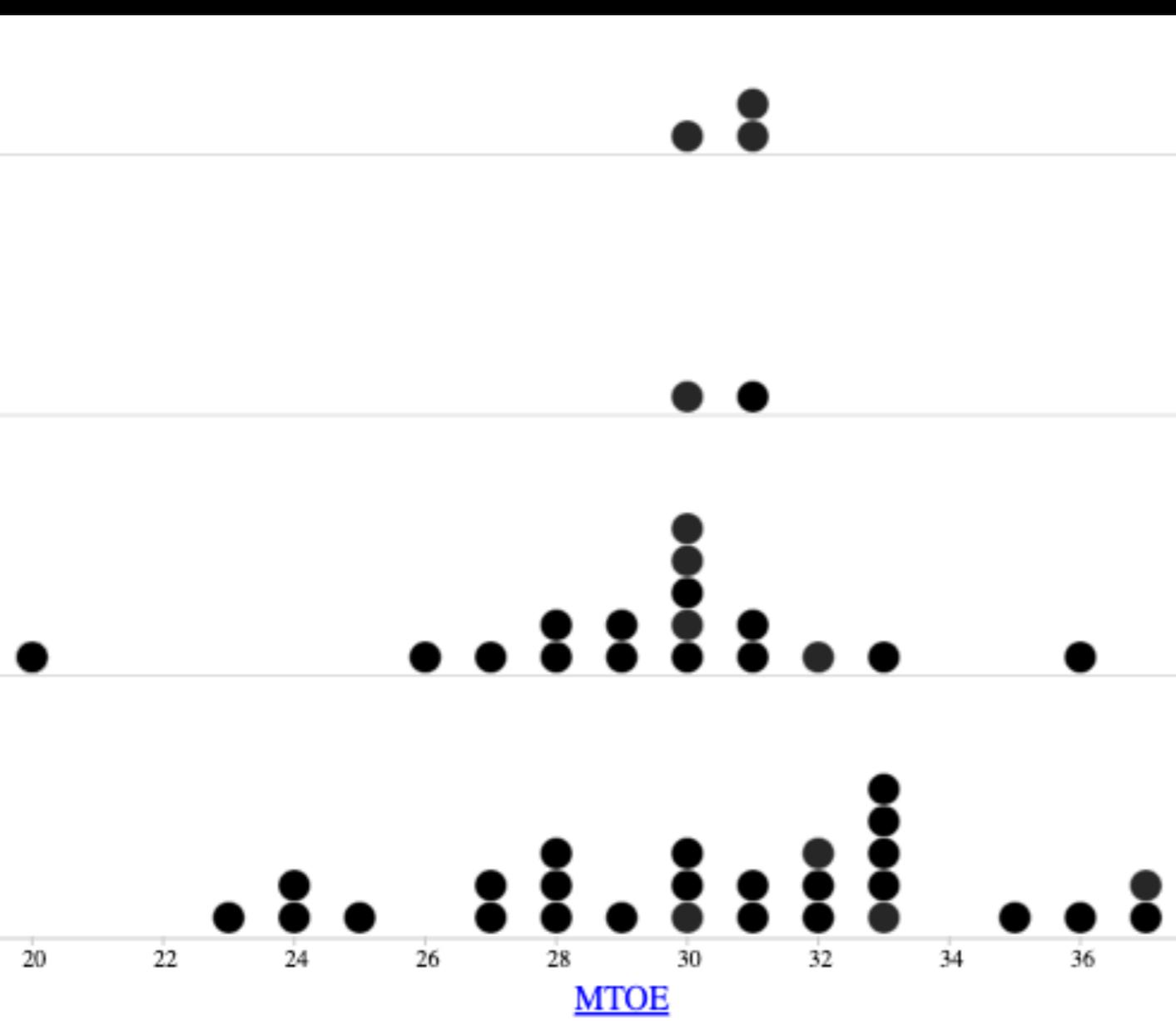


The belief that effective teaching of mathematics will have a positive effect on student learning

# Mathematics Teacher Outcome Expectancy (MTOE)



The belief that effective teaching of mathematics will have a positive effect on student learning



**Contradictory**

**Positive**

**Negative**

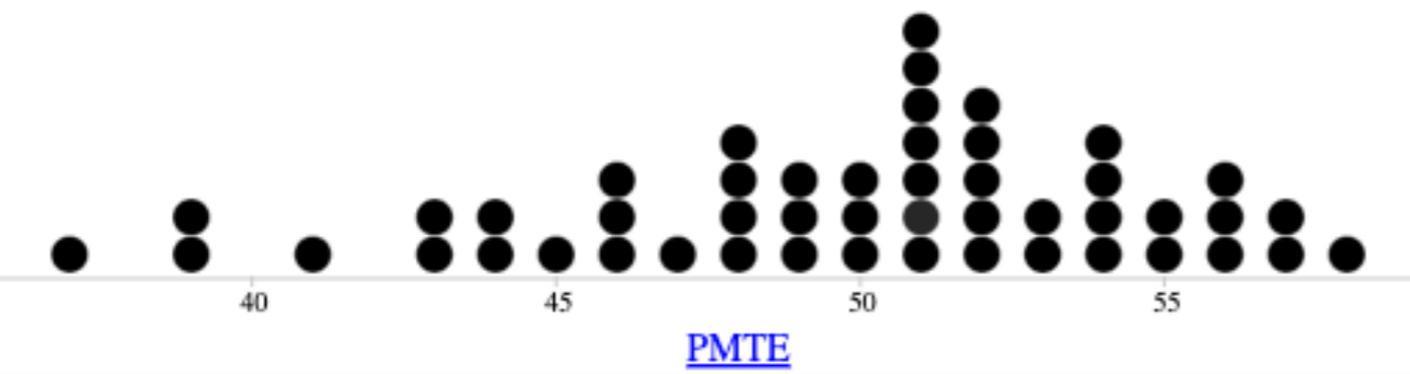
**Reconciled**

**Personal Mathematics  
Teaching Efficacy  
Belief Subscore  
(PMTE)**

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(PMTE)**

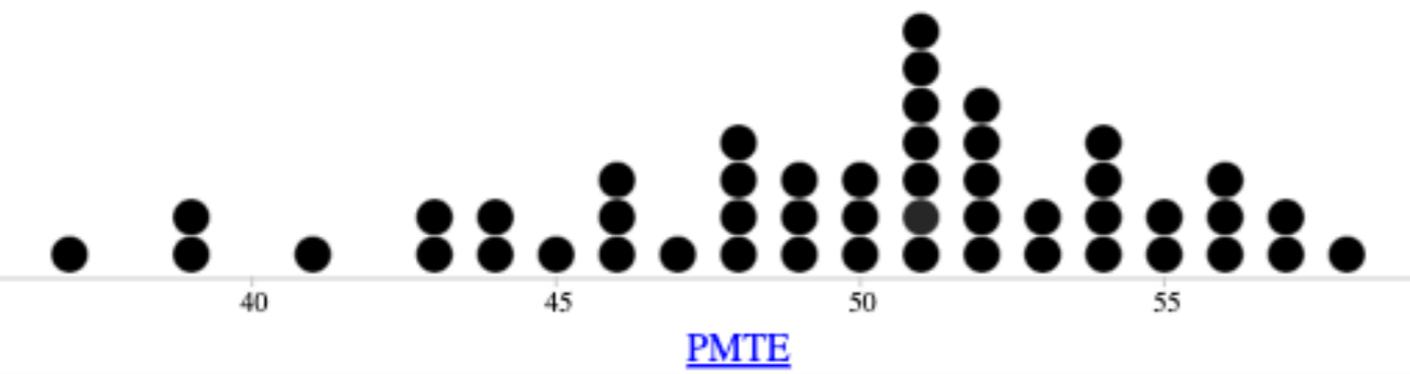
The belief in one's ability to teach mathematics effectively.

# Personal Mathematics Teaching Efficacy Belief Subscore (PMTE)

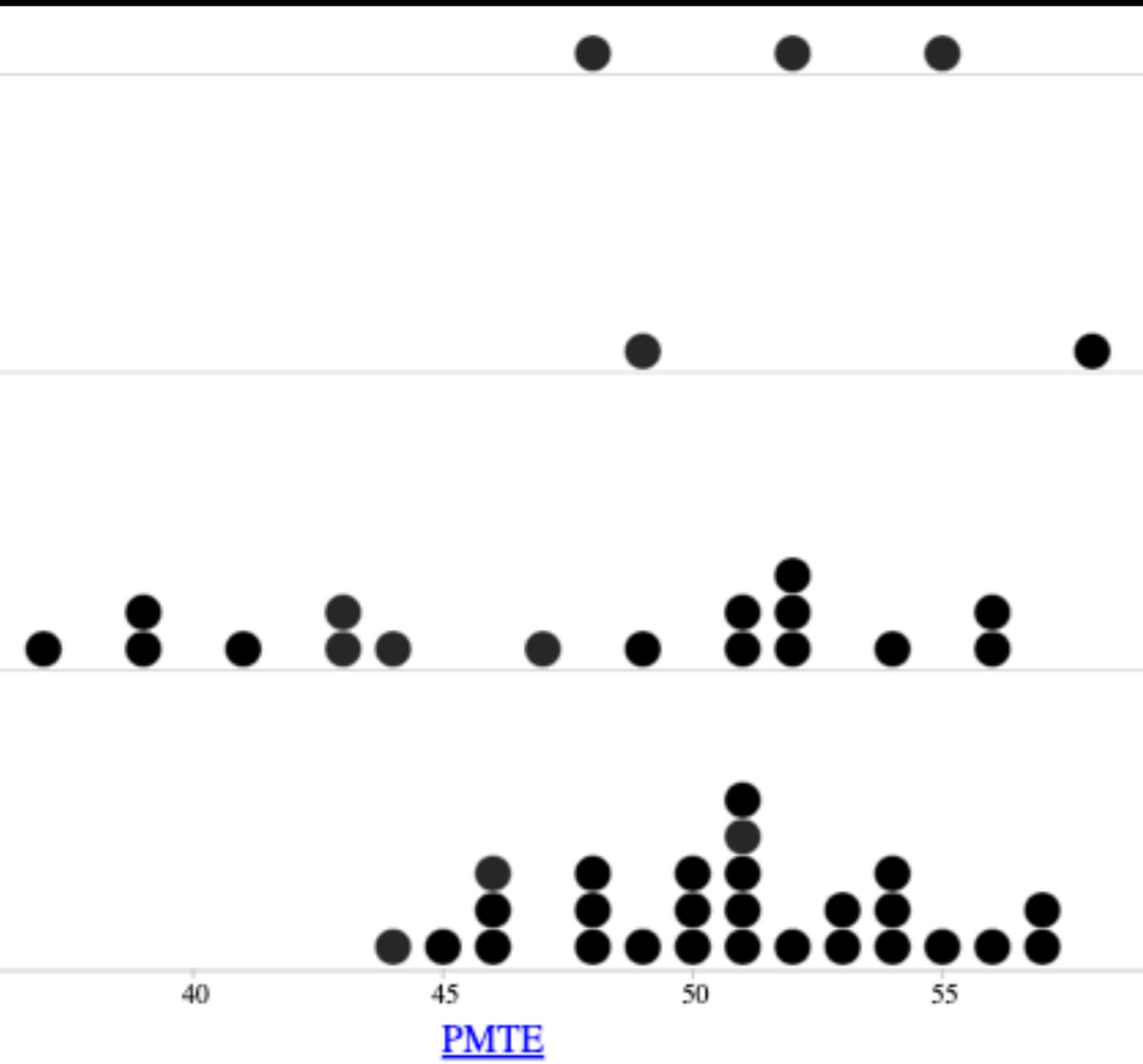


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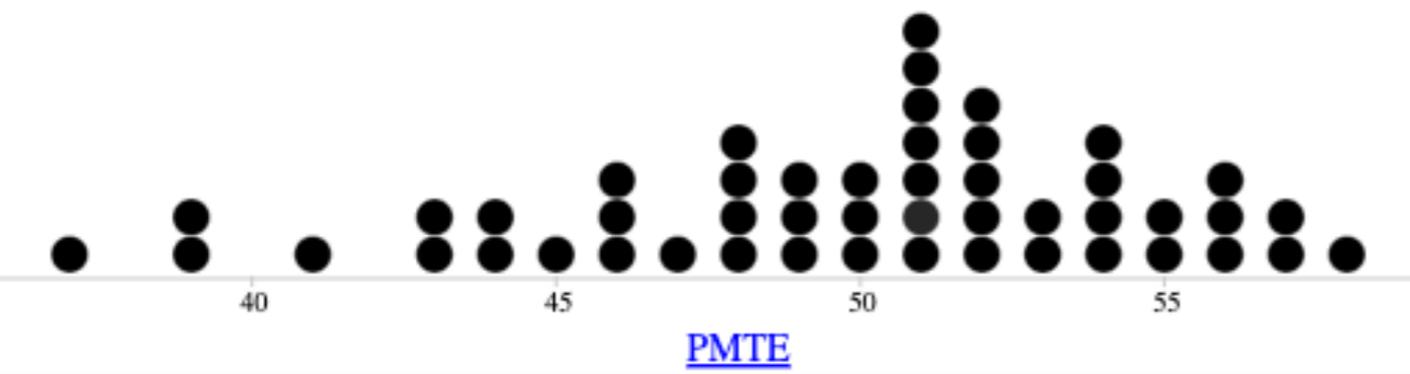
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**Positive**

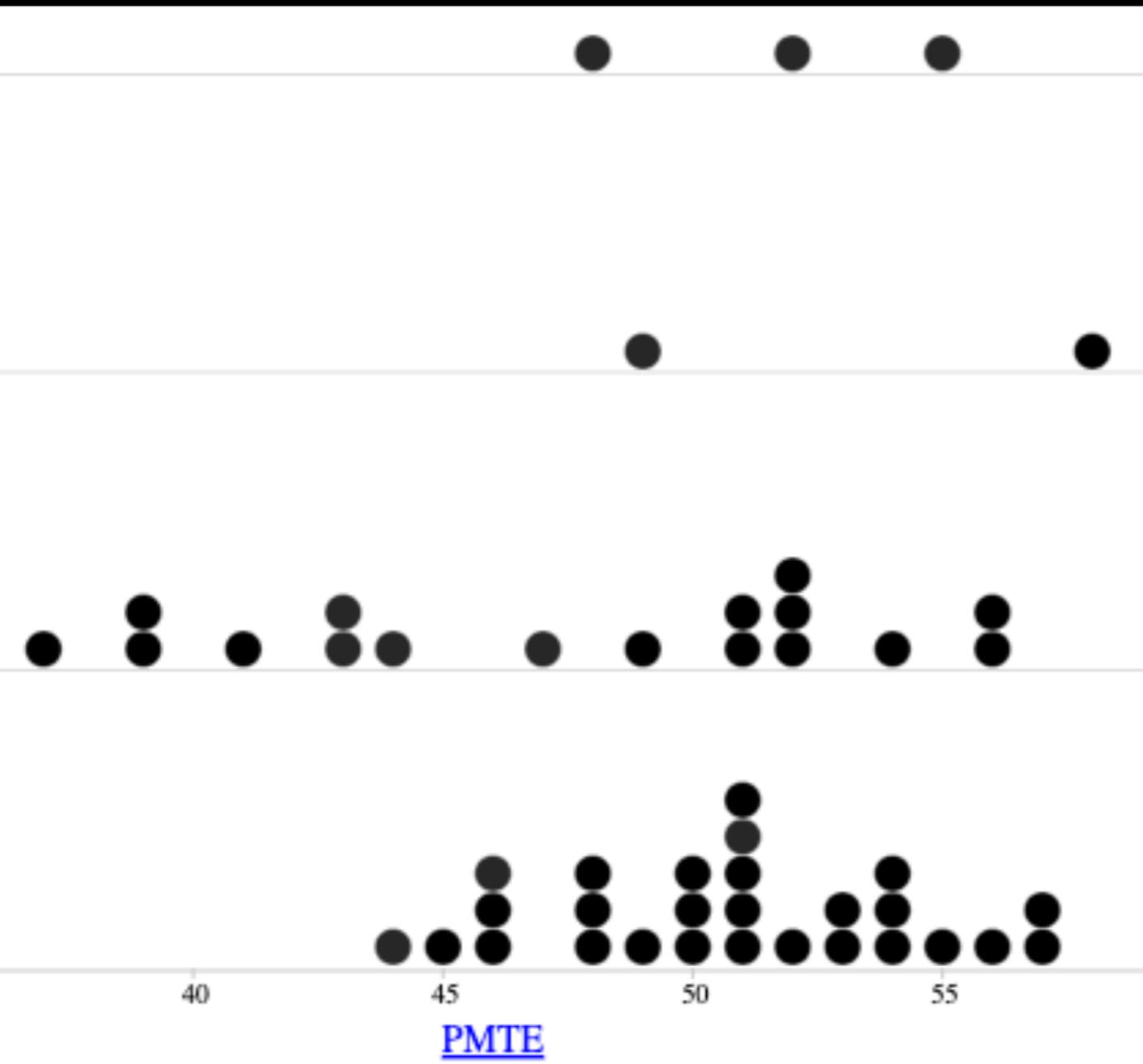
**Negative**

**Reconciled**

# Personal Mathematics Teaching Efficacy Belief Subscore (PMTE)



The belief in one's ability to teach mathematics effectively.



**Contradictory**

**Positive**

**Negative**

**Reconciled**

A story



# Findings

# Findings

## **Reconciled Relationships**

Happening in secondary/post-secondary settings

Connection to personal efficacy

# Findings

## Reconciled Relationships

Happening in secondary/post-secondary settings

Connection to personal efficacy

## Continuum of Instructional Quality

Manipulatives

Differentiated

Solid  
Traditional

Unskilled

Apathetic

Antagonistic



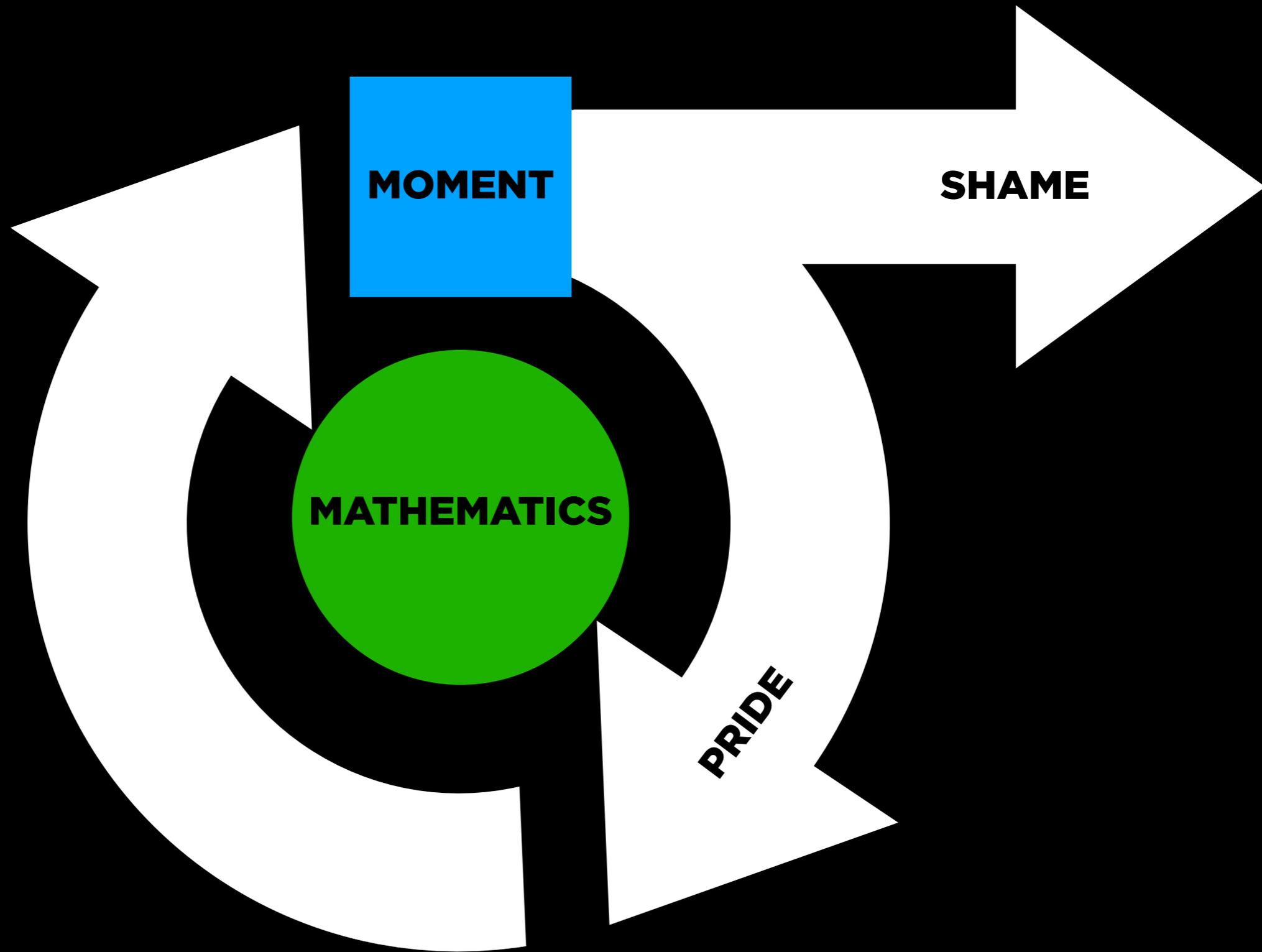
# Implications

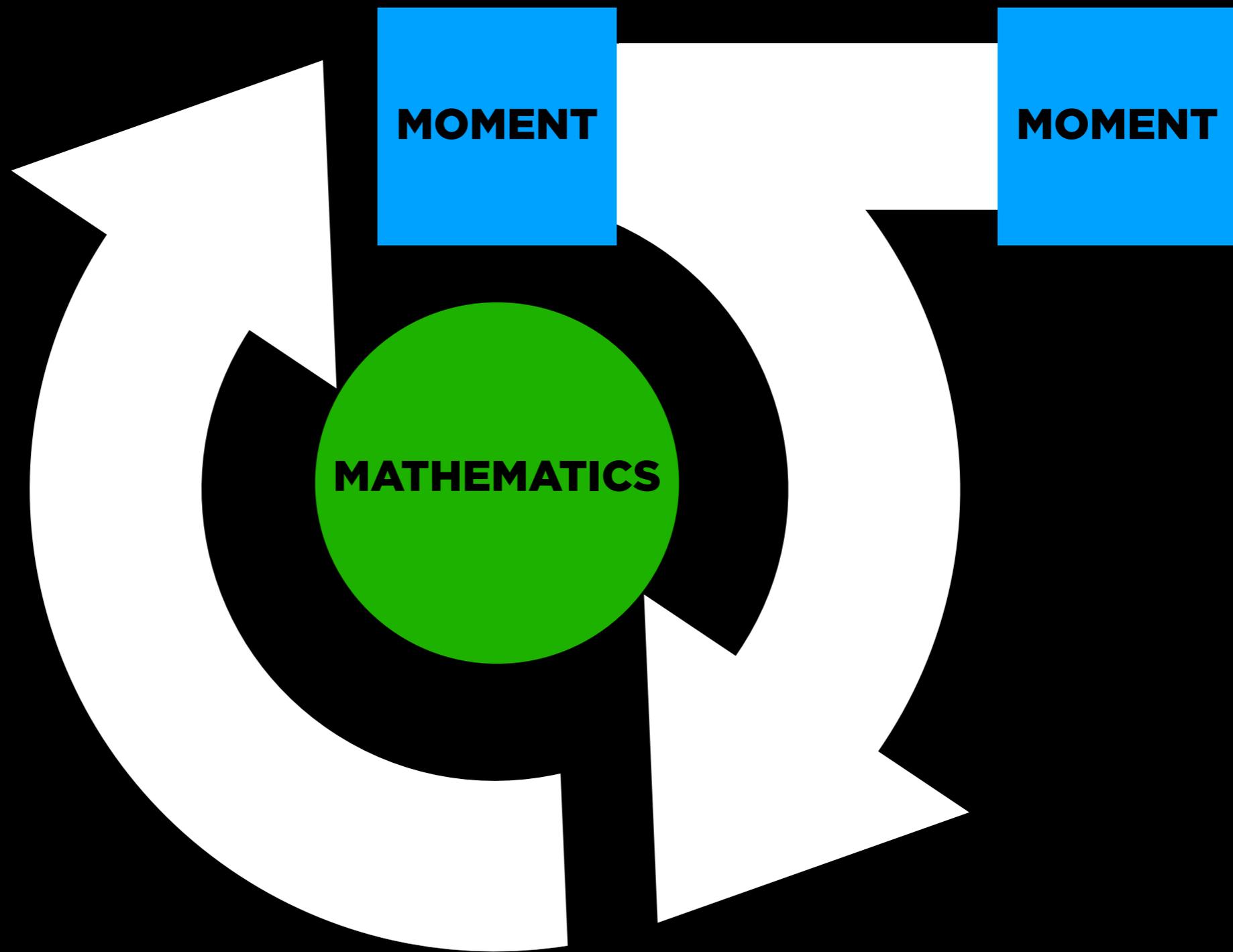
Potential for those with a Negative MathHistory  
Manufacture Moments  
Work with other Mathematics (Teacher)  
Educators

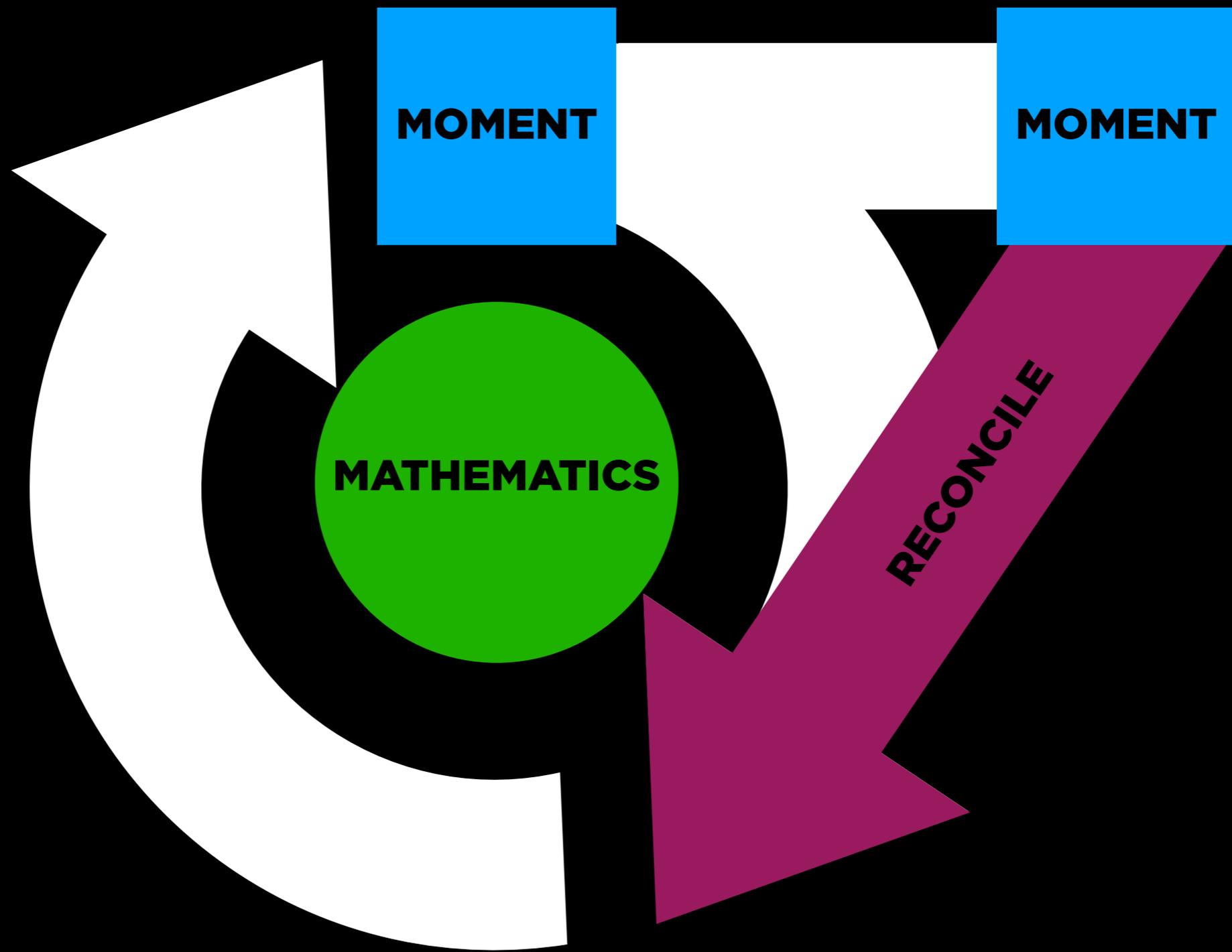
# Implications

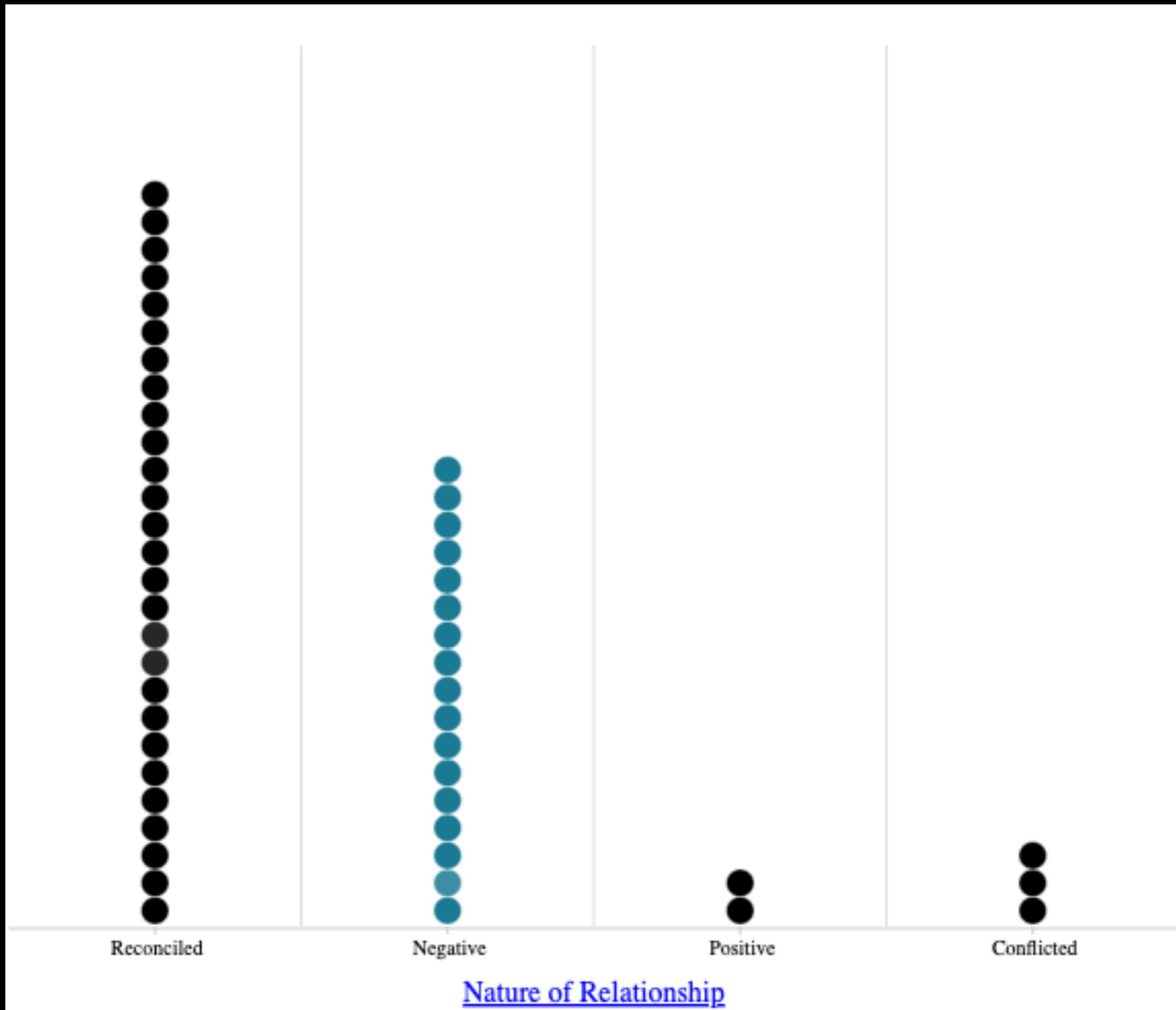
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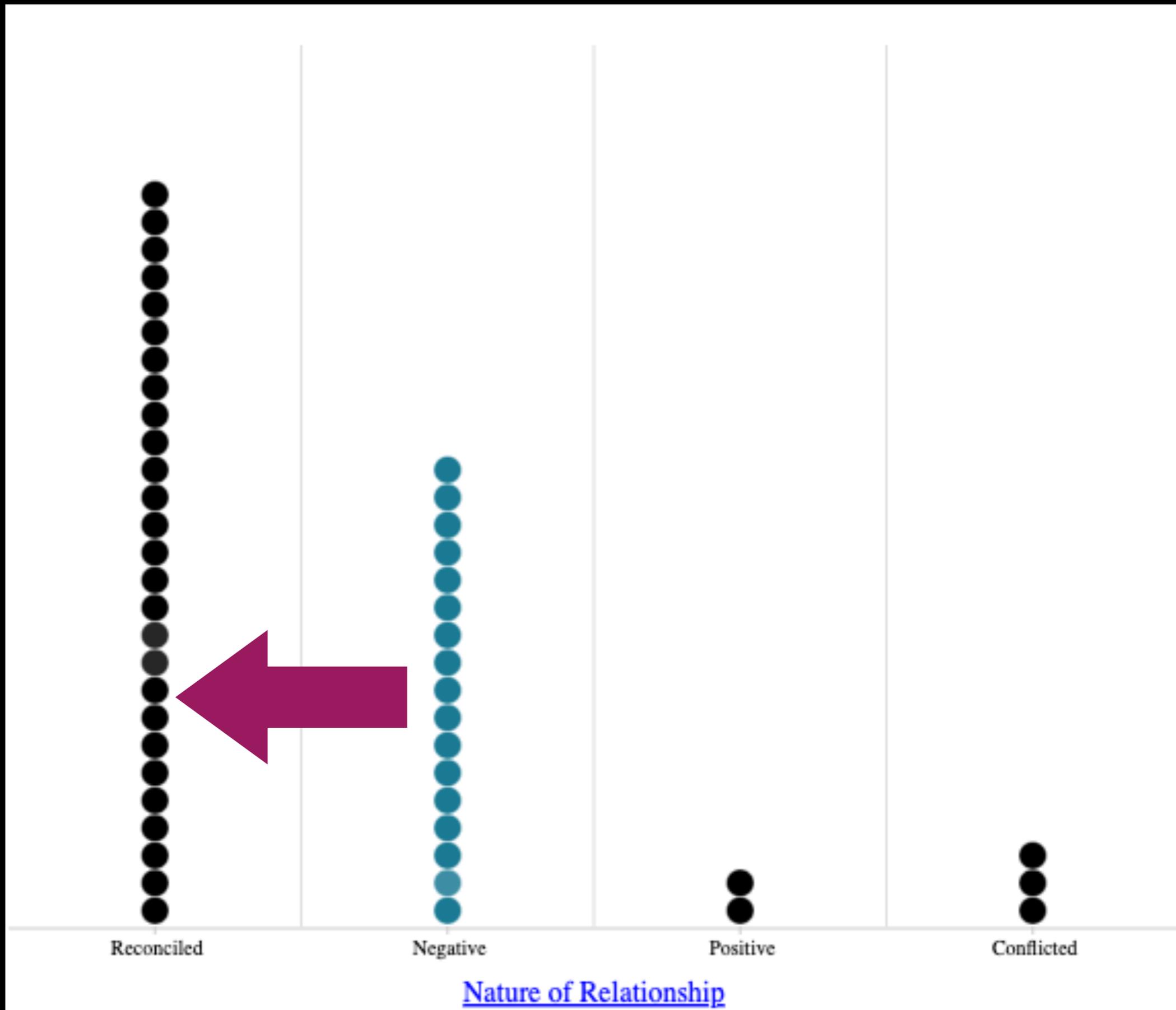
Study the influence of the elementary  
mathematics methods course on MatHistory and  
efficacy

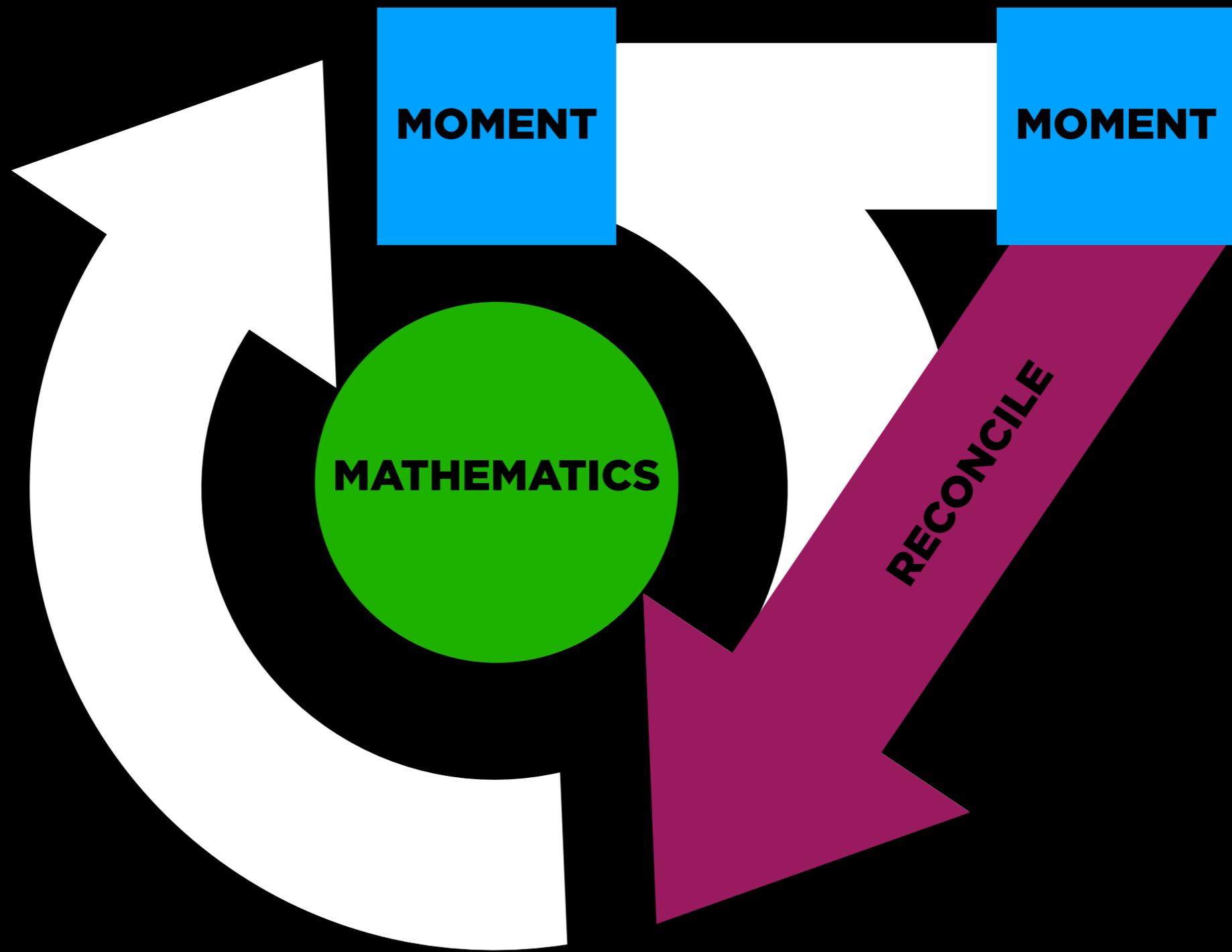












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