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## THE POTENTIAL ROLE OF TRAUMA-INFORMED POSITIVE EDUCATION IN THE SECONDARY MATHEMATICS CLASSROOM IN DISRUPTING THE PRESCHOOL-TO-PRISON PIPELINE

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THE POTENTIAL ROLE OF TRAUMA-INFORMED POSITIVE EDUCATION  
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PRESCHOOL-TO-PRISON PIPELINE

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DISSERTATION

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A dissertation submitted in partial fulfillment of the  
requirements for the degree of Doctor of Philosophy in  
College of Education  
at the University of Kentucky

By  
Jessica Michele Doering  
Lexington, Kentucky  
Director: Dr. Margaret Mohr-Schroeder, Professor of STEM Education  
Lexington, Kentucky  
2021

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## ABSTRACT OF DISSERTATION

### THE POTENTIAL ROLE OF TRAUMA-INFORMED POSITIVE EDUCATION IN THE SECONDARY MATHEMATICS CLASSROOM IN DISRUPTING THE PRESCHOOL-TO-PRISON PIPELINE

This mixed-methods study considered the potential for trauma-informed mathematics education to disrupt the preschool-to-prison (or school-to-prison) pipeline. Phenomenological qualitative interviews were conducted in conjunction with the use of the Attitudes Related to Trauma-Informed Care (ARTIC; Baker et al., 2016) scale to determine teacher perceptions of trauma-informed care practices, their thoughts regarding challenging classroom behaviors and the connection of these behaviors with trauma and the pipeline, and their ideas about how much of an impact teachers can have on students who present with challenging behaviors that might be symptoms of trauma or that might be an indicator of future incarceration. This study found that there is high potential for disrupting the preschool-to-prison pipeline in using trauma-informed practices in mathematics classrooms, but also found that there are limits that teachers perceive for this impact.

**KEYWORDS:** trauma-informed education, preschool-to-prison pipeline, challenging student behavior

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4/26/2021  
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Date

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## DEDICATION

To my Boo/Stud Muffin/Hubby, my Princess, my Little Big Man, and my Baby Nugget.

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First, I am grateful for the example of Jesus Christ in caring for the brokenhearted and the crushed in spirit—for teaching me grace and compassion for the hurting. I am thankful for the sacrifices and constant encouragement of my family as I have pursued this endeavor and their patience with me as I navigated graduate school. Especially for my husband and children who supported me in my pursuits and for our parents and siblings who spent hours watching the kids when I had to work. I am thankful for my Grandma and Grandpa, who helped instill in me a love of reading and education from an early age and whose legacy is evident in my own children's love of learning.

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I am thankful for the giants on whose shoulders I stand—I saw the potential for trauma-informed education to disrupt the pipeline because of the beauty and power of mathematics and the great work already being done to expose students to this world. I want to acknowledge publically that I largely failed as a mathematics teacher when working with trauma-affected students, which is what fueled my desire to take on this project. I loved these kids and wish I had known then what I now know.

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## 1 INTRODUCTION

Educators and policy makers have an ethical responsibility to care for children in our communities that are the most at-risk of being denied equitable educational opportunities. Many of these at-risk children are funneled through the preschool-to-prison pipeline (sometimes called the school-to-prison pipeline), and we must do better to find ways to disrupt this pipeline to increase their chance of having access to quality educational experiences that assist in developing the skills they need for future success. Trauma survivors are among the most vulnerable of our children, and there is a significant overlap between those who experienced trauma as children and those who end up in prisons (Cuadra et al., 2014; Dierkhising et al., 2013; Fox et al., 2015; Sarchiapone et al., 2009;). Considering the significant overlap between these populations, I sought to consider how trauma-informed mathematics education might help disrupt the preschool-to-prison pipeline.

### 1.1 Defining Childhood Trauma

Childhood trauma refers to trauma experienced by an individual before they are eighteen years old. However, as a result of the complexity and unique nature of the human experience, it is difficult to define trauma. From a behavioral and mental health standpoint, The Substance Abuse and Mental Health Services Administration (SAMHSA) defines individual trauma as “an event, series of events, or set of circumstances experienced by an individual as physically or emotionally harmful or life-threatening with lasting adverse effects on the individual’s functioning and mental, physical, social, emotional, or spiritual well-being” (Substance Abuse and Mental Health

Services Administration, 2014, p. 7). Their definition of trauma and suggestions for trauma-informed care practices have been widely cited (e.g., Alvarez et al., 2017; Bartlett et al., 2016; Bowen & Murshid, 2016; Hanson & Lang, 2016; Lang et al., 2016; Magruder et al., 2016), but their definition does not specifically mention trauma resulting from events not experienced directly by an individual, for example, learning of the sexual assault of a classmate. This is accounted for in the definition in the updated Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013):

Exposure to actual or threatened death, serious injury, or sexual violence in one (or more) of the following ways: directly experiencing the traumatic event(s); witnessing, in person, the traumatic event(s) as it occurred to others; learning that the traumatic event(s) occurred to a close family member or close friend (in case of actual or threatened death of a family member or friend, the event(s) must have been violent or accidental); or experiencing repeated or extreme exposure to aversive details of the traumatic event(s). (p. 271)

This definition of trauma is narrow, but assists us in understanding the types of traumatic events that might lead to serious mental health problems. To account for the wide array of experiences that could be traumatic, including generational trauma caused by genocide or slavery and community-based trauma like gang violence (Kira, 2001), trauma will be defined for the purposes of this paper as “real or perceived experiences or events that negatively impact the well-being of a person, including their actual or felt safety.”

Examples of events and experiences that would fall within this simple definition include physical abuse, sexual abuse, neglect, physical injury, or being in a car accident. Trauma also includes experiences that might not be as obvious, such as divorce, having

inadequate access to healthcare, witnessing a parent get arrested, a family member being seriously or chronically ill, being bullied or rejected by peers, being separated from a loved one, or moving to a new location. Within their guide on trauma, the Substance Abuse and Mental Health Services Administration (SAMHSA) also recognizes that trauma can be transmitted generationally or communally (SAMHSA, 2014, p. 17). Examples of community trauma could include the impact of a natural disaster (hurricane, tornado, earthquake, etc.) or ongoing violence within the community (e.g., war, gang violence) (Kira, 2001). Generational trauma can be seen in people groups whose ancestors lived through slavery or genocide (Kira, 2001).

## 1.2 Measuring Childhood Trauma

Even given a definition, the subjective nature of trauma makes understanding and measuring trauma a complex task. What might be traumatic for one person may not be traumatic for another, and the degree to which an event is traumatic for an individual is difficult to measure. But if we are to understand how we might help trauma-impacted children, a measure of childhood trauma could be helpful in quantifying the problem. Two of the most commonly-used measures for trauma experienced in childhood that are outlined below.

### 1.2.1 Childhood Trauma Questionnaire (CTQ)

The Childhood Trauma Questionnaire (CTQ) is a self-reporting tool that measures five types of trauma: physical abuse, sexual abuse, emotional abuse, physical neglect, and emotional neglect. The questionnaire screens for trauma experiences in childhood. It also includes a measure for detecting the underreporting of trauma. The CTQ has been shown to have high internal consistency, good test-retest reliability (Bernstein et al., 1994;



Bernstein et al., 1997; Paivio & Cramer, 2004; Scher et al., 2001; Villano et al., 2004), and has been shown to be reliable even when translated into other languages (Grassi-Oliveira et al., 2006; Thombs et al., 2009; Wingefeld et al., 2010; Zhao et al., 2005). The CTQ gives a classification of the level of trauma exposure (none, low, moderate, and severe) for each of the five categories.

### 1.2.2 Adverse Childhood Experiences (ACEs)

The CDC-Kaiser Permanente Adverse Childhood Experiences (ACE) Study is well-known for being one of the largest studies on how childhood trauma impacts an individual's well-being in adulthood. The original study was conducted from 1995 and 1997, and collected data on over 17,000 patients. In this study, Felitti et al. (1998) found a significant correlation between childhood trauma and poor outcomes in later life. The study's list of childhood traumatic events, known as "adverse childhood experiences" (ACEs) includes childhood abuse (emotional, physical, and sexual), neglect (emotional and physical), and household challenges (violence against mother, substance abuse of parent, mental illness in the house, divorce, and incarceration of a parent) (Center for Disease Control, 2019). This list of ACEs has been used as a tool for assessing trauma, scoring one point for every ACE that someone has experienced. Subsequent studies have verified the measure to be reliable (Mersky et al., 2017; Murphy et al., 2014;), and as of April 2021, the original ACEs study (Felitti et al., 1998) has been cited over 13,000 times in academic literature. This tool was not intended to screen for trauma, but rather as a research tool to "determine the population impact of the cumulative effect of childhood stress" (Anda et al., 2020, p. 2). Anda et al. (2020) and Finkelhor (2018) caution against

the use of this measure as a screening tool and believe further research is needed to determine how this research tool could be used for screening.

### 1.3 Trauma-Informed Care

The National Survey of Children’s Health (NSCH) found that between 2017 and 2018, over forty percent of children have had at least one adverse childhood experience. With the prevalence of traumatic experiences among the youth in our schools, it is imperative that we work toward solutions that improve access to education for children who have experienced trauma. And while other helping professions have implemented trauma-informed care practices with success (e.g., Bartlett et al., 2018; Isobel & Delgado, 2018; Kramer et al., 2012; Kenny et al., 2017;), there is has been limited study on the effectiveness of interventions proposed for classroom teachers and school administrators. There is great need to consider what trauma-informed care looks like for educators and how effective interventions could be implemented in the classroom. According to Pickens and Tschopp (2017), “[t]he aim of a trauma-informed classroom is to infuse an understanding of the impact of trauma and adverse life experiences on students into the classroom culture and promote a physically and psychologically safe environment to foster student growth” (p. 1).

Generally, trauma-informed care (TIC) begins by considering how we, as professionals, might behave differently should we know the impacts of trauma on those we are caring for (Wilson et al., 2013). It starts with shifting from asking “What is wrong with those we are caring for?” to considering “What has happened to them?” (Brodovsky & Kiernan, 2017). The National Child Traumatic Stress Network (NCTSN) defines trauma-informed systems as systems

in which all parties involved recognize and respond to the impact of traumatic stress on those who have contact with the system including children, caregivers, staff, and service providers. [TIC systems] infuse and sustain trauma awareness, knowledge, and skills into their organizational cultures, practices, and policies. They act in collaboration with all those who are involved with the child, using the best available science, to maximize physical and psychological safety, facilitate the recovery or adjustment of the child and family, and support their ability to thrive. (National Traumatic Stress Network, 2016)

Some researchers have begun to discuss how trauma-informed care can inform “healing centered engagement” that moves beyond what has happened to those who have been through trauma and focuses more on healing and resilience among trauma survivors so that we can discern how to best help them to thrive (Barnhill et al., 2019; Ginwright, 2018).

As we continue to grow in our understanding of how trauma impacts survivors, it is important to consider how educators fit into the solutions to bring about positive outcomes for these survivors. Since trauma impacts the way that children interact with others, impacts brain development and learning, and can have long-term effects on those it impacts (McInerney & McKlindon, 2014), trauma-informed educators must implement classroom and disciplinary practices that encourage healing and help.

#### 1.4 Defining the Preschool-to-Prison Pipeline

In recent years, policy makers and community organizers have been focused on disrupting what they have called the preschool-to-prison pipeline, including prominent organizations such as the American Civil Liberties Union (ACLU), the Justice Policy

Institute (JPI), the Legal Defense and Education Fund (LDF), and the National Association for the Advancement of Colored People (NAACP). Broadly, the preschool-to-prison pipeline, also known as the “school-to-prison pipeline,” can be defined as the pipeline through which at-risk children are funneled from preschool to prisons that is impacted by school policies and changes in the criminal justice system. There are several identified factors at play, including zero-tolerance policies in schools and the increase in punishing children for behavior in educational settings through the criminal justice system (Coalition for Juvenile Justice, 2001; Wald & Losen, 2003; Wald, 2012). As a reaction to the high-profile school shootings and gang violence in recent decades, schools implemented these harsh policies in order to send a message to students (Heitzeg, 2009). However, it seems schools may have lost sight of discipline being an opportunity to teach students, instead focusing on punishing behavior (Porter, 2015), and these punishments are being dished out at disproportionately higher rates among minority students. More students are being suspended since the implementation of the zero-tolerance policies, with black students being more than 2.5 times as likely to be suspended as their white counterparts (Wald & Losen, 2003). Nance (2016) states that “...schools increasingly have relied on extreme forms of punishment such as suspensions, expulsions, referrals to law enforcement, and school-based arrests to discipline students for violations of school rules” (p. 1063). Additionally, Wald and Losen (2003) discuss how disparities in the youth juvenile justice system have mimicked the disparities in the education system, with black children with no criminal records six times as likely and Latinos three times as likely to be incarcerated as white children for the same offense. As punishments in the school and justice systems become more severe, minority students are being

disproportionately harmed by these policies. At-risk children are being funneled into the preschool-to-prison pipeline through the use of these punitive policies, and by implementing a trauma-informed approach in schools that takes into account how children's behaviors might be trauma-related, educators may have the opportunity to disrupt this pipeline. As Cole et al. (2005) point out,

[s]chool is a place where it is possible for traumatized children to forge strong relationships with caring adults and learn in a supportive, predictable, and safe environment. These are factors that can help protect children from, or at least ameliorate, some of the effects of exposure to family violence. (p. 5)

There needs to be an effort from adults across every aspect of the school (administrators, teachers, school resource officers, nurses, etc.) to implement trauma-informed practices to support children in their development and to strengthen the support network of children who have been impacted by trauma. Chafouleas et al. (2016) agree that “[s]chools represent an opportune system for prevention and early intervention across domains related to child success” (p. 144).

### 1.5 Why Mathematics?

At this point, it is reasonable to wonder why mathematics education should receive special attention in how trauma-informed care can disrupt the preschool-to-prison pipeline. After all, trauma-informed care needs to be a holistic approach (Cole et al., 2005; McInerney & McKlindon, 2014) and the entire school system needs to have supports in place at every level to care for trauma survivors. However, mathematics educators have a special position in schools to empower students, especially those who have been impacted by trauma. Mathematics performance in school is a significant

predictor of future educational success, and as such, mathematics is seen as a gatekeeper to future academic opportunities (Adelman, 1999; Douglas & Atwell, 2017; Horn and Nutiez, 2000; Riley, 1997). What follows is a discussion about the potential power of trauma-informed mathematics education to support trauma survivors.

### 1.5.1 Unconditional Positive Regard Meets High Expectations

Mathematics educators have an important role in having both high expectations for students and what Rogers (1957) calls “unconditional positive regard.” Borrowing the term from Rogers, Brunzell et al. (2105) state that within the classroom a “position of unconditional positive regard encourages a teacher to value a student regardless of his or her behaviors, affect, or presentation” (p. 5). Students with a trauma background (and arguably all students) need both grace for mistakes and shortcomings (looking past frustrating behaviors, giving extended time or resources for students who need it, incredible amounts of patience, etc.) and high expectations (not lowering expectations for their performance and behaviors because of their trauma history). This is important because

[c]hildren often interpret lowered standards as validation of a sense of themselves as worthless, a self-image created by the trauma. Ideally, it is best to let the student know that, despite the travails of his or her life, your expectation is that the student will continue to meet the high standards set for all the children, and that the school will help to make that possible. (Cole et al., 2005, 54)

The mathematics classroom is the perfect place to set high expectations, yet still teach students that failure and mistakes are a part of life and that they can be successful despite failures and setbacks. Mistakes in mathematics are positive opportunities for

growth (Boaler, 2013), and students can learn how to face challenges (both personal and academic) within the context of a trauma-informed mathematics classroom. The necessity of unconditional positive regard as teachers hold to high expectations is vital for trauma-affected student. As Brunzell et al. (2015) notes, relationships and trust are difficult for kids who have experienced trauma, which often leads them to act in ways that could disrupt the relationship with the teacher. According to Brunzell et al. (2015), “Teachers must establish strong relational foundations in the classroom to ground the students in safety and belonging” (p. 5).

#### 1.5.2 Culturally-Responsive Mathematics Education as a Means of Teaching Empathy and Empowering Students

The rise in culturally-responsive education, specifically mathematics education, has shown us that educators are working toward a more caring and community-centered approach to mathematics (Brown-Jeffy & Cooper, 2011; Gay, 2002; Wachira & Mburu, 2019). Empathy and perspective-taking can be learned in the mathematics classroom through culturally responsive teaching practices. These practices might not only benefit students in their understanding of how mathematics has the power to help students change their own communities, but could help students who have experienced trauma disrupt the thinking styles that are associated with criminal behavior, as discussed by Cuadra et al. (2014). “Culture plays an important role in the meaning we give to trauma and our expectations for recovery” (APA, 2008, p. 4), which shows that culturally responsive teaching can assist in trauma-informed mathematics education. Cavanaugh (2016) views culturally-responsive teaching as a necessity for teachers to be trauma-informed, as it provides a lens through which we create lessons and use language in our

classrooms that takes into consideration student backgrounds. This in turn impacts how survivors respond to trauma they have endured (Cavanaugh, 2016).

One important aspect of culturally-responsive mathematics education is giving students a sense of power over changes in their lives and their communities. In discussing trauma-informed educational practices, Crosby et al. (2018) recommend adding some measure of control for students into the classroom environment, giving students a sense of power and ownership. They also recommend using trauma-informed practices that “support teacher awareness of students’ trauma and disempowerment in their school and community context and promote critical recognition of the ways in which systems—including the school itself—contribute to this disempowerment” (Crosby et al., 2018, p. 17). Mathematics is a context within which students can view their communities and the chronic issues that affect them, and a platform on which to stand to bring about social justice reform (Gutstein, 2006; Kokka, 2015; NCTM & TODOS, 2016; Panthi et al., 2018).

### 1.5.3 Improving Necessary Communication Skills

Cole et al. (2005) point out that trauma impacts communication. “Instead of using language to build bridges with others on the basis of mutual understanding, some traumatized children use language to build walls between themselves and those they regard as potentially threatening” (Cole et al., 2005, p. 25). Mathematics educators have the ability to not only teach students how to communicate about mathematics with one another, but to assist in the development of communication skills for students whose experiences have hindered their ability to use the tool of communication with others appropriately (Cole et al., 2005; Silver, 1990). Communicating about misunderstandings



and mistakes in mathematics might lead to students having a greater capacity for communicating about mistakes and misunderstandings in other settings.

The Common Core State Standards Initiative includes communicating about mathematics (including critiquing the ideas of others) in their Standards for Mathematical Practice, and this makes sense given that mathematics is a field which requires communication with others on a consistent basis. Professional mathematicians work collaboratively on almost every project, requiring them to communicate with others, understand multiple perspectives, and articulate their own ideas in a way that others can understand. These communication skills can be taught by mathematics educators at all levels, giving students who have been through trauma experience in empathy and communication. Cole et al. (2005) found that teachers have the ability to impact the lives of children when teachers realize that “failing to understand directions, overreacting to comments from teachers and peers, misreading context, failing to connect cause and effect, and other forms of miscommunication” (p. 6) are at the root of a lot of their behavioral issues. Mathematics educators have the opportunity and responsibility to give children the communication tools they need to succeed in and out of the classroom.

#### 1.5.4 Teaching Problem-Solving and Critical Thinking

Trauma-affected students need help with sequential memory, cause-and-effect relationships, taking on the perspectives of others, setting and carrying out plans, and engaging in the curriculum (Cole et al., 2005). Rich and authentic mathematical tasks in an appropriate mathematics classroom that emphasizes a trauma-informed approach to discipline and environment may be a great tool for developing these necessary skills. These skills may not only assist students in their success in the classroom, but students

who have the ability to reason and think critically will be at a lower risk for criminal thinking that leads to maladaptive behaviors, and ultimately, will keep them out of the justice system (Cuadra et al., 2014). Trauma impacts the way that survivors think, and if not corrected, these thought patterns can lead to criminal behavior, especially with those “who commit reactive crimes [because] they put little effort into problem solving or being critical of their own ideas” (Cuadra et al., 2014, p. 1401). Critical thinking and problem solving are two critical components of a complete mathematics education program, and being able to critique the mathematical ideas of themselves and others may give children a safe setting in which to learn these essential skills that lead to more healthy thought patterns. Cuadra et al. (2014) also showed that “difficulty persisting in problem solving and following through on good intentions may also be associated with sexual offending” (p. 1406), which further emphasizes that mathematics educators have the opportunity to teach persistence in problem solving that can help students stay out of the justice system.

#### 1.5.5 Intersection of Mathematics, Trauma, and Those with Learning (Dis)abilities

Recently, there has been discussion about improving access to mathematics (and STEM fields in general) for students with learning (dis)abilities (Gersten et al., 2009; Basham & Marino, 2013), and this is significant to the discussion about trauma-informed education. First, it is important to note that it is easy to misdiagnose learning (dis)abilities when a student has been through trauma because the symptoms of trauma often mimic learning differences (Cole et al., 2005). In light of the literature that points to the need for equitable practices for students with identified learning differences in STEM (e.g., Gersten et al., 2009), these data are even more important to consider trauma-

informed mathematics (and more broadly, STEM) education in our pursuit for an equitable education system. In addition, The Coalition for Juvenile Justice (2001) found that “[b]etween 70 and 87 percent of incarcerated youth suffer from learning or emotional disabilities that interfere with their education.” Whether these (dis)abilities were properly diagnosed or were the result of trauma, the important thing for mathematics educators to note here is that special education students who have experienced trauma are a vulnerable population that should be carefully considered when creating lessons, establishing classroom routines, and implementing disciplinary practices in the classroom.

Mathematics has the potential to provide not only a rich classroom experience for those with learning differences, but also opens the door to rewarding careers in which they can thrive—these students have a lot to offer the STEM fields (Basham & Marino, 2013; Gersten et al., 2009), and mathematics educators should pay careful attention to the needs of students with learning (dis)abilities as they establish a trauma-informed classroom approach.

## 1.6 Summary

There is an urgent need for considering how to disrupt the preschool-to-prison pipeline, as the data show an increase in the number of children being funneled through the justice system for behaviors exhibited in schools. Children who have experienced trauma often display behaviors in the classroom that are challenging for teachers, as defiance, aggression, withdrawal, and perfectionism (Cole et al., 2005) are all common for students who have experienced trauma. Add to this the facts that youth who drop out of school are three and a half times more likely to be arrested than students who graduated, and eighty-two percent of adults in the criminal justice system dropped out of

high school (Coalition for Juvenile Justice, 2001), and we see that it is critical to consider how to keep kids who have experienced trauma in school and keep them learning the skills they need to face the world. Without the proper understanding of trauma symptomology, “school staff may misunderstand trauma-related behavioral reactions as oppositional or defiant behavior, inadvertently use discipline strategies that can serve as triggers for traumatized students, and miss opportunities to support social, emotional, and academic growth” (Chafouleas et al., 2016, p. 154). It is the moral and ethical responsibility of educators to consider how they can work toward disrupting this pipeline, and mathematics educators have a special role in this endeavor. To this end, the following research questions are proposed to guide the research into the potential for trauma-informed positive education (TIPE) in secondary mathematics classrooms to disrupt the preschool-to-prison pipeline:

- 1) Research Question 1: How do secondary mathematics teachers believe they should respond to challenging student behaviors?
  - a) What links do teachers draw between these behaviors and the likelihood that a student will end up in the criminal justice system?
- 2) Research Question 2: What do mathematics teachers believe about the ability of mathematics education to make a difference for students who present with maladaptive behaviors?
  - a) How does their perception of their ability change when they know that the child has experienced trauma?
  - b) How does negative behavior change their perception of the student’s future success?

- 3) Research Question 3: What are secondary mathematics teachers' perceptions of trauma-informed positive education practices, and to what extent do they already use them in their classrooms?
  - a) How do teacher perceptions of challenging behavior change when they know it is a potential symptom of trauma?

## 2 THEORETICAL AND CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

### 2.1 Theoretical Framework

While Maslow's initial intent in his 1943 proposal of a conceptual framework for the motivation of human behavior was not explicitly about trauma-informed classroom education, it says quite a lot that is beneficial for understanding conceptual frameworks for implementing trauma-informed classroom interventions. Maslow's paper has become a widely-used theoretical framework in the field of education, and is the chosen theoretical framework for this study because of the applicability of the material in understanding how the impacts of trauma might influence the motivation of student behavior.

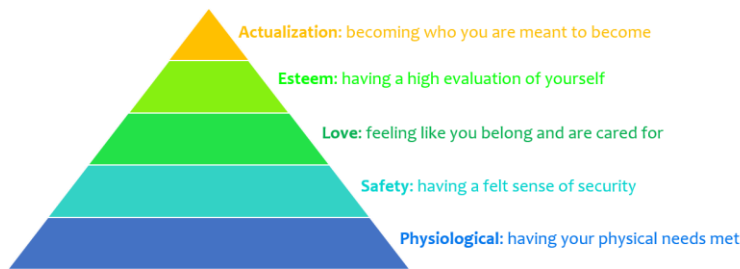
Maslow (1943) proposed a hierarchical structure for understanding the motivation for human behavior, with "human needs [arranging] themselves in hierarchies of prepotency. That is to say, the appearance of one need usually rests on the prior satisfaction of another, more pre-potent need" (Maslow, 1943, p. 370). His original framework involved five categories of needs, in hierarchical order: (1) physiological needs, (2) safety needs, (3) love needs, (4) esteem needs, and (5) the need for self-actualization. Maslow knew that describing these needs in a hierarchal way would lead to the misconception that needs can only emerge in one category when the needs in the category below are completely satisfied. Maslow clarified by saying

...most members of our society who are normal, are partially satisfied in all their basic needs and partially unsatisfied in all their basic needs at the same time. A more realistic description of the hierarchy would be in terms of decreasing

percentages of satisfaction as we go up the hierarchy of prepotency. (Maslow, 1943, p. 388)

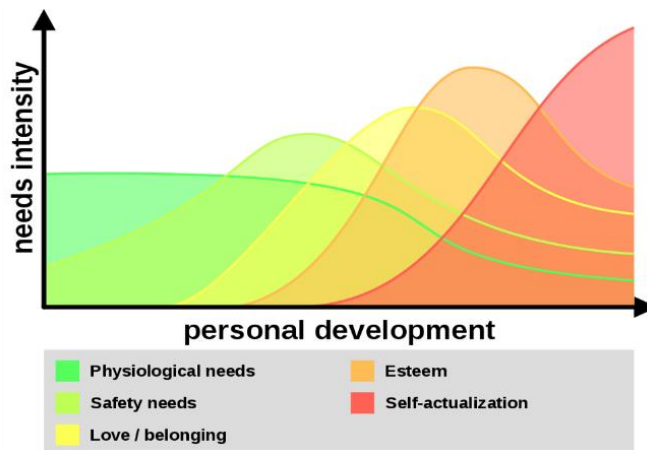
This means that someone does not have to have complete satisfaction of a need in a category to seek satisfaction of a need in another, but that it is typically more pressing for their needs to be met in the lower categories in the hierarchy. This hierarchy is typically depicted as a pyramid, as in Figure 2.1.

**Figure 2.1 Maslow's Hierarchy of Needs**



However, this fails to capture the dynamic nature of the needs based on the other contexts for behavior, including situational, biological, or cultural needs, and a better visual model might be the one Guttman (n.d.) created to describe the overlapping and flowing nature of the needs, such as in Figure 2.2.

**Figure 2.2 Maslow's Dynamic Hierarchy of Needs (Guttman, n.d.)**



What follows is a discussion on each of these five categories of needs, with emphasis on the portion of his work that relates to the discussion on trauma and classroom education.

### 2.1.1 Physiological Needs

Maslow (1943) identifies physiological needs as the most “pre-potent of all needs” (p. 373), meaning that when a person is deficient in all categories of need, these needs are going to be the most motivating. Physiological needs include food, water, and sleep, which are often missing in the homes of children who experience abuse (domestic violence, for example, can lead to sleepless nights; neglect cases often involve children not being fed properly). Sometimes, even when these needs are met, children will still fear that they will not have them, which Maslow (1943) addresses when he says

individuals in whom a certain need has always been satisfied who are best equipped to tolerate deprivation of that need in the future, and that furthermore, those who have been deprived in the past will react differently to current satisfactions than the one who has never been deprived. (Maslow, 1943, p. 375)

It can be perplexing when a child who has been removed from a neglectful home and placed in the care of a family who always provides food for them continues to hoard and gorge on food (see Casey et al., 2012 for examples of food-related issues in foster children), but Maslow’s statement reminds us that if a child is deprived of their basic physiological needs, they will respond differently and might perceive their need to be high even when the need is met. With the physiological needs being unmet for at least 11 million children in the United States (No Kid Hungry, 2020), the need to realize the



impact of unmet physiological needs on the ability of children to reach their potential is urgent.

### 2.1.2 Safety Needs

Safety needs refer to the feelings of safety and security a person experiences when there is no perceived threat of danger (Maslow, 1943). Maslow's (1943) description of a baby who experiences sickness they do not understand essentially describes any child who experiences a traumatic event they cannot understand:

At such a moment of pain, it may be postulated that, for the child, the appearance of the whole world suddenly changes from sunniness to darkness, so to speak, and becomes a place in which anything at all might happen, in which previously stable things have suddenly become unstable. (p. 377)

The instability in the feelings of safety of a child can even surpass physiological needs in importance if they become persistent and all-consuming (Maslow, 1943). Maslow (1943) describes the feelings of anxiety experienced by children whose parents are unjust, inconsistent, or unfair, and talks about how this loss of felt safety impacts a child's view of the world. Children who have experienced trauma may view the world as "unreliable, unsafe, or unpredictable" (Maslow, 1943, p. 377), which certainly impacts their ability to learn in school.

Further, Maslow (1943) discusses the importance of children experiencing functional homes free from safety concerns:

The central role of the parents and the normal family setup are indisputable.

Quarreling, physical assault, separation, divorce or death within the family may be particularly terrifying. Also parental outbursts of rage or threats of punishment

directed to the child, calling him names, speaking to him harshly, shaking him, handling him roughly, or actual physical punishment sometimes elicit such total panic and terror in the child that we must assume more is involved than the physical pain alone. (p. 377)

Maslow (1943) discusses the impact that unfamiliar or unmanageable situations can cause them to feel fear because of the loss of felt safety, which can be helpful for understanding the way children feel in school when they do not trust adults to meet their safety needs. Maslow (1943) makes the statement that children prefer

a safe, orderly, predictable, organized world, which he can count on, and in which unexpected, unmanageable or other dangerous things do not happen, and in which, in any case, he has all-powerful parents who protect and shield him from harm. (p. 378)

This need is always disrupted for children who have experienced trauma, as trauma by definition impacts the real or felt safety of a child. And Maslow (1943) discusses the occasional brain responses to seemingly harmless stimuli in those who have experienced a loss of felt safety, noting that it can trigger a panic in the child, as though the harmless occurrence was a dangerous threat. Teachers might see this type of reaction in a student, and without an understanding of the effects of trauma on the brain, they might not understand why the student was set off by something that seemed to the teacher to be insignificant. Maslow (1943) tells us that educators play an important role in combatting this sense of insecurity about the world because "...one of the main cognitive functions of education is this neutralizing of apparent dangers through knowledge, e.g., I am not afraid of thunder because I know something about it" (p. 377). Teaching students about

the neurobiological effects of trauma and how to mitigate those effects can assist students in restoring feelings of felt safety in classroom settings and help them self-regulate their brain's response to unwelcome stimuli so they can focus on their schoolwork (Brunzell et al., 2016a; Brunzell et al., 2016b; Chafouleas et al., 2016; Pickens & Tschopp, 2017).

### 2.1.3 Love Needs

Maslow (1943) discusses the need for love, affection, and belonging only briefly, likely because “we know more about it perhaps than any of the other needs except the physiological ones” (p. 381). Maslow (1943) notes that the absence of love has been linked with many maladaptive behaviors and psychological disorders, and that to fulfill this need and avoid the negative consequences of not experiencing love and belonging, people need to both give and receive love. Since children who experience childhood trauma often have issues forming attachments with others, it is even more imperative that teachers understand how to meet this need for love within their classroom settings (Brunzell et al., 2015; Brunzell et al., 2016a; Brunzell et al., 2016b; Cole et al., 2005; Pickens & Tschopp, 2017). This need for love and belonging is consistently addressed in some way by proposed frameworks for trauma-informed classroom education (Brunzell et al., 2016b; Cole et al., 2005; Crosby et al., 2018; Waters & Loton, 2019).

### 2.1.4 Esteem Needs

Maslow (1943) defines the esteem needs as “a need or desire for a stable, firmly based, (usually) high evaluation of themselves, for self-respect, self-esteem, and for the esteem of others” (p. 381). He tells us that the esteem need is met only when it is based upon “real capacity, achievement and respect from others” (Maslow, 1943, p. 381). When seeking these needs, Maslow (1943) indicates that people will be searching to

know that they are enough, that they can be confident in their abilities, that they can be self-reliant, and that they are important to other people. Unfortunately, for kids who have experienced trauma, the feelings of worth and satisfaction can be diminished leading to an inability to form attachments and negative mental health outcomes (Lim et al., 2012). Trauma-informed approaches acknowledge the esteem needs by focusing on strengths-based interventions and the positive accomplishments of the student (Brunzell et al., 2016a; Brunzell et al., 2016b; Seligman et al., 2009; Stokes & Brunzell, 2019; Waters & Loton, 2019). When these needs are not met, Maslow (1943) describes “feelings of inferiority, of weakness and of helplessness” (p. 382) that can lead to discouragement and helplessness. According to Cole et al. (2005), “[w]hen educators can identify and focus on a child’s strength, they afford the child the opportunity to experience success, with all the emotional implications of doing something well” (p. 57).

#### 2.1.5 The Need for Self-Actualization

Maslow (1943) describes self-actualization as a person “doing what he is fitted for” (p. 382). He says “[w]hat a man can be, he must be” (Maslow, 1943, p. 382). This need cannot be met, however, unless the other needs are met. When children have experienced trauma that has disrupted their ability to have the other four need categories met, it will be difficult for them to get to the point of becoming everything that they are capable of becoming, which is what Maslow (1943) deems self-actualization. Maslow (1943) identified self-actualization as difficult for research, and stated that there are not that many people who reach this point because they are still worried about the other more basic needs. Yet for children who have experienced trauma that greatly impacts their ability to meet their other needs, this is even more of a difficult need to meet.

### 2.1.6 The Role of Education

Maslow (1943) has a great deal to say that applies to the teacher working with trauma-affected children. As stated previously, he believes that education can play a role in mitigating fear and empowering children to understand the world. He also states that [a]cquiring knowledge and systematizing the universe have been considered as, in part, techniques for the achievement of basic safety in the world, or, for the intelligent man, expressions of self-actualization. Also freedom of inquiry and expression have been discussed as preconditions of satisfactions of the basic needs (Maslow, 1943, p. 384).

This statement about the importance of knowledge and inquiry in meeting these hierarchical needs demonstrates the supreme importance in the role of an educator in facilitating a trauma-informed classroom that allows space for traumatized children to succeed. Teachers undoubtedly have an important role to play in assisting children in understanding the world and in giving children the skills for inquiry, giving them the ability to work through their feelings of felt safety. This includes making students aware of the needs they have, as Maslow (1943) discusses the fact that most of the time, people's motivations are unconscious, which then leads to behavior that is motivated by these unconscious desires. Maslow (1943) believes that "with suitable techniques, and with sophisticated people [they can] become conscious" (p. 389). When a trauma-affected child can understand their body's response to stimuli and the brain's reaction to unwelcome feelings, they can bring these unconscious motivations into focus and are empowered to take control of their behavior (Stokes & Brunzell, 2019; Brunzell et al., 2016b; Pickens & Tschopp, 2017; Bath, 2008).

It is also important to note that Maslow (1943) lists freedom as a prerequisite to the satisfaction of the basic needs, as some children are education within schools in which freedoms are severely limited (e.g., alternative schools, schools for incarcerated youth, schools with locked doors and armed guards). When this prerequisite to meeting the basic needs is not present in the school in which children who have experienced trauma spend the majority of their weekday hours, there are implications for the students' hierarchy of needs and the way they are met (or are not met) at school.

An important note for educators who are working with children who have been impacted by trauma is Maslow's (1943) statement that

[e]veryday conscious desires are to be regarded as symptoms, as surface indicators of more basic needs. If we were to take these superficial desires at their face value we would find ourselves in a state of complete confusion which could never be resolved, since we would be dealing seriously with symptoms rather than with what lay behind the symptoms. (p. 392-393)

Teachers sometimes cannot tell what the motivating factor is behind the behavior of disruptive or disobedient children in the classroom and whether this behavior is the result of trauma (Alisic, 2012). This points to the need for teachers to better understand trauma and how to help children through their brain's responses to trauma to avoid treating only symptoms (disruptive behavior) and not the cause (the underlying needs not being met).

#### 2.1.7 Maslow's Updates to the Framework

Over time, Maslow updated his framework based on his own clinical experiences, as well as his observations of healthy individuals whose motivations did not fit neatly within the five-tier framework. Maslow (1970) first updated the framework by adding

cognitive needs and aesthetic needs (which are situated between esteem and self-actualization needs), then later added transcendent needs (Maslow, 1971), which are what he considered to be the highest level of motivation. Each of these additions have implications to the classroom, so there is a brief discussion of each below.

#### 2.1.7.1 Cognitive Needs

Cognitive needs are needs that are driven by a desire for knowledge and understanding. Maslow (1970) describes these needs as being “attracted to the mysterious, to the unknown, to the chaotic, unorganized, and unexplained” (p. 49). This has obvious implications for the classroom, since fulfilling the cognitive needs is the most obvious purpose of classroom education. According to Maslow (1970), while understanding and learning were mentioned before within the safety and self-actualization needs, and being free to inquire is a requirement for the basic needs to be met, these understandings of the cognitive needs “do not constitute definitive answers to the questions as to the motivational role of curiosity, learning, philosophizing, experimenting, etc. They are at best no more than partial answers” (p. 48). He saw the drive for the fulfillment of cognitive needs as warranting its own, separate inclusion within the hierarchy. One warning Maslow (1970) gives that should be heeded by teachers is that “[c]hildren do not have to be taught to be curious. But they may be taught, as by institutionalization, not to be curious” (p. 50). According to this view, educators then are primarily both cultivating curiosity and also working to not squash it. This desire for knowledge fits into the original hierarchy after the esteem needs, telling us that trauma-affected students may not desire cognitive challenge until their other basic needs are met. This means that simply giving trauma-affected students challenging

mathematics problems will likely not be a sufficient measure in mitigating the effects of trauma in the classroom.

#### 2.1.7.2 Aesthetic Needs

Maslow (1970) included aesthetic needs because he saw “impulses to beauty, symmetry, and possibly to simplicity, completion, and order,” (p. 2), though Maslow (1970) did have concern that there was so much overlap between cognitive and aesthetic needs that it is difficult to completely separate the two. Maslow (1970) found that some people “get sick (in special ways) from ugliness, and are cured by beautiful surroundings; they crave actively, and their cravings can be satisfied only by beauty” (p. 51). With this addition to the framework, Maslow (1970) gives an indication as to why this drive for beauty matters for educators, even beyond art classroom: “The aesthetic satisfactions of succinctness, parsimony, elegance, simplicity, precision, neatness, are values to the mathematician and to the scientist as they are to the craftsman, to the artist, or the philosopher” (p. 6). For an educator, this means that there need to be opportunities within the classroom to tap into this desire for beauty and symmetry and order. Maslow (1970) did not say much about these needs, likely because he believed we know less about these than the others, “yet the testimony of history, of the humanities, and of aestheticians forbids us to bypass this uncomfortable (to the scientist) area” (p. 51). These aesthetic needs were added by Maslow after the other basic needs, and after cognitive needs, telling educators that trauma-affected students are not likely to value the aesthetic beauty within the content they are learning unless their other needs are being met first.

#### 2.1.7.3 Transcendent Needs



The last addition to the hierarchy came in the posthumous publication of Maslow's (1971) thoughts on a human nature. He defined transcendence as "the very highest sense and most inclusive or holistic levels of human consciousness, behaving and relating, as ends rather than means, to oneself, to significant others, to human beings in general, to other species, and to the cosmos" (Maslow, 1971, p. 269). The transcendence need was something Maslow (1971) found to be common among self-actualized people, stating that self-actualized people tend to be

devoted to some task "outside themselves," some vocation, or duty, or beloved job. Generally the devotion and dedication is so marked that one can fairly use the old words vocation, calling or mission to describe their passionate, selfless, and profound feeling for their "work." (p. 291)

This desire for finding something outside of oneself is a characteristic of many scientists, according to Maslow (1971), who stated:

...the most creative scientists...the more they know, the more apt they are to go into an ecstasy in which humility, a sense of ignorance, a feeling of smallness, awe before the tremendousness of the universe, or the stunningness of a hummingbird, or the mystery of a baby are all a part, and are all felt subjectively in a positive way, as a reward. (p. 280-281)

This smallness against the backdrop of the universe can only be felt if students have experiences with the vastness and intricacy of the universe. These experiences can be created by the educator in the classroom setting. Maslow (1971) ties this need for transcendence to adversity, saying, transcendence was often found in "people who have overcome adversity and who have been strengthened by it rather than weakened" (p.

271). With this understanding, it becomes even more essential to the trauma-affected student that they are strengthened through their adversity and given every opportunity to achieve this highest level of motivation and need.

## 2.2 Conceptual Framework

Working alongside Maslow's theoretical framework, the conceptual framework proposed by Brunzell et al. (2016b) gives a helpful framework for considering how to best implement trauma-informed practices in an educational setting. Their model is the Trauma-Informed Positive Education (TIPE) approach to classroom interventions. They acknowledge the importance of understanding the neurobiological effects of trauma on children and having a strengths-based approach to trauma-informed education. The TIPE model has three domains: (1) repairing regulatory abilities, (2) repairing disrupted attachment, and (3) increasing psychological resources. These three domains are discussed in greater detail next.

### 2.2.1 Repairing Regulatory Abilities

Brunzell et al. (2016b) discuss the importance of helping trauma-informed students repair their dysregulated stress responses by building their capacity for self-regulation. They discuss the importance of understanding emotions and being able to navigate negative emotions when they arise. A focus of TIPE is the empowerment of students through assisting them in regulating their emotions through regulatory supports like "proximal positioning (e.g., side by side with child versus facing confrontationally), and assisting the student to understand how to address and restore negative outcomes" (Brunzell et al., 2016b, p. 67). This domain addresses the effects of trauma on the brain through healing practices that include "sensory integration, self-regulation, rhythm and

repetition, and mindfulness applications to learning tasks” (Brunzell et al., 2016b, p. 71). Practical examples of classroom interventions within this domain include teaching students body sensations related to different emotional states, creating routines in the classroom environment that give the student a sense of felt safety in the predictability of the rhythm, and teaching empathy to students as part of the curriculum (Brunzell et al., 2016b).

### 2.2.2 Repairing Disrupted Attachment Styles

Trauma severely impacts some children’s ability to form attachments in meaningful relationships, and the second domain of TIPE addresses classroom interventions to assist in healing students’ ability to form the attachments necessary for learning. The model emphasizes the need for co-regulation, which is the process of assisting the student in learning how to regulate their own bodies. The TIPE model also discusses the importance of the use of Rogers’ (1957) unconditional positive regard, a principle from psychology that Brunzell et al. (2016b) define as making sure the student “feels valued regardless of their presenting behaviors, affect, or cognitions” (p. 67). The focus of unconditional positive regard is that the child would feel that the teacher cares about them without demanding anything in return from the student (Brunzell et al., 2016b; Rogers, 1957). The implementation of this domain includes reaching emotional intelligence, the building of strong teacher-student relationships, and an emphasis on play and fun in the classroom as both a relational strategy and a resource for learning (Brunzell et al., 2016b).

### 2.2.3 Increasing Psychological Resources (PERMA)

The final domain of the TIPE model is increasing psychological resources, which involves engaging positive emotion, engagement, relationships, meaning, and accomplishment (PERMA) to contribute to the child's psychological wellbeing (Brunzell et al., 2016b). The implementation of this domain includes giving students clear learning objectives and the tools to meet those objectives, the focus on character strengths and empowering students to leverage those strengths in the classroom, teaching resilience in the educational context, and giving all students the opportunity to succeed and experience accomplishment in the classroom (Brunzell et al., 2016b). Within this domain is also the explicit teaching of growth mindset principles to students, helping students to savor positive feelings, teaching students to experience and express gratitude, broadening and building on positive emotions, and building on students' skills to help them to be successful in meeting class aims (Brunzell et al., 2016b). This framework suggests that teachers have a role to play in teaching students how to construct and contribute to positive relationships, persist through difficulty, and find hope through positive accomplishments (Brunzell et al., 2016b).

### 2.2.4 Underlying Principles of TIPE

The TIPE framework is built upon the idea of strengths-based interventions, with a foundation in positive psychology (Brunzell et al., 2016b). They believe that ...many of the current trauma-informed approaches have failed to explicitly focus attention on identifying and increasing [strengths]. As such, existing trauma-informed approaches are not reaching the full heights of healing that are possible within the classroom milieu because they only focus on repairing negatives and

have not given sufficient emphasis on growth by building on the strengths of trauma-affected students. (Brunzell et al., 2016b, p. 68)

This highlights an important point about trauma-informed care, which is that the discussion is often around the maladaptive behaviors and mental illness that can result from trauma, and not centered on the wellness and strengths of trauma-affected children.

Positive education is also a major underlying principle of the TIPE framework. “Positive education is the application of positive psychology in a school setting and positions wellbeing learning to be of equal importance to academic learning” (Brunzell et al., 2015, p. 6). Positive education is a strengths-based approach to classroom practices that emphasizes emotional management, attention and awareness, positive relationships, healthy coping, and management of goals and habits (Waters & Losen, 2019). Brunzell et al. (2015) argue that “combining trauma-informed approaches with positive psychology will empower and enable teachers to promote both healing and growth in their classrooms” (p. 6).

The TIPE model is also a hierarchical yet synergistic model of healing (Brunzell et al., 2016b). Within this framework, healing is discussed in a hierarchical structure among the three domains, with self-regulation leading to strong attachments which lead to building psychological resources (Brunzell et al., 2016b). However, they also propose that healing occurs within these three domains synergistically, meaning that the three domains are not completely isolated from one another and one cannot be fully explained without the other (Brunzell et al., 2016b). The TIPE framework leans heavily on the idea of “upward spirals” of healing and growth within this synergistic model, claiming that

these three domains are working together to continually provide upward spirals of growth (Brunzell et al., 2016b).

One of the important underlying assumptions in their review of the literature on current models and frameworks was that they “could be adapted for cultural or socio-economic diverse populations” (Brunzell et al., 2016b, p. 66). While not explicitly mentioned elsewhere in their framework, it is an important inclusion in the development of their framework. It is in line with the assertion by Cramer et al. (2014) that to break the preschool-to-prison pipeline, we have to consider that “[t]he disconnect between student culture and school culture is at the root of student performance, where certain behaviors begin to be seen as deficit and inappropriate” (p. 463). It connects to Maslow’s (1943) framework, which states that “[w]hile behavior is almost always motivated, it is also almost always biologically, culturally and situationally determined as well” (p. 371). Taking into consideration the culture of the students who will be receiving intervention is an important piece of considering equitable trauma-informed practices.

### 2.3 Literature Review

The following review considers six overarching ideas that are important for understanding trauma and the preschool-to-prison pipeline that influenced the current study design: (1) the link between trauma and delinquency, (2) trauma-informed classrooms, (3) challenging student behaviors, (4) social justice mathematics, (5) student-centered teaching and learning, and (6) mathematics for positive behavior and identity. Each of these is discussed, drawing important connection to the current study.

However, before discussing the themes that emerged from the literature, it is important to note a few things. First, not all children who experience trauma have long-

term negative effects. Over time, most children who are exposed to trauma will “return to their prior levels of functioning” (APA, 2008, p. 2). This gives us great hope that children can experience resilience and overcome great adversity. However, the data also show that children who are exposed to repeated trauma, have a history of anxiety, or face adversity within their family are less likely to resume normal levels of functioning than those who experience one-time traumatic events or do not have these psychological risk factors (APA, 2008). This should encourage us to focus on ways to reduce the risk of children being re-traumatized by the education system and work to empower them to overcome the adversity they have faced.

Second, much of the literature on the preschool-to-prison pipeline focuses on two major aspects of children’s identity, race/ethnicity and socioeconomic background, and rightfully so. Because of the punitive system we have created, the rate of African American men entering the prison system was at one time outpacing the rate of African American men entering higher education (Shiraldi & Ziedenberg, 2002, Wald & Losen, 2003), schools have become increasingly re-segregated, and students in high-poverty, high-minority schools have less resources and less access to quality teachers and classes (Wald & Losen, 2003). These disparities persist despite intentional interventions to reverse them (e.g., Hetey & Eberhardt, 2018, Morgan & Amerikaner, 2018; Nellis, 2018). This paper is not suggesting that we abandon considering how we can better help minority students and those who live in poverty to avoid the pipeline. Rather, I assert that we have an additional and important consideration to add: trauma.

### 2.3.1 Methods for Literature Review

For all six of the main ideas considered in this literature review, a search of extant literature was conducted on the University of Kentucky InfoKat search engine (including JSTOR, EBSCOHost, among other databases) and Google Scholar. (An asterisk indicates a word stem with different word endings.) Papers were considered if they were in peer-reviewed journals or well-established and often-cited books within the field. The references on each included paper were searched for additional papers to include, as well as those that cited the given paper. Additionally, chapters and articles that provided a meta-analysis were used to search for relevant articles. The literature for most of these topics is vast (for example, a search on Google Scholar for math\* identity brings up more than 2.5 million results, InfoKat has more than 600,000), so a complete review of the literature is outside of the scope of this paper. However, the author attempted to bring in literature that gives a broad view of the topics that will help in understanding the current study.

For the link between trauma and delinquency, search terms included trauma and delinq\*, jail, prison\*, childhood trauma, maladaptive behavior, juvenile, adult. Papers were included if they (1) discussed maladaptive or delinquent behaviors in those who had experienced childhood trauma, (2) discussed trauma rates among prison or juvenile detention center populations, or (3) discussed the reasons for maladaptive behaviors in these populations.

For trauma-informed classrooms, search terms included trauma-informed classroom, trauma-informed care in schools, trauma and schools, trauma-informed school, impact of trauma on learning, trauma behav\* in the class\* (or school), and



neurobiological impacts of trauma. Papers were considered if they (1) were focused on classroom-specific trauma-informed methods, (2) gave a framework for trauma-informed schools or classrooms, (3) discussed trauma-informed classroom interventions, or (4) considered teacher perspectives on trauma-informed education.

For teacher perceptions of challenging student behaviors, search terms included teacher, bias, behavior, racial, ethnic, minority, disability, disparity, discipline, and intervention. Once certain diagnostic labels emerged as consistent in conversations about teacher bias (e.g., ADHD, ODD, ED), a search was conducted including these terms as well. Studies were considered if they were in peer-reviewed journals, were specific to the education setting, and gave insight into either (1) teacher implicit or explicit bias, (2) student perceptions of implicit or explicit bias, (3) the impact of teacher bias on student outcomes, or (4) general teacher perceptions of challenging student behaviors.

When searching extant literature for frameworks for social justice mathematics, search terms included social justice math\*, equit\*, divers\*, and rehumanizing math\*. Papers were considered if they (1) proposed a framework for social justice mathematics, (2) discussed challenges or cautions in implementing these approaches, or (3) provided a meta-analysis of frameworks or approaches for social justice mathematics and (4) were specific to the K-12 classroom setting.

When searching extant literature for frameworks for student-centered mathematics teaching and learning, search terms included teach\*, learn\*, student-centered, learner-centered, active learn\*, transformational learn\*, and project-based. Papers were considered if they (1) discussed a framework for student-centered learning or

(2) discussed a specific method of student-centered teaching or learning and (3) were specific to the K-12 mathematics classroom setting.

Lastly, a search was conducted of the extant literature for mathematics for positive behavior and identity. For mathematics and positive behavior, search terms included math\*, positive, behavior, manage\*. For positive mathematics identity, search terms included math\*, ident\*, Complex Instruction, cultur\*, equity, stereotyp\*, STEM, motiv\*. Science, Technology, Engineering, and Mathematics (STEM) identity was considered since mathematics is an integral part of STEM, and STEM identity is an emerging topic in the literature. The criteria for inclusion were (1) that the article specifically reference mathematics (with the exception of a few articles that discuss potential interventions that are used school-wide, including mathematics classrooms, and are specific to positive behavior supports), (2) the article directly discusses either positive behavior or identity, and (3) the article focused primarily on identity development or behavior in K-12.

### 2.3.2 The Link Between Trauma and Delinquent and Maladaptive Behavior

There is a clear correlation between adverse childhood experiences and criminal thinking and behavior (Cuadra et al., 2014; Fox et al., 2015; Sarchiapone et al., 2009; Smith & Thornberry, 1995). Cuadra et al. (2014) found that experiences with childhood abuse and neglect were significantly and positively correlated with the criminal thinking styles that might contribute to criminal behavior. “Notably, general criminal thinking styles...fully accounted for the relations between early maltreatment to adult criminal behavior” (Cuadra et al., 2014, p. 1406). The results of this study suggest that childhood maltreatment leads to cognitive distortions that put children at a greater risk for criminal

behavior (Cuadra et al., 2014). This is in line with Sarchiapone et al. (2009) who found in their study of male prisoners that prisoners with high Childhood Trauma Questionnaire (CTQ) scores had higher aggression indicator scores, were more often convicted as a minor, had multiple convictions, and were more violent during their prison stays. Both of these empirical studies were on adult male prisoners and were considering the impact of their childhood trauma on their thinking and behavior. Fox et al. (2015) considered the population of juvenile offenders, and asked similar questions using the Adverse Childhood Experience (ACE) measure. They found that a youth offender's ACE score was a strong and significant predictor of serious, violent, and chronic (SVC) offending, more than any other risk factor for criminal behavior (Fox et al., 2015). They also found that

for each additional ACE that a child experiences, the odds of becoming an SVC offender increases by 35% even when controlling for gender, race, age of onset, impulsivity, peer influence, and family income. This means that children with two ACEs are 70% more likely to be SVCs, 4 ACEs increases a child's SVC risk by 140%, and six or more ACEs leads to more than a 200% higher risk of SVC vs. single-felony offending. (Fox et al., 2015, p. 169)

While Smith & Thornberry (1995) also demonstrated an association between childhood maltreatment and delinquency in adulthood, they were also able to show that most children exposed to trauma did not end up in the justice system, and that they were resilient. The APA (2008) study discussed previously also demonstrates that most children who have survived traumatic experiences were able to resume normal levels of functioning, reminding us that while trauma is a factor for why some children end up in

the justice system, it does not mean that children who experience trauma will automatically experience these negative outcomes. There is hope for children who have experienced trauma, and considering the ways in which we can impact these outcomes is a major focus of trauma-informed education.

#### 2.3.2.1 Both Intervention and Prevention are Important Components of Discussion for How We Should Care for Trauma Survivors

It is clear that we need interventions to care for children in our educational system who have experienced trauma (Cuadra et al., 2014, Fox et al, 2015). Physical responses to trauma can impact how our students are responding to stress in schools. “The psychological changes resulting from the allostatic load may lead to extreme, and potentially violent, reactions to even trivial stimuli” (Fox et al., 2015, p. 164). This means that we have to be thoughtful in how we structure our classrooms and schools to create a safe environment for students to be able to process how their bodies are wired to respond to stress and difficulties. Teachers also need to be thoughtful in their discipline and take into account these intense reactions students can have to seemingly small provocations.

While much of the literature linking trauma to offending is about how to help those who have already offended, there is an obvious component of this educational model: prevention. Not just preventing offenders from offending again, but preventing students from ever offending in the first place. Fox et al. (2015) conclude that the evidence for the association between ACE scores and negative outcomes is so significant, we should consider using the ACE scores to help identify children who are at risk for SVC offending and that we should put in place preventative measures for these children.

And in case policy-makers have trouble justifying the cost of preventative programs for children in schools, Fox et al. (2015) discuss the cost differential between preventative programs and the reactive justice system facilities, and show that the cost over time is significantly lower for society if we are able to care for these children before they offend.

It is important for policymakers to acknowledge that justice-involved youth have strikingly high rates of trauma... [and] prevention and intervention policies should target young children exposed to violence in order to reduce the likelihood of re-victimization and mental health problems, as well as prevent future justice involvement. (Dierkhising et al., 2013, p. 9)

However, screening children for trauma is controversial, as there are debates regarding widespread screening as a general practice, regardless of the measure (e.g., McLennon et al., 2019; Watson, 2019).

#### 2.3.2.2 Empathy and Perspective-Taking can Assist in Disrupting the Pathway to Offending

Modeling empathy and social skills is crucial to a trauma-informed approach (Brunzell et al., 2015; Crosby et al., 2018). Modeling the use of feeling words is also a key step toward a more equitable classroom for trauma survivors. And giving students the opportunity to work on these skills themselves will allow them room to grow in these areas in a safe environment (Crosby et al., 2018). Cuadra et al. (2014) also suggest that there is a need for interventions to “enhance empathy and perspective-taking” in order to break the cycle of violence in offenders. Crosby et al. (2018) considered children in schools and Cuadra et al. (2014) considered offenders in prisons, but both emphasize the importance of teaching empathy in working with those who have experienced trauma.

Cole et al., (2005) also found that those who have experienced trauma have aggressive behaviors that “may spring from misinterpretation of comments and actions due to the child’s inability to adopt another’s perspective, underdeveloped linguistic skills, and/or inexperience with verbal problem solving” (p. 34), pointing again to the need for children to be able to empathize with others and to learn important social skills to further their social development.

### 2.3.3 Trauma-Informed Classrooms

With forty percent of children impacted by at least one traumatic event (NSCH, 2018), it is clear from the sheer number of children who have experienced trauma that teachers need to understand the impacts of trauma on a child’s ability to learn. In the classroom, trauma manifests itself in many ways, with children trying to avoid reminders of their experiences, having intrusive reminders of their trauma, or feeling disconnected from others because of their experiences (Pickens & Tschopp, 2017). “Essentially, a student who experiences a traumatic event is at risk for constantly being triggered into a survival mode mindset, particularly when navigating stressful situations in school” (Pickens & Tschopp, 2017, p. 4). Children who have experienced trauma often struggle with forming the attachments that are necessary for the feelings of safety needed to take risks in the classroom (Brunzell et al., 2016b). West et al. (2014) also found that teachers needed to know how to respond to student behavior because these behaviors due to trauma were impacting a child’s ability to stay in the classroom to learn. Additionally, Waters and Loton (2019) discuss the impact of emotions on learning and how studies in neurobiology and psychology have demonstrated an important connection between emotions and learning. Children who have been affected by trauma often have difficulty

in understanding and controlling their emotions, which impacts their learning (Brunzell et al., 2015; Brunzell et al., 2016b; West et al., 2014). Brunzell et al. (2016b) believe that “[i]f students are provided with the opportunities to connect the causal relationships between emotions and thinking, they will be better equipped to self-regulate at moments of uncertainty, stress, or confusion” (p. 66).

The impact of trauma on relationships is another important factor to consider in understanding how trauma impacts learning. Pickens and Tschopp (2017) discuss a common reaction to traumatic stress:

distortions about oneself and others. These distortions may reflect a learned pattern of hypervigilance that accurately and inaccurately detects threats from others, produces a negative outlook on the future due to an overwhelming feeling that painful experiences from the past will be repeated, or encourages a deflated sense of self that reflects a belief that the trauma has permanently damaged the individual. (p. 5)

These distortions will impact the child’s ability to maintain the types of relationships within the classroom that are necessary to facilitate trust and a healthy learning environment, both among peers and with the educators within the school building working with the child. This might lead to aggression or defiance in the classroom (Cole et al., 2005), and teachers need to understand how to build positive relationships to assist children before these maladaptive behaviors emerge (Crosby et al., 2017; Crosby et al., 2015; Chafouleas et al., 2016).

Maslow (1943) touches on the interconnectedness between learning and the meeting of an individual’s basic needs:

If we remember that the cognitive capacities (perceptual, intellectual, learning) are a set of adjustive tools, which have, among other functions, that of satisfaction of our basic needs, then it is clear that any danger to them, any deprivation or blocking of their free use, must also be indirectly threatening to the basic needs themselves. Such a statement is a partial solution of the general problems of curiosity, the search for knowledge, truth and wisdom, and the ever-persistent urge to solve the cosmic mysteries. (p. 384)

Understanding learning as an important tool for meeting the basic needs, we can also see how children who are unable to learn because their basic needs are unmet are at risk of continuing in a perpetual cycle of unmet needs followed by an inability to learn and meet their needs. This is important for understanding trauma-informed approaches to education.

#### 2.3.3.1 Healing Centered Engagement and Social Justice Through Trauma-Informed Education

The zero-tolerance school policies and use of the juvenile justice system to punish in-school behaviors are examples of oppressive systems that are hindering children from being able to reach their educational potential and are funneling children through the preschool-to-prison pipeline (Heitzeg, 2009; Porter, 2015). The impact of these systematic injustices is especially felt in children who have experienced trauma, as already shown in the previous discussion. Understanding social justice as the concept of a fair and equitable distribution of opportunities (among other things), "...trauma-informed teaching is, within itself, an act of social justice education" (Crosby et al., 2018, p. 16). Trauma-informed education emphasizes the empowerment of trauma-survivors



(Crosby et al., 2018; Wilson et al., 2013) and gives students the opportunity to overcome these oppressive systems to achieve positive outcomes. Crosby et al. (2018) gives an excellent summary of how trauma-informed care can be viewed through a social justice lens:

Rather than blaming and punishing students for their reactions to their circumstances, trauma-informed teaching has an embedded social justice perspective that seeks to disassemble oppressive systems within the school. It encourages educators to gain awareness of the ways in which trauma-exposed students have been disempowered by their circumstances, to recognize the ways in which traditional school practice may continue to disempower them, and to persistently monitor their own behavior, exchanging oppressive and counterproductive responses for those that model positive socioemotional skills for students. (p. 20)

Trauma-informed care gives rise to encouraging healing centered engagement, which focuses on the cultural and political aspects of trauma (Ginwright, 2018). This community aspect of trauma informs our perspective on trauma-informed care as social justice. “In some communities in which trauma exposure is prevalent both currently and historically, particular attention must be paid to the context of the trauma” (APA, 2008, p. 4). We have to consider trauma-informed education within the contexts discussed above (race/ethnicity and socioeconomic status) to consider how other oppressive systems might further impact the ability of trauma survivors to access the same opportunities as those who have not experienced trauma.

#### 2.3.3.2 Other Existing Frameworks for Trauma-Informed School Interventions

There are several other existing frameworks proposed for trauma-informed care in schools beyond TIPE. The frameworks are listed with their basic components below, followed by a comparison of the frameworks and a discussion about their connection to the TIPE framework.

#### 2.3.3.2.1 THE NATIONAL CHILD TRAUMATIC STRESS NETWORK (NCTSN) FRAMEWORK FOR TRAUMA-INFORMED SCHOOLS

The National Child Traumatic Stress Network (NCTSN) gives a list of elements which they believe are essential to having a trauma-informed school:

- (1) Identifying and assessing traumatic stress.
- (2) Addressing and treating traumatic stress.
- (3) Teaching trauma education and awareness.
- (4) Having partnerships with students and families.
- (5) Creating a trauma-informed learning environment (social/emotional skills and wellness).
- (6) Being culturally responsive.
- (7) Integrating emergency management & crisis response.
- (8) Understanding and addressing staff self-care and secondary traumatic stress.
- (9) Evaluating and revising school discipline policies and practices.
- (10) Collaborating across systems and establishing community partnerships. (NCTSN, n.d.)

They develop these ideas further in a comprehensive trauma-informed schools framework that builds upon these ten essential elements and discusses the three tiers of a trauma-informed educational approach: (1) creating and maintaining a trauma-informed community, (2) early interventions for children who are at-risk, and (3) intensive support (NCTSN, 2017).

#### 2.3.3.2.2 THE HEARTS APPROACH TO TRAUMA-INFORMED SCHOOLS

The University of California San Francisco's Healthy Environments and Response to Trauma in Schools (HEARTS) approach to trauma-informed schools is also a tiered approach, with tiers for early prevention, initial intervention, and intensive intervention. They highlight six principles in their framework: "1. Understand trauma and stress 2. Establish safety and predictability 3. Foster compassionate, dependable relationships 4. Promote resilience and social emotional learning 5. Practice cultural humility and responsiveness 6. Facilitate empowerment and collaboration" (Blodgett & Dorado, 2016). This approach emphasizes "equity and social justice through cultural humility and responsiveness" and takes into consideration the wellness of educators who experience vicarious trauma ("HEARTS Program Overview", n.d.). The schools that have implemented this program have seen dramatic reductions in negative behaviors and suspensions, and teachers have reported better outcomes for their students (Dorado et al., 2016).

#### 2.3.3.2.3 THE TRAUMA AND LEARNING POLICY INITIATIVE'S FRAMEWORK FOR TRAUMA-INFORMED SCHOOLS

Similarly, the Trauma and Learning Policy Initiative (TLPI), a collaboration between Massachusetts Advocates for Children and Harvard Law School, has proposed a framework that consists of six main school operations that need a trauma-informed approach: "(1) leadership, (2) professional development, (3) access to resources and services, (4) academic and nonacademic strategies, (5) policies, procedures and protocols, and (6) collaboration with families" (Cole et al., 2013, p. 12). They believe in the flexibility of their framework because while the needs of individual schools might differ

when implementing a trauma-informed approach, they assert that no trauma-informed approach should neglect one of these operational categories in the schools. This framework allows for fluidity and flexibility in implementing the approach based on the needs of individual schools or districts, and they give guidelines and suggestions for how to implement practices based on their framework.

#### 2.3.3.2.4 CAVANAUGH’S FRAMEWORK FOR TRAUMA-INFORMED CARE IN SCHOOLS

Cavanaugh (2016) proposes a similar framework for trauma-informed care in schools, including promoting safety and consistency, focusing on positive interactions (verbal affirmations), using culturally-responsive practices, and implementing peer supports (peer tutoring), targeted supports (screening students for risk factors, teaching social skills), and individualized supports (identifying potential triggers, family supports). This framework emphasizes using a strengths-based approach and addressing vicarious trauma.

#### 2.3.3.2.5 FRAMEWORKS SUMMARY

In these frameworks, we see an emphasis on providing resources and supports, both at the individual and family level (Cavanaugh, 2016; Cole et al., 2013; “HEARTS Program Overview”, n.d.; NCTSN, n.d.). These frameworks also highlight the need for there to be changes at the school and classroom levels, with both administrators (Cole et al., 2013; NCTSN, n.d.) and classroom educators (Cole et al., 2013; “HEARTS Program Overview”, n.d.; NCTSN, n.d.) taking steps to become trauma-informed in their practices. There is also a consistent mention of professional development, either explicitly written into the framework or mentioned as part of the policy suggestions, since classroom teachers play a significant role in relationship building and feelings of safety

for the students (Cole et al., 2013; “HEARTS Program Overview”, n.d.; NCTSN, n.d.). It is also significant that culturally-responsive practices are mentioned as central components of trauma-informed schools (Cole et al., 2013; “HEARTS Program Overview”, n.d.; NCTSN, n.d.). Conversations about disrupting the preschool-to-prison pipeline through trauma-informed educational practices cannot avoid discussing racial disparities in disciplinary practices in schools and their role in the pipeline (Wald & Losen, 2003), so for trauma-informed education to assist in disrupting this pipeline, we must consider how to respond to students in culturally relevant and appropriate ways.

#### 2.3.3.2.6 CONNECTION TO TIPE

The TIPE model intentionally placed relationships “twice in the TIPE model to conceptually link relationships as a healing intervention...and reiterate the importance of increasing psychological resources through positive relationships” (Brunzell et al., 2016b, p. 76). This should not be surprising given the fact that these relationships form the basis of meeting safety and love needs within the schools (Brunzell et al., 2016b), and can even help identify children who do not have their physiological needs met. The other frameworks either explicitly mention relationships/partnerships/collaboration (Cole et al., 2013; “HEARTS Program Overview”, n.d.; NCTSN, n.d.). or use language to describe how to build those positive relationships, for example, through focusing on positive interactions with students (Cavanaugh, 2016).

One of the distinguishing features of TIPE is the use of positive psychology and the emphasis on strengths-based interventions. While Cavanaugh (2016) mentions explicitly strengths-based approaches, the other frameworks do not mention this focus on strengths. However, this could fall under NCTSN’s (n.d.) elements of creating a trauma-

informed environment, partnerships between school staff and students, and cultural responsiveness; the HEARTS model principle of facilitating empowerment of students (“HEARTS Program Overview”, n.d.); and the TLPI’s operation of nonacademic strategies (Cole et al., 2013).

Another important feature of the TIPE model is the inclusion of an awareness of the importance of interventions being flexible across cultures (Brunzell et al., 2016b). According to Cramer et al. (2014), this is an important consideration in disrupting the preschool-to-prison pipeline, as they state “Given the negative impact of cultural marginalization, culturally responsive models could be implemented to stop the hemorrhaging of minority youth into the penal system” (p. 472). It is also mentioned in the NCTSN (n.d.), HEARTS (n.d.), and Cavanaugh (2016) frameworks through their inclusion of cultural responsiveness, and the TLPI framework mentions collaboration with families which could include a deeper understanding of their culture (Cole et al., 2013). Each of these frameworks is helpful for understanding slightly different facets of trauma-informed classroom interventions, and the TIPE model captures the three overarching themes in each of them, namely the attachment, regulatory, and psychological supports trauma-affected children often need (Brunzell et al., 2016).

#### 2.3.3.3 Research on the Effectiveness of TIPE Practices in Classroom Settings

Limited research has been conducted on proposed trauma-informed classroom educational practices, but there are some data supporting the effectiveness of TIPE practices within classroom settings (Brunzell et al., 2016a; Stokes & Brunzell, 2019) and more generally positive educational practices and relationship based regulation strategies that align with TIPE suggestions (Seligman, 2009; West et al., 2014). Brunzell et al.

(2016a) conducted longitudinal interviews with nine participants with reflective journals on the impacts of interventions and performed interpretive phenomenological analysis to determine the impact of TIPE regulatory practices on student regulation. Brunzell et al. (2016a) found that “[u]sing the TIPE model, teachers may assist trauma-affected students to nurture the necessary healing and growth for successful learning, while providing significantly more intervention pathways for classroom adaptation to meet specific student needs” (p. 223). Brunzell et al. (2016a) found in their research in alternative education settings that brain breaks were helpful in moving students toward regulation and that relationships were key in teachers knowing how to implement interventions for their students. In a different study on the impact of TIPE practices in a rural school, Stokes and Brunzell (2019) found that TIPE helped teachers focus on both healing and growth for their students. The teachers in this study were able to teach students how to calm their bodies, and teachers grew in their own self-regulation skills through implementing TIPE (Stokes & Brunzell, 2019). The data “suggests that TIPE can be a dual-pathway towards becoming a trauma-aware school. If the first pathway is to implement effective student strategies, the second emergent pathway is to support leaders and their staff” (Stokes & Brunzell, 2019, p. 9).

The TIPE model has an emphasis on positive education, and these practices have been shown to have positive impacts on student outcomes. Seligman et al. (2009) outlined some of the research conducted on positive education practices and their impact on students. One such study was on the Penn Resilience Program (PRP), a curriculum with the goal

to increase students' ability to handle day-to-day stressors and problems that are common for most students during adolescence. PRP promotes optimism by teaching students to think more realistically and flexibly about the problems they encounter. PRP also teaches assertiveness, creative brainstorming, decision making, relaxation, and several other coping and problem solving skills.

(Seligman et al., 2009, p. 297)

Seligman (2009) notes that the PRP program has been widely researched, mostly using randomized controlled designs in studies with over 2000 children from ages 8 to 15. This program has been shown to reduce symptoms of depression, anxiety, hopelessness, and behavioral problems, and works well for children from different racial/ethnic backgrounds (Seligman, 2009). These practices are encouraged within the TIPE framework (Brunzell et al., 2016b), and the positive outcomes noted from these studies are all outcomes that the TIPE model hopes for in trauma-affected children, so this research is promising for the framework. However, more research is needed to determine the effects of these positive education practices on “a broader range of outcomes, including students' social skills, positive emotion and engagement in learning” (Seligman et al., 2009, p. 300).

Additionally, Seligman et al. (2009) documents another positive education program that aligns with the TIPE framework called the Positive Psychology Programme, an empirical study of positive education curriculum with children in the eighth grade (year nine). The program was a strengths-based program, which is a core tenant of TIPE. The questionnaires given to teachers, students, and their parents showed that the positive education interventions they used (20-25 80-minute lessons spread throughout the year



on strengths, resilience, and student's sense of meaning) led to an increased enjoyment and engagement in school and improved social skills (Seligman, 2009). This is again promising research for the TIPE model which relies heavily on positive education interventions similar to the ones described in this study. More research is needed to determine if interventions like these can be successful when implemented school-wide and with students from a variety of socioeconomic and ethnic backgrounds (Seligman, 2009).

West et al. (2014) studied relationship-based regulatory interventions within a public charter school on the campus of a child welfare agency for girls that works exclusively with female court-involved students. They asked students who had been participating in these regulatory interventions to describe behaviors they saw in their schools, what might have led to those behaviors, and what advice they would give to teachers working with students demonstrating those behaviors (West et al., 2014). Students in this study “recommend that teaching personnel need to improve their management of student behavior in order to enhance engagement in student learning” (West et al., 2014, p. 62). These students found it challenging to focus on classwork when they had overwhelming emotions (West et al., 2014).

They also identified many triggers from their prior experiences that they believe lead to intense emotional and behavioral reactions. These reactions are not typically observed among those who have not had complex trauma exposure. The description of their experiences also indicated a need for greater trauma-informed teaching practices at school. (West et al., 2014, p. 62)

While these students were still frustrated with behaviors within this alternative school setting, they recognized and appreciated the interventions that were in place at their school for trauma-informed services (West et al., 2014). The students identified the benefit of the interventions for both teacher and students and the positive impact the intervention had on their regulatory abilities (West et al., 2014). While West et al. (2014) were not explicitly working within the TIPE framework, their focus on relationships, regulation, and psychological resources align with the TIPE model, and their findings align with Seligman et al. (2009), Brunzell et al. (2016a), and Stokes and Brunzell (2019) in showing promise for the types of interventions suggested in the TIPE framework. However, West et al. (2014) also shows that there might be limitations to the effectiveness of the TIPE practices in preventing maladaptive behaviors in the classroom and further research is needed in this area.

With the limited data available for the TIPE model (and generalized trauma-informed classroom practices more broadly), further study is necessary for understanding the impact of TIPE practices on student outcomes. Chafouleas et al. (2016) noted the need for rigorous testing of trauma-informed educational practices, stating that “[a]s trauma-informed systems of service delivery are planned, implemented, and integrated into educational practice, data should be collected to inform if and how processes and outcomes are changing as intended” (p. 157).

#### 2.3.3.4 Teacher Perspectives on Working With Trauma-Affected Youth

Though “[s]ystematic research on teachers’ perspectives regarding childhood trauma [was] virtually nonexistent” (Alisic, 2012), this area of research has recently begun to gain attention as trauma-informed education has become more popular (Alisic,

2012; Brunzell et al., 2018; Crosby et al., 2015; Stokes & Brunzell, 2019; ). The research shows that teachers face challenges in working with trauma-affected students (Alisic, 2012; Brunzell et al., 2018; Crosby et al., 2015; Stokes & Brunzell, 2019; ), but that training in trauma-informed classroom practices can mitigate some of those challenges for teachers (Crosby et al., 2015; Stokes & Brunzell, 2019).

Teachers identified challenges in working with trauma-affected students, including feeling unprepared to teach them (Alisic, 2012; Crosby et al., 2015; Brunzell et al., 2018) and feeling emotionally and professionally overwhelmed by caring for them (Brunzell et al., 2018). In a study by Brunzell et al. (2018), teachers revealed in group interviews and journal responses that they view the effectiveness of their pedagogical choices as an important factor in the meaning they draw from their work, yet find that their attempts at effective pedagogical practices were impacted negatively by student behaviors from trauma-affected students. Teachers have much difficulty in navigating relationships with trauma-affected students when they persist in challenging behaviors and have a challenging time with self-regulation themselves when faced with these challenging behaviors on an ongoing basis (Brunzell et al., 2018). This is support for the dual-pathway to TIPE Stokes and Brunzell (2019) propose: “Our data suggests that TIPE can be a dual-pathway towards becoming a trauma-aware school. If the first pathway is to implement effective student strategies, the second emergent pathway is to support leaders and their staff” (Stokes & Brunzell, 2019, p. 9). Alisic (2012) found in their interviews with 21 teachers who had all worked with at least one trauma-affected student that “...the most prominent themes in the participants’ narratives reflected uncertainty about, or a struggle with, providing optimal support to children” (p. 54). Teachers

interviewed struggled with feeling like they were being asked to be social workers and psychologists without the training of one (Alisic, 2012). However, as Bath (2008) points out, “One does not need to be a therapist to help address these three crucial elements of healing: the development of safety, the promotion of healing relationships, and the teaching of self-management and coping skills” (p. 18). What was missing for the teachers in Alisic’s (2012) study was training regarding interventions that could be used with trauma-affected youth (Alisic, 2012). The teachers in Alisic’s (2012) study were unsure how to treat children who had experienced trauma and worried about balancing the needs of the entire class with the needs of a single student. Similar concerns were echoed by teachers in the Brunzell et al. (2018) study who believed that “their pre-service university teacher training left them feeling unprepared for teaching in vulnerable communities” (p. 126).

In contrast, teachers who were trained in TIPE practices felt they were able to positively impact students’ capacity to pay attention and focus on academic tasks (Stokes & Brunzell, 2019). As teachers learned more strategies, they became “ingrained into the way teachers were teaching” (Stokes & Brunzell, 2019, p. 8). The teachers were able to assist students in regulating their physical responses to stress, as well as manage their own responses to stress within the classroom (Stokes & Brunzell, 2019). Teacher perceptions of working with trauma-affected students shifted positively after receiving training on and implementing the TIPE model within their own classrooms (Stokes & Brunzell, 2019). Similarly, Crosby et al. (2015) showed positive results for teachers who had been trained in trauma-informed classroom interventions. Teachers in this study were able to build positive relationships with students, identify behaviors associated with

trauma, and their perception of working with trauma-affected students was positively impacted by the trauma-informed training they received (Crosby et al., 2015). However, teachers still desired further training for practical resources to use their knowledge of trauma symptomology and using it in classroom interventions (Crosby et al., 2015). These teachers (Crosby et al., 2015) echoed teachers in the Alisic (2012) study in desiring more training on how to effectively work with trauma-affected children.

While more research is needed on teacher perceptions on the TIPE framework and working with trauma-affected students, these results point to the importance of teacher training (Alisic, 2012; Brunzell et al., 2018; Crosby et al., 2015; Stokes & Brunzell, 2019) and indicate that teacher perceptions of their ability to work with and impact trauma-affected students can be positively impacted by implementing the trauma-informed educational models (Crosby et al., 2015; Stokes & Brunzell, 2019).

#### 2.3.4 Teacher Perceptions of Challenging Student Behaviors

While there is a need for more studies regarding how teachers respond to manifestations of trauma within the classroom, particularly behaviors that may be the symptom of childhood trauma, there is much extant literature on teacher perceptions of challenging student behavior in general and biases that affect how teachers respond to these behaviors. The importance of understanding factors that influence teachers' response to challenging behaviors and interventions to mitigate potential bias is urgent, as students are increasingly referred to the criminal justice system for classroom behaviors (Wald, 2012). Challenging student behavior can impact a teacher's stress, self-efficacy, and the likelihood they will leave the profession (Abidin & Robinson, 2002; Butler & Monda-Amaya, 2016), which can in turn lead to an increase in discipline referrals

(Kokkinos et al., 2005). This is particularly important, as there is “evidence that the positive impacts of teacher expectations on educational attainment extend to associated longer-run socioeconomic outcomes” (Papageorge et al., 2020, p. 242). What follows is a discussion regarding the behaviors teachers find to be challenging, disparities in disciplinary practices, teacher biases, and potential interventions to mitigate these.

#### 2.3.4.1 Teacher Response to Challenging Student Behavior

Teachers vary in their perception of challenging behavior, with differences between preservice and inservice teachers (Ohan et al., 2011), special education and general education teachers (Westling, 2010), elementary and secondary teachers (Butler & Monda-Amaya, 2016), as well as differences based on the length of time the teacher had been teaching (Alter et al., 2013). For example, Alter et al. (2013) found differences based on the race and gender of the teacher, with African American and Caucasian teachers finding off-task behavior as less of a problem than teachers of other racial backgrounds, and female teachers reporting higher frustration with students who disrupt the class by talking out of turn. Westling (2010) found that special education teachers were more likely to attribute challenging behaviors to a student’s mental or physical state or (dis)ability. As an additional factor in teacher perceptions of student behavior, Kokkinos et al. (2005) found that the more stressed a teacher was, the less tolerant they were of maladaptive behavior in their classrooms. This is especially important as Abidin and Robinson (2002) found that students who exhibit maladaptive behavior enhance feelings of stress among teachers, which may create a cycle of negative disciplinary consequences.

As for the behaviors teachers find to be challenging, “the three most prevalent types of behavior for both [special education and general education teachers] were defiance and noncompliance, disruption, and socially inappropriate behavior” (Westling, 2010, p. 54). Teachers working with trauma-affected students have an especially difficult time managing behavior relating to internal distractions and students who shut down (Crosby et al., 2015), and challenging behavior can make it difficult for teachers to form meaningful relationships with trauma-affected children (Brunzell et al., 2018; Crosby et al., 2015). Additionally, though some teachers fear physical aggression from students (Butler & Monda-Amaya, 2016), more minor infractions may be more impactful, as it “is possible that off-task student behavior may be best typified as the gateway behavior that leads to other challenging behaviors” (Alter et al., 2013, p. 64), which may fuel the cycle of discipline and negative behavior discussed previously.

#### 2.3.4.2 Disparities in Discipline

In order to understand the interest in teacher bias among educational researchers, particularly as it relates to student behavior, one can turn to the data regarding disparities in school-based discipline. Anyon et al. (2014) found that “a student's racial background, gender, special education status, and designation as seriously emotionally disabled were among the most salient risk factors for exclusionary discipline practices” (Anyon et al., 2014, p. 384). Whitford and Emerson (2019) state that discriminatory discipline “has been a persistent concern, as several culturally and linguistically diverse child and adolescent student groups continue to be overrepresented in disciplinary referrals, suspensions, and expulsions: Alaskan Native students, American Indian students, Black students, and Hispanic/Latino students” (p. 670-671). These disparities have been well-

documented in the literature (Bryan et al., 2012; Gregory et al., 2016; Scott et al., 2019; Wallace et al., 2008; Welsh & Little, 2018).

There have also been discussions regarding the impact of student behavior and attitudes on disproportionate discipline (Goyer, 2019; Scott et al., 2019; Yeager, 2014). Since student-teacher relationships involve a complex series of interactions that can cause negative behaviors to be reinforced over time, ways to break the cycles of negative interactions are important to consider. For example, even though disparities persist when accounting for actual student behavior, Scott et al. (2019) also found that Black students behaved statistically worse in classrooms with White teachers. Scott et al. (2019) posit that the increased challenging behavior by these students may be due to lack of trust in teachers who treat them differently, and that teachers may be overreacting to student behavior because of past negative interactions. They bring up the “chicken and egg” conundrum, as it is challenging with cross-sectional data to give insight into why disparities exist and persist. Studies by Yeager (2014) and Goyer (2019) also point to the potential for student attitudes to impact discipline outcomes, as they focused on reducing perceptions of teacher bias among students. While these findings point to the need for more data (particularly data that can give insight into how ongoing teacher-student interactions and teacher biases impact these disparities), they also point out the importance of understanding teacher bias and the potential interventions that can decrease bias and limit the disparities in disciplinary practices.

#### 2.3.4.2.1 RACIAL BIAS AMONG TEACHERS

Since disparities in school-based disciplinary practices exist across racial/ethnic lines, there have been significant resources dedicated to understanding teacher racial and



cultural bias and potential interventions to mitigate these (Chang & Sue, 2003; Gregory et al., 2016; Kozlowski, 2014; Lafferty & Pang, 2014; Scott et al., 2019; Wallace et al., 2008; Whitford & Emerson, 2019). For example, a study by Kozlowski (2014) measuring teacher bias in classroom interactions found that teachers were more likely to give White and Asian students unwarranted positive attention when off-task compared to Black and Hispanic students. However, Kozlowski (2014) also found that racial background was not a significant predictor of mismatch in teacher and student perceptions of student effort when the student believed they were working hard and the teacher did not. These findings together suggest that, rather than teachers having overly negative views of Black and Hispanic students, they have overly positive views of White and Asian students. This is consistent with findings from Papageorge et al. (2020), who found that “...teacher expectations for black students are not necessarily low relative to observed outcomes. Rather, they are less inflated relative to observed outcomes compared to expectations for white students” (Papageorge et al., 2020, p. 237). This may lead to benefits for White students, as teacher perceptions of students are linked to long-term outcomes (Papageorge et al., 2020). Chang and Sue (2003) found that the strongest teacher stereotyping occurred with Asian American students when teachers read vignettes depicting three hypothetical children (Caucasian, African American, Asian American). Mason et al. (2014) conducted a meta-analysis of studies relating to ethnic bias in behavior ratings and found that there were mixed results in different studies, pointing to the need for further data on teacher bias. And although their study findings contradict the findings from other studies, Abidin and Robinson (2002) found that “for the most part, teachers' ratings of students' behavior is consistent with independent observations of the

students' behavior in their classroom” (p. 205). They attribute their results to positive shifts in American society, and more data are needed to see if these results are consistent with the current social and educational climate.

Much of the literature on racial bias among teachers focuses on interventions that either seek to mitigate bias or reduce the discipline gap. Since teacher bias and disproportionate disciplinary outcomes are linked in the literature (e.g., McIntosh et al., 2014), both are considered here. Since “racial and ethnic differences in minor disciplinary measures – being sent to the office or detained after school – are relatively small compared to the much larger differences in the harsher forms of discipline – suspension and expulsion” (Wallace et al., 2008, p. 53), much of the conversation surrounds reducing office discipline referrals as a means of reducing inequitable disciplinary outcomes (e.g., Goyer et al., 2019; Gregory et al., 2016; Yeager et al., 2014). Interventions range from one-time community events (Lafferty & Pang, 2014) to a comprehensive, multicomponent approach to reducing disproportionality in schools with three major goals: (a) to prevent situations that can lead to disproportionate discipline, and, when such situations occur, reduce the likelihood that (b) explicit bias or (c) implicit bias will influence the outcome of the situation. (McIntosh et al., 2014, p. 10)

The literature is clear that interventions can work. Gregory et al. (2016) found that teachers who were coached on general teaching best practices using video recordings of their own teaching had lower levels of disciplinary referrals than teachers in the control group, especially with Black students. Gregory et al. (2016) also found that coached teachers “had no racial discipline gap in their classrooms, whereas Black

students in the control teachers' classrooms were over two times more likely to be issued a referral compared with non-Black students" (p. 182). Their findings were particularly interesting given that the program was not explicitly about equity or reducing teacher racial/ethnic or cultural bias, but instead focused on learning how to interact effectively with all students. This is consistent with literature that shows the potential for empathy in relationships as a focus in interventions on racial bias (Okonofua et al., 2016; Whitford & Emerson, 2019).

In their analysis of the impact of a single-event intervention, Lafferty and Pang (2014) found that the Learning Fair, a community-based activity preservice teachers lead for students and their families, assisted in reducing the deficit mindset in preservice teachers about low-income and minority families. It was unclear as to whether the preservice teachers were required to participate in the interviews as part of their course grade and whether they were free to opt out of participation in the study, though their findings that "[c]ommunity interactions brought to life abstract classroom discussions about multiculturalism, and subsequent reflection anchored experiences within the caring-centered framework" (Lafferty & Pang, 2014, p. 199) are promising for reducing teacher bias against racial/ethnic minorities and low-income students.

As was discussed previously, there is also discussion regarding reducing student perceptions of teacher bias as a means of mitigating the effects of perceived bias on student outcomes. These studies do not focus on whether the teacher is measurably biased, but rather examine how student attitudes can shift regarding their teacher's motives, leading to measurable improvements in their achievement and disciplinary outcomes compared to students who did not receive interventions (Goyer, 2019; Yeager,

2014). Specifically, teaching students that critical teacher feedback is given because the teacher believes the student is capable (Yeager et al., 2014) and “interventions that mitigate stereotype-based concerns and foster instead a sense of belonging, inclusion, and growth in students early in middle school” (Goyer et al., 2019, p. 230) led to statistically significant differences in student behavioral and academic outcomes. This points to the role that student perceptions have on mitigating the effects of perceived teacher bias (and potentially actual bias, too). As an example of such promising findings, Yeager et al. (2014) found that when students were randomly assigned to receive a note from their teacher that was either neutral or expressed that their feedback was an expression of their belief in the students’ ability, “[a]n estimated 71% of African American students who received the wise feedback note revised their essays, compared with 17% of students who received the control” (p. 810). Yeager et al. (2014) found positive and statistically significant impacts from the intervention on student success across multiple studies, including a longitudinal study that demonstrated increased student trust in the school system and positive academic and discipline outcomes persist over time.

Lastly, restorative practices have shown promise in reducing office discipline referrals and exclusionary discipline (Anyon et al., 2016; Gonzalez, 2012; Gregory et al., 2018; McIntosh et al., 2014; Schiff et al., 2018;), although disproportionate disciplinary outcomes still persist in schools with restorative disciplinary practices for Black students, those with emotional disorders, students receiving special education services, and those eligible for free lunch (Anyon et al., 2016; Gregory et al., 2018). “Within the school context, restorative justice is broadly defined as an approach to discipline that engages all parties in a balanced practice that brings together all people impacted by an issue or

behavior” (Gonzalez, 2012, p. 281). These practices are in contrast to exclusionary disciplinary practice, though data suggests that restorative practices need to be culturally responsive, consider student (dis)ability and language barriers, and be implemented with fidelity in order to reach equitable outcomes (Gonzalez, 2012; Gregory et al., 2018; Kervick et al., 2019; Schiff, 2018). Together, the data show the promise of teacher-based, student-based, and disciplinary-based interventions for reducing actual racial bias, perceptions of bias, and the potential impacts of actual and perceived racial bias within the school system.

#### 2.3.4.2.2 BIAS REGARDING (DIS)ABILITY STATUS AMONG TEACHERS

There is also a wealth of knowledge from the literature regarding teacher bias and (dis)ability labels (Allday et al., 2011; Foster & Ysseldyke, 1976; Fox, 1995; Gregory et al., 2018; Murray & Murray, 2004). Even outside of education, there is a discussion regarding whether the use of diagnostic labels is harmful for children, leading Fernald and Getty (1980) to conclude that “labeling is no longer a question of mere academic debate or pragmatic clinical consideration but an important social-political issue as well” (p. 229). This is because labels can lead to negative perceptions of the child regardless of their actual behavior (Allday et al., 2011; Foster & Ysseldyke; 1976; Fox, 1995).

However, there are also data that suggests there are positive outcomes associated with labeling for some (dis)abilities, like increased teacher willingness to help a student or change their classroom practices for students with ADHD diagnoses (Ohan et al., 2011).

The data suggest that diagnoses such as Attention Deficit Hyperactivity Disorder (ADHD), Emotionally Disturbed (ED), and Oppositional Defiance Disorder (ODD) especially negatively impact teacher perceptions of student behavior (Allday et al., 2011;

Levin et al., 1982; Ohan et al., 2011). Results show that pre-service teacher (e.g., Allday et al., 2011; Butler & Monda-Amaya, 2016) and inservice teacher (e.g., Gregory et al., 2016; Kozlowski, 2014; Scott et al., 2019) biases and perceptions vary, and may differ based on real interactions with students in the classroom (Ohan et al., 2011). Moreover, Murray and Murray (2004) found that “teachers viewed their relationships with students with disabilities as greater in conflict...and lower in closeness” (p. 755). Similar to racial bias, while teachers have been shown to have bias when it comes to labels of student (dis)ability status and there are measurable inequities in disciplinary outcomes (Allday et al., 2011; Fox, 1995; Gregory et al., 2018; Murray & Murray, 2004), more research is needed to understand how this bias impacts student-teacher interactions or teacher use of office referrals. This is especially true in light of the fact that many of the studies that consider teacher bias and (dis)ability status use vignettes, which may not translate to real teacher relationships with students or teachers’ actual behavior (Allday et al., 2011; Lucas et al., 2009; Ohan et al., 2011).

One suggested intervention for reducing teacher bias in regard to (dis)ability status is further training on how specific diagnoses present and interventions that assist with maladaptive behaviors associated with the diagnoses (Ohan et al., 2008). Teachers who know more about a diagnosis may feel more empowered to help children with that diagnosis, which may reduce the impact of label bias on teacher behavior (Ohan et al., 2008). Additionally, restorative practices have been considered as useful in mitigating the potential effects of teacher bias based on (dis)ability (Kervick et al., 2019) since restorative practices are helpful in reducing overall rates of exclusionary discipline (Anyon et al., 2016; Gonzalez, 2012; Gregory et al., 2018; McIntosh et al., 2014; Schiff,

2018). However, “the spoken language structure of the restorative circle process may actually diminish the opportunity for some students with disabilities to participate in equitable ways” (Kervick et al., 2019, p. 601). Restorative practices should include accommodations for students when speech or language barriers exist. Kervick et al. (2019) bring up ethical cautions regarding restorative circles and students with (dis)abilities, especially when it comes to disclosing their (dis)ability status to other students in the process of the circle. Further research is needed to determine the effects of restorative practices when implemented with students with (dis)abilities in an equitable manner, and whether these practices reduce teacher bias or the effects of these biases, though the data are promising.

#### 2.3.4.3 Connections to Trauma-Informed Education and the Preschool-to-Prison Pipeline

Challenging student behaviors that are associated with discipline disparities among racial and (dis)ability groups overlap significantly with behaviors that are associated with trauma:

Classroom behavioral adaptations to trauma include aggression, defiance, withdrawal, perfectionism, hyperactivity, reactivity, impulsiveness, and/or rapid and unexpected emotional swings. Trauma-related behaviors are often confused with symptoms from other mental health issues such as ADHD and mood disorders....When educators review the reasons that children are not behaving and/or learning, trauma should be considered a possible contributing factor.

(Anderson-Ketchmark & Alvarez, 2010, p. 13)

Thus, the discussion surrounding disparities in behavioral outcomes and teacher bias is intimately connected to the conversations about trauma-informed education and the preschool-to-prison pipeline. Additionally, teacher-student relationships is a central component of Trauma-Informed Positive Education (TIPE), and efforts to improve these relationships and nurture a sense of belonging may overlap with the interventions used to mitigate teacher bias (e.g., Goyer et al., 2019; Kervick et al., 2019). Positive teacher-student relationships were also consistently discussed as having the potential to assist with reducing disruptive behaviors (Butler & Monda-Amaya, 2016; Gregory et al., 2016; Okonofua et al., 2016), which may help disrupt the pipeline by giving fewer opportunities for negative interactions that lead to office discipline referrals. Interestingly, Bryan et al. (2012) found differences between counselor referrals for behavior between mathematics teachers and English teachers, stating that “subject context may affect disciplinary referrals” (Bryan et al., 2012, p. 184). This points to the need to better understand teacher perspectives on maladaptive behavior within the context of their content expertise.

Additionally, teacher perceptions of challenging student behavior has also been considered among teachers working with trauma-affected students (Alisic, 2012; Crosby et al., 2015; Milot et al., 2010). Crosby et al. (2015) found that school staff working with court-involved youth with high trauma rates had a difficult time managing student behaviors relating to students shutting down and internal distractions. Similarly, Alisic (2012) found that for teachers who had interacted with trauma-affected youth, “the most prominent themes in the participants’ narratives reflected uncertainty about, or a struggle with, providing optimal support to children” (p. 54). Each of these behaviors have been



discussed as stressors for teachers and carry the potential for office discipline referrals, which are disproportionately given to students with (dis)abilities and racial/ethnic minority students. These studies show that the need for understanding challenging student behavior through the lens of trauma-informed practices may be beneficial, though none of the studies have directly considered how trauma-affected status might impact their perceptions of these children or how racial/ethnic or (dis)ability label bias may have impacted their perceptions. Further study is needed in these areas.

### 2.3.5 Social Justice Mathematics

There has been a sociopolitical turn in mathematics education (Gutiérrez, 2013; NCSM & TODOS, 2016) which has brought to the foreground conversations about how power and knowledge, within the context of community and identity, impact mathematics teaching and learning. This shift has caused researchers to question just about everything about how we conduct mathematics education in our schools. Panthi et al. (2018) ask:

What mathematics is taught in the classroom? Whose mathematics is taught?  
Who teaches mathematics and to whom? How do teachers teach the subject in the classroom? What context do teachers use in teaching mathematics? How do students participate in learning mathematics? How do parents support their children in learning mathematics? How does the school system maintain access to the resources for students? Do all students have access to resources to learn mathematics? Does education policy support equitable mathematics education for all students? How does power and politics play a role in supporting or hindering students' empowerment through learning of mathematics? (p. 7)

With these questions in mind, the question then might become, “Why do the answers to these questions matter?” Oslund (2012) and Gutiérrez (2013) answer this question by stating that “[t]eaching a high level of mathematics to all students is more than an economic issue—it is a moral one” (Oslund, 2012, p. 215) and “those who have taken the sociopolitical turn seek not just to better understand mathematics education in all of its social forms but to transform mathematics education in ways that privilege more socially just practices” (Gutiérrez, 2013, p. 40). Since mathematics is a gatekeeper for future academic and economic success (Douglas & Atwell, 2017; Gutiérrez, 2013; Martin et al., 2010; NCSM & TODOS, 2016; Riley, 1997), we must consider why it has kept students from success and how to remove barriers so that all students have the opportunity for success in mathematics classrooms and beyond.

#### 2.3.5.1 Recent Frameworks for Social Justice Mathematics

There are several recent frameworks for equity and social justice mathematics (Gutiérrez, 2012, 2013, 2018; Gutstein, 2006; Kokka, 2015; NCSM & TODOS, 2016; Yeh et al., 2020). Each is briefly described, followed by a discussion on the connections across the frameworks. Additionally, the connections between equity and social justice mathematics and Trauma-Informed Positive Education (TIPE; Brunzell et al., 2016b) will be discussed.

##### 2.3.5.1.1 EQUITY THROUGH MATHEMATICS EDUCATION

Gutstein (2006) believes that there should be a distinction made between equity within mathematics education and equity through mathematics education, and that to achieve both we must consider the structures that lead to inequity in the first place and give students the mathematical tools and language to change inequitable structures.

Gutstein (2006) believes that a “crucial aspect of teaching mathematics for social justice is what students do with the mathematics that they learn” (p. 14), and that the foundational principle of social justice mathematics is liberation from oppression through the use of mathematics. Gutstein (2006) also asserts that “...students need to be prepared through their mathematics education to investigate and critique injustice, and to challenge, in words and actions, oppressive structures and acts—that is, to ‘read and write the world’ with mathematics” (p. 4).

Gutstein (2006) outlines two important types of goals within social justice mathematics: social justice pedagogical goals and mathematics pedagogical goals.

The three social justice pedagogical goals are (1) reading the world with mathematics, (2) writing the world with mathematics, and (3) developing positive cultural and social identities. The three mathematics pedagogical goals are (1) reading the mathematical word, (2) succeeding academically in the traditional sense, and (3) changing one’s orientation to mathematics. (p. 24)

Gutstein (2006) says that reading the world with mathematics is “equivalent to developing mathematical power” (p. 29), and involves understanding the world around them (and inequities in particular) through a mathematical lens. Writing the world with mathematics means “using mathematics to change the world” (Gutstein, 2006, p. 27), which involves developing social agency, an increase in how they view their ability to change the things around them.

#### 2.3.5.1.2 SOCIAL JUSTICE FOR THE ADVANCEMENT OF MATHEMATICS EDUCATION

In a joint statement, the National Council of Supervisors of Mathematics (NCSM) and TODOS: Mathematics for ALL (TODOS) (2016) outlined what social justice

mathematics is and how to implement it within mathematics classrooms. In this statement, they “ratify social justice as a key priority in the access to, engagement with, and advancement in mathematics education for our country’s youth” (NCSM & TODOS, 2016, p. 1). Their framework requires equitable teaching practices, high expectations for every student, access to quality mathematics that is both rigorous and relevant, and connections to the broader community (NCSM & TODOS, 2016). “Equally important, a social justice stance interrogates and challenges the roles power, privilege, and oppression play in the current unjust system of mathematics education—and in society as a whole” (NCSM & TODOS, 2016, p. 1). The framework outlines steps to implementation, including acknowledgement of past injustices in mathematics education, action toward institutional changes that lead to equitable opportunities for all students, and accountability for organizations to help sustain systemic changes (NCSM & TODOS, 2016). They also discuss challenging deficit perspectives and instead considering counter narratives that build upon the strengths of students, the elimination of tracking systems within mathematics education, increased commitment to recruitment of a diverse teaching population, and an increased use of Complex Instruction (NCSM & TODOS, 2016).

#### 2.3.5.1.3 SOCIAL JUSTICE MATHEMATICS INSTRUCTION THROUGH COLLABORATION

Kokka (2015) proposes a three-part definition of social justice mathematics, requiring that students and teachers work to empower those who are not served by dominant paradigms, that rigorous mathematics is offered to all students, and that students and teachers co-construct the mathematics classroom. Kokka (2015) calls for empowerment both inside the traditional system (e.g., seeing higher grades) and outside

of the formal education environment by encouraging students to use their mathematics knowledge for social change. Kokka (2015) calls for more than just access to quality mathematics, but instead requires that inequities be addressed to ensure that all students can be successful in the mathematics courses they can access.

This framework also addresses dilemmas in implementing social justice mathematics and ways to navigate those. For example, the traditional definition of “success” in mathematics should be questioned within this social justice paradigm, and Kokka (2015) advocates for the “dual goal” approach, which acknowledges both success in the traditional sense (passing courses, doing well on high-stakes exams) and in ways that challenge the dominant perspective (focusing on social justice, critical mathematics) (also see Gutiérrez, 2002; Gutstein, 2006). An additional consideration in implementing social justice mathematics that Kokka (2015) addresses is curriculum: while it is the goal to allow students to engage in rich mathematics problems guided by their own interests, “a great amount of time, content expertise, and creativity are needed to design a [social justice mathematics] lesson or project based on students’ interest” (p. 17). Kokka (2015) acknowledges this barrier, along with the tension created when students choose to consider a social justice issue that requires mathematics skills that does not align with their grade level.

#### 2.3.5.1.4 EQUITABLE MATHEMATICS, THE SOCIOPOLITICAL TURN, AND REHUMANIZING MATHEMATICS

Gutiérrez has written extensively on equitable mathematics (Gutiérrez, 2012), the sociopolitical turn in mathematics education (Gutiérrez, 2013), and rehumanizing mathematics (Gutiérrez, 2018), which together offer a comprehensive look at key areas of

social justice and equity mathematics. Four dimensions of equity Gutiérrez (2012) outlines are access, achievement, identity, and power. The approaches to equitable mathematics that only focus on access to quality mathematics content and ignore student outcomes, that require students to downplay “personal, cultural, or linguistic capacities in order to participate in the classroom or the math pipeline” (Gutiérrez, 2012, p. 42), or that ignore alternative understandings or student voices are missing a big part of what it means for mathematics to be equitable (Gutiérrez, 2012). Gutiérrez (2012) also fights back against the notion that a prescribed “culturally relevant mathematics” is the goal of equitable mathematics, but rather argues that the goal should be to give students a window into the world of others and a mirror into their own worlds.

Gutiérrez (2012) asserts that “...mathematics is a human practice that reflects the agendas, priorities, and framings that people bring to it” (p. 45), and seeks to bring a perspective that will help make mathematics a more just human practice (Gutiérrez, 2013). Gutiérrez (2012, 2013, 2018) believes that we can make this a more just and equitable field through the rejection of deficit language and mindsets regarding racial and ethnic minority students and the affirmation of the rich cultural and contextual knowledge and understandings that they bring to the mathematics classroom. And the sociopolitical view of mathematics additionally requires seeing “knowledge, power, and identity as interwoven and arising from (and constituted within) social discourses” (Gutiérrez, 2013, p. 40).

Gutiérrez (2018) has moved from using the term “equity” to the term “rehumanizing mathematics” because of the superficial and ill-defined ways that the word equity has been used in the field, with little positive results that have actually

demonstrated equitable practices. Gutiérrez (2018) seeks to change the mathematical experience of students from dehumanizing (e.g., valuing speed over understanding) to rehumanizing, an ongoing process rooted in the traditions of rich cultures around the world that have used complex mathematics within cultural practices. This approach to just mathematics involves shifting authority to students, “...acknowledging students’ funds of knowledge, algorithms from other countries, the history of mathematics, and ethnomathematics” (Gutiérrez, 2018, p. 5), appreciating the views of others, and viewing mathematics as a human endeavor. Additionally, it requires that students have rich contexts that may allow them to approach mathematics in a unique and interesting way and teachers who encourage them to explore these types of ideas rather than simply repeat what has been taught (Gutiérrez, 2018). Going beyond mathematics prescribed in textbooks, attending to emotion in mathematics education (rather than just logic), and allowing students to express themselves through mathematics are also foundations to this framework for just mathematics (Gutiérrez, 2018).

#### 2.3.5.1.5 REHUMANIZING MATHEMATICS FOR STUDENTS WITH DIS/ABILITIES

Yeh et al. (2020) builds on rehumanizing mathematics with a framework specifically for rehumanizing mathematics for students with dis/abilities that involves viewing

the historical and political use of school mathematics as colonized by Western and ableist norms,...mathematics as a product of human thought and interaction learned through activity...[and] dis/ability as a cultural identity: the “complex embodiment” ...of dis/ability as both corporal and social has implications for notions of mathematical activity and mathematical knowledge. (p. 4)

This framework places the discussion of mathematics education and dis/ability within historical and political contexts through a critical framework that considers dis/ability as not simply a medical status, but a socially constructed reality (Yeh et al., 2020). “This awareness provides opportunities to disrupt assumptions that only some students are capable of being mathematically competent and instead approach one’s work as finding ways to identify and promote all students’ agentic becoming as doers of mathematics” (Yeh et al., 2020, p. 4). It also focuses on the cultural, creative, and collaborative history of mathematics as relevant to understanding how students learn and reason (Yeh et al., 2020). Yeh et al. (2020) call for research to have a strengths-based lens that rejects the notions that we can measure student ability completely in static and objective ways.

#### 2.3.5.2 Summary

From these recent frameworks, several clear themes emerge. First is the rejection of deficit-based perspectives and a need for a strengths-based lens for mathematics education for all students, especially those in racial and ethnic minority groups and those with (dis)abilities (Gutiérrez, 2012, 2013, 2018; NCSM & TODOS, 2016; Yeh et al., 2020). This is in line with the consistent theme of questioning the power structures and empowering students, particularly students who might be disempowered in “traditional” mathematics education paradigms (Kokka, 2015; Gutiérrez, 2013; Gutstein, 2006). Social justice and equity mathematics require that the teacher relinquishes authoritarian power and control in the classroom, instead focusing on developing norms that establish a collective responsibility for both discourse and the production of knowledge (Gutiérrez, 2013; Kokka, 2015; NCTM & TODOS, 2016). There is also a consistent call for rigorous mathematics (Kokka, 2015; NCTM & TODOS, 2016), with a particular focus on



going beyond potential access and opportunity to high quality mathematics courses, instead focusing on every mathematics course having these opportunities for students (Kokka, 2015). And social justice mathematics requires changing notions of “success” in mathematics, understanding that traditional assessment measures may be overemphasizing particular forms of learning and expression. For example, Gutiérrez (2002), Gutstein (2006), and Kokka (2015) all argue for dual goals in social justice mathematics education: both success in the traditional sense (passing courses, doing well on high-stakes exams) and in ways that challenge the dominant perspective (focusing on social justice, critical mathematics).

#### 2.3.5.3 Cautions and Challenges

There are several challenges to be considered when implementing social justice mathematics. The first is that there are some people who use the words “equity” and “justice” as a means of generating profit and continuing the status quo, therefore teachers need to be critical of methods and curriculum they consider using in their classrooms to ensure that it truly embodies social justice mathematics tenets (Sriraman et al., 2012). Secondly, it is possible to fall into the trap of discussing power for the sake of discussion instead of within the context of mathematics and for the sake of opening up “possibilities for something new—new forms of operating, new strengths to be valued, new arrangements in schooling practices, new meanings of mathematics education, new connections between mathematics education and the world” (Gutiérrez, 2013, p. 56). Additionally, it is difficult sometimes to balance the desire for rich, social justice oriented mathematics with the demands of time and pressure created by high-stakes testing (Kokka, 2015).

#### 2.3.5.4 Connections to Trauma-Informed Positive Education (TIPE)

Social justice and equity-focused mathematics and TIPE are deeply connected to one another, both in their goals and in their implementation. First, all emphasize a need for equitable practices to ensure that the needs of a diverse student population, particularly students who are traditionally underserved by the current schooling system, are considered (Brunzell et al., 2016b; Gutiérrez, 2012, 2013, 2018; Gutstein, 2006; Kokka, 2015; NCSM & TODOS, 2016; Yeh et al., 2020). Also, Kokka (2015) suggests that deep teacher-student relationships in mathematics for equity and social justice can bridge the gap for teachers lacking sociopolitical consciousness, which is in line with the emphasis on student-teacher relationships in TIPE. The TIPE framework suggests that it is these healthy relationships that help provide a context within which trauma-affected students can learn and that teachers may need to provide opportunities to repair students' ability to form such attachments in order for them to participate in rich educational experiences (Brunzell et al., 2016b).

Another connection to TIPE is that playing with mathematics is central to the development of students' identity as mathematicians and is a component of some social justice mathematics frameworks (Gutierrez, 2012; NAEYC, 2002), which is in line with TIPE's emphasis on play as a means of healing within educational contexts (Brunzell et al., 2016b). Gutierrez (2012) states that her experience with facilitating play in mathematics settings

suggests that this “play” time helps students learn how to relate to one another and to adults in ways that push their ability to solve problems, make conjectures,

reason about their strategies, convince others, and so on. (Gutierrez, 2012, p. 48-49)

This emphasis on being able to communicate effectively and problem solve is also connected generally to trauma-informed practices and the disruption of the preschool-to-prison pipeline, as it assists in disrupting criminal thinking styles and antisocial behavior that inhibits a person's ability to avoid the criminal justice system (Cole et al., 2005; Cuadra et al., 2014), particularly maladaptive behaviors that have been linked to trauma (Anderson-Ketchmark & Alvarez, 2010).

In addition, “[c]ulture plays an important role in the meaning we give to trauma and our expectations for recovery” (APA, 2008, p. 4). An important aspect of TIPE is that Brunzell et al. (2016b) intentionally designed a framework that could be applied in diverse settings because of their commitment to ensuring that all trauma-affected students would have access to the skills they need, regardless of their cultural or ethnic background. This focus on racial and ethnic cultural diversity is obviously also a central component of every social justice mathematics framework (Gutiérrez, 2012, 2013, 2018; Gutstein, 2006; Kokka, 2015; NCSM & TODOS, 2016; Yeh et al., 2020). Additionally, strengths-based anti-deficit approaches to education are central to both TIPE and social justice mathematics (Brunzell et al., 2016b; Gutiérrez, 2012, 2013, 2018; NCSM & TODOS, 2016; Yeh et al., 2020).

### 2.3.6 Student-Centered Learning

Felder and Brent (1996) define student-centered instruction as “a broad teaching approach that includes substituting active learning for lectures, holding students responsible for their learning, and using self-paced and/or cooperative (team based)

learning” (p. 43). The term “student-centered learning” includes a variety of teaching frameworks, including learner-centered, transformational, and active learning (Kyriacou, 1992; Lee & Hannafin, 2016; Mascalò, 2009; Meece, 2003; NAEYC, 2003; Slavich & Zimbardo, 2012), as well as a variety of methods for implementation, including project-based learning and concept mapping (Romance & Vitale, 1999; Schettino, 2016; Wong, 2015). Each of these approaches attempts to shift the responsibility of the teacher from being the “all-knowing imparter of knowledge” to the developer of a community in which students and teachers share in the learning process (Heibert et al., 1996; Romance & Vitale, 1999; Slavich & Zimbardo, 2012).

In *Principles to Action*, the National Council of Teachers of Mathematics (NCTM, 2014) gave a list of mathematics teaching practices that they believe are the answer to failures in the mathematics education system. These included “implement[ing] tasks that promote reasoning and problem solving,” “facilitat[ing] meaningful discourse,” supporting collective and individual “productive struggle in learning mathematics,” and “elicit[ing] and us[ing] evidence of student thinking” (NCTM, 2014, p. 3). Their statement follows decades of shift in mathematics education to approaches that are “student-centered,” as opposed to teacher-centered (Eronen & Kärnä, 2018). Many of these approaches build upon a learner-centered foundational paper by the APA (1997) that was not specific to mathematics, but encouraged all learner-centered classrooms to value diversity, encourage self-regulation, help students set meaningful goals, link to their existing knowledge, give meaningful feedback, give opportunities for meaningful self-reflection, encourage creativity and curiosity, and operate with the understanding that “[s]uccessful learners are active, goal-directed, self-regulating, and assume personal

responsibility for contributing to their own learning” (“Cognitive Factors” section). What follows is a discussion regarding overarching frameworks for K-12 student-centered mathematics, as well as frameworks for techniques used to implement student-centered learning, and their connection to TIPE.

#### 2.3.6.1 Recent Frameworks for Student-Centered Teaching and Learning

Since student-centered learning is a broad topic that includes both overarching principles and specific methods for implementation, this review will give a broad overview of both types of frameworks. These frameworks will cover the “what” of student-centered mathematics teaching and learning through student-centered/learner-centered (Lee & Hannafin, 2016; McCombs & Whistler, 1997; Meece, 2003; NAEYC, 2002), transformational (Slavich & Zimbardo, 2012), and active learning (Kyriacou, 1992; Mascalò, 2009; Wong, 2015) frameworks, as well as the “how” through project-based learning (Schettino, 2016; Stein et al., 2003) and concept mapping (Romance & Vitale, 1999). These will be considered, along with a discussion on student-centered integrated STEM (Jong et al., 2020; Mohr-Schroeder et al., 2018; Tanenbaum, 2016), as mathematics is a critical component of STEM education.

##### 2.3.6.1.1 STUDENT-CENTERED/LEARNER-CENTERED TEACHING

McCombs and Whistler (1997) proposed that learner-centered mathematics classrooms were those that involve meaningful activities, challenging mathematics, high expectations, autonomy for students, collaboration, a focus on student needs, culturally-relevant pedagogy, respect for students, cooperation, responsibility, and a sense of belonging. Building from their framework, Meece (2003) defines learner-centered teaching as involving

a movement toward a constructivist and authentic approach to teaching; a focus on conceptual understanding, problem solving, and reasoning; an emphasis on student improvement and learning for its own sake; a collaborative learning and decision making process, and a classroom environment that honors and respects students' voices. (p. 113)

Additionally, Lee and Hannafin (2016) have proposed a practical framework, the Own It, Learn It, Share It model of student-centered learning. First, Lee and Hannafin (2016) list two overarching assumptions of project-based learning: autonomy and scaffolding. Lee and Hannafin (2016) believe that students' autonomy influences academic outcomes and that they can even feel autonomous when engaged in an activity that was imposed upon them if given the opportunity for some level of autonomy within the mathematical task they are given. As for the role of the teacher, they believe that the "more knowledgeable other" guides students through their learning and should provide opportunities for support with a focus on goal-setting and opportunities for self-monitoring (Lee & Hannafin, 2016). Their model then requires students to own their learning by taking on responsibilities, learn the material by constructing their knowledge and meeting set goals, and sharing their learning broadly with authentic audiences outside of the mathematics classroom (Lee & Hannafin, 2016).

In 2002, the National Association for the Education of Young Children (NAEYC) put out a joint position on early childhood (3-6 years old) education that was steeped in student-centered language, and has many connections to social justice mathematics and trauma-informed education. They believe that student-centered learning should involve problem solving, mathematical play, and project-based learning (NAEYC, 2002). In

addition, their statement places careful emphasis on equity and student culture as central to their learning (NAEYC, 2002).

#### 2.3.6.1.2 ACTIVE LEARNING

Another term often used for student-centered learning techniques is “active learning.” Kyriacou (1992) discusses active learning as requiring direct experience, investigation, problem-focused techniques, work in small groups, student ownership of their learning, and content that is relevant to the student. Mascaló (2009) has a broader view of “active learning,” with the idea that all learning is active in some way and that even in a situation where the student may seem passive, they can be actively engaged in learning, particularly if given the right task.

In a more recent framework, Wong (2015) proposes an active teaching style that centers on student questioning. Wong (2015) believes that students can be taught to view the world with a mathematical lens being led by their teacher in learning how to ask questions to stimulate deeper understanding. Wong (2015) proposes that asking questions is “a natural way with which they try to satisfy their curiosity” (p. 1086), which Wong believes is important to active learning.

While a more complete treatment is outside of the scope of this paper, it is worth mentioning that active learning is often discussed in the context of college-level mathematics as an important way to encourage communication, collaboration, and creation among students (Braun et al., 2017; Rosenthal, 1995). These college-specific conversations about active learning are very similar to the frameworks for K-12, as they call for implementing small group work, writing assignments, peer review, and modeling for actively engaging students (Braun et al., 2017; Rosenthal, 1995). It is relevant to the

discussion on student-centered learning in K-12 to understand how students will be engaging in mathematics during college, and active learning is increasingly a part of postsecondary institutions, mirroring the changes in K-12 education.

#### 2.3.6.1.3 TRANSFORMATIONAL LEARNING

Though not a framework specific to mathematics education, Slavich and Zimbardo's (2012) framework for transformational learning is considered here because of the framework's links to student-centered and active mathematics and the applicability of the framework to the mathematics classroom, as well as the overlap with many of the mathematics-specific frameworks. Slavich and Zimbardo (2012) discuss that transformational learning, which they state encompasses student-centered and active learning, as each of these teaching and learning frameworks opposes the "sage on the stage" style of traditional lecture-based instruction. According to Slavich and Zimbardo (2012), the key components of transformational learning are motivation, perspective-taking, creating opportunities and removing barriers, study groups, growth mindset, emotional and instructional support, and alternative methods of testing that fit this new teaching paradigm. Their framework includes

- (1) establishing a shared vision for a course;
- (2) providing modeling and mastery experiences;
- (3) intellectually challenging and encouraging students;
- (4) personalizing attention and feedback;
- (5) creating experiential lessons that transcend the boundaries of the classroom; and
- (6) promoting ample opportunities for prelection and reflection. (Slavich & Zimbardo, 2012, p. 585)

Slavich and Zimbardo (2012) believe all transformational learning methods require teachers to become facilitators of learning who give students the skills and



strategies they need to discover new ideas and promote a positive attitude toward learning. This framework requires teachers to intellectually challenge students, help them solve challenging problems, give them problems that go beyond the immediate classroom context, and give them constructive feedback (Slavich & Zimbardo, 2012). This framework proposes that “enhancing how students regard learning and discovery is as important as having students master more content” (Slavich & Zimbardo, 2012, p. 585).

#### 2.3.6.1.4 PROJECT-BASED LEARNING

While Project-Based Learning (PBL) is a very broad theory, an interesting recent framework for PBL is highlighted here because of its unique perspectives on this student-centered approach. Schettino (2016) proposed a framework for relational project-based learning, with an emphasis on how relationships impact women in the mathematics classroom. Schettino’s (2016) framework involves “relational trust, relational authority, relational equity, and voice and agency” (Theoretical Framework section). Schettino (2016) posits that since relationship is the context within which project-based mathematics learning occurs, it is essential that everyone within the classroom shares in the creation of the experience and authorizes the learning process, which can only happen through trust-based relationships. This framework emphasizes the creation of an environment that “allows students to freely express ideas, grapple with learning tasks openly, and question not only authority but also knowledge in general” (Schettino, 2016, “Voice” section). It also acknowledges that in reality, these principles are difficult to enact within mathematics education because of persistent barriers (Schettino, 2016).

Additionally, it is worth mentioning here that Stein et al. (2003) conducted a review of studies regarding problem solving behaviors as a method of teaching mathematics education and found that it is important to move beyond teaching of problem solving to “teaching through problem solving” (Stein et al., 2003, p. 246). This is the heart of project-based learning, and Stein (2003) indicates that context is meaningful within PBL, that it is problematic to use traditional measures to quantify student success, and that scaffolding is key in these student-centered approaches. Roh (2003) summarizes the benefits of PBL nicely: “Since PBL starts with a problem to be solved, students working in a PBL environment must become skilled in problem solving, creative thinking, and critical thinking” (p. 1).

#### 2.3.6.1.5 CONCEPT MAPPING

Another framework that considers a specific method for student-centered mathematical learning is Romance and Vitale’s (1999) framework for concept mapping. Romance and Vitale (1999) “believe that any framework for student-centered instruction must also focus upon the conceptual structure of the discipline through a dynamic, interactive strategy for students” (p. 74). Their solution to this is through concept-mapping, focusing on the mastery of hierarchical understanding of the discipline of mathematics as a means of true understanding (Romance & Vitale, 1999). They believe that concept mapping is a way for students to express their conceptual understanding in either individual or group contexts in a way that allows the teacher a window into the thinking of the student (Romance & Vitale, 1999). They “view concept mapping and student centered instruction as highly interactive and complementary” (Romance & Vitale, 1999, p. 78).

### 2.3.6.2 Broader Application to STEM Education

As mathematics is a critical component in STEM education, the application to STEM education is both relevant and essential for understanding how student-centered approaches to mathematics are realized within STEM education broadly. Much of the literature regarding STEM education practices connects to these student-centered learning frameworks. For example, according to Mohr-Schroeder et al. (2018), one of the primary ways we are falling short in STEM education is in diversity and opportunity for minorities. To address these failings, they conclude that “...a strong need remains for learning environments to provide students with meaningful exposure and transformative opportunities in STEM, especially through a community approach” (Mohr-Schroeder et al., 2018, “Cohesive View” section). The focus on community and meaningful opportunities for learning is also central to each of the student-centered mathematics approaches already discussed (e.g., Lee & Hannafin, 2016; NAEYC, 2002; Slavich & Zimbardo, 2012).

### 2.3.6.3 Summary

In summary, student-centered learning approaches have several important commonalities. First, these frameworks emphasize the student’s ability to drive their own learning through guidance of a teacher who facilitates the learning process, and they shift the focus in the classroom to student needs and their understandings of the content that are developed through opportunities for autonomy and authentic engagement with mathematical tasks (Kyriacou, 1992; Lee & Hannafin, 2016; Mascalò, 2009; Meece, 2003; NAEYC, 2003; Slavich & Zimbardo, 2012). There is also a focus on collaboration and problem solving as important components of the frameworks (Lee & Hannafin, 2016;

McCombs & Whistler, 1997; NAEYC, 2002). The frameworks operate from a constructivist perspective, which emphasizes that knowledge is generated best in situations where students have experiences that challenge their perceptions of the world (Lee & Hannafin, 2016; Slavich & Zimbardo, 2012). Eronen and Kärnä (2018) summarize student-centered approaches well, saying that they “offer students opportunities to collaborate and cooperate as well as to self-guide in making decisions regarding their own processes” (p. 683). Student-centered teaching and learning is a balancing act for teachers, requiring them to give students autonomy and share power while also relinquishing power and rejecting traditional classroom hierarchies (Lee & Hannafin, 2016; McCombs & Whistler, 1997; Meece, 2003).

#### 2.3.6.4 Cautions and Limitations to Student-Centered Learning

One of the most commonly-cited challenges to student-centered learning approaches is that power and control has largely dominated mathematics education teaching styles, and it is a difficult shift for many teachers to make to relinquish control within their classroom and share power with their students (Felder & Brent, 1996; Lee & Hannafin, 2016; McCombs, 2001; Schettino, 2016). Even within student-centered teaching and learning research, sometimes the discussions regarding the teacher’s role emphasize that the teacher is still “in charge” in a way that not only contradicts much of the student-centered literature, but also the previously discussed sociopolitical and justice-oriented mathematics (see Felder & Brent, 1996 for an example). An additional challenge to implementing student-centered teaching and learning is the challenge in assessing student learning, with many traditional assessment methods inappropriate for

measuring understanding within the student-centered approach (Slavich & Zambrano, 2012; Stein, 2003).

Mascaló (2009) has proposed that “teacher-centered” and “learner-centered” mathematics is a false (and unhelpful) dichotomy, and instead proposes an alternative framework to strike a balance between the two. Mascaló (2009) points out that student-centered pedagogy can promote active engagement from students without active engagement by the teachers, “privilege individual experience over linguistically-mediated cultural knowledge in the development of higher-order knowledge” (p. 7) and confuse what the outcome of education is supposed to be. Mascaló (2009) believes that there is a more central role for teachers than what most student-centered approaches emphasize, which entails “organizing the structure, content and direction of a student’s learning” (p. 7-8). McCombs (2001) summarizes the need for a healthy role for the teacher, stating that “[w]hen power is shared by students and teachers, teaching methods become a means to an end rather than an end in themselves” (p. 185). Mascaló (2009) and McCombs (2001) want to avoid the extremes of too much focus on the student and not enough on the role and responsibility of the teacher and vice versa.

#### 2.3.6.5 Connection to TIPE

An important principle of learner-centered approaches to mathematics education is that “[r]elationships with adults and friends become increasingly important as adolescents learn new social roles” (Meece, 2003, p. 110). This is in line with the need outlined in TIPE for trauma-affected students to have healthy attachments with teachers to facilitate learning (Brunzell et al., 2016b). There are also many TIPE connections in the assumptions and key characteristics of a learner-centered model discussed in Meece

(2003) as quoted from McCombs and Whisler (1997). First, they emphasize the learner's "emotional states of mind" and nonacademic needs (McCombs and Whisler, 1997; Meece, 2003), which aligns with the TIPE framework's domain of increasing positive psychological resources (Brunzell et al., 2016). Second, positive environments are encouraged and positive interpersonal relationships (McCombs and Whisler, 1997; Meece, 2003), which connects with both the positive attachment and positive psychology domains of TIPE (Brunzell et al., 2016b). Lastly, both TIPE and McCombs and Whisler's (1997) framework for student-centered learning address that the learner may encounter negative thoughts that can be addressed (which TIPE calls increasing psychological resources) but they don't need to be 'fixed' (which aligns with TIPE's emphasis on unconditional positive regard) (Brunzell et al., 2016b). Student-centered approaches may facilitate the type of experience Brunzell et al. (2016b) call for in the TIPE framework that challenges students and gives the tools they need for success.

#### 2.3.6.6 Social Justice Mathematics, Student-Centered Learning, and TIPE

Social justice mathematics, student-centered learning, and TIPE all call into question traditional paradigms of teaching and learning, requiring teachers to reconsider everything starting with what they are teaching, why they are teaching it, and who benefits from this arrangement (e.g., Kokka, 2015; Panthi et al., 2018; Schettino, 2016). A consistent theme throughout the student-centered and social justice mathematics theoretical frameworks is an emphasis on equity, and it is reasonable to wonder how this connects to TIPE. After all, although the framework is designed with equity in mind, the framework does not specifically address connections to the equitable practices discussed in the social justice and student-centered mathematics frameworks. However, to address

inequitable disciplinary and educational outcomes, one must consider trauma. In their discussion on trauma-informed practices, Crosby et al. (2018) explicitly draw a connection to social justice and equity, “identify[ing] trauma-informed teaching as a viable solution to current inequities present in the field of education...[They] posit that trauma-informed teaching is, within itself, an act of social justice education” (p. 16). This argument by Crosby et al. (2018) is bolstered by the clear overlap between populations that have not been served by the educational system well, including trauma-affected students, racial/ethnic minority students, and students with identified (and unidentified) learning and emotional (dis)abilities. For example, American Indian/Alaska Native and Black or African American children are overrepresented in the child welfare system (Children’s Bureau, 2016). Children who are trauma-affected often have diagnosed learning (dis)abilities (sometimes incorrectly diagnosed) at high rates, and trauma symptomatology can mimic learning (dis)abilities (Cole et al., 2005). Children who are incarcerated overwhelmingly suffer from learning or emotional (dis)abilities (Coalition for Juvenile Justice, 2001). The overlap between students diagnosed with learning and emotional (dis)abilities, trauma-affected children, incarcerated children, and students from racial and ethnic minority groups strengthens the argument for the need to investigate further using education as a means of social justice for these groups.

As an example of inequitable outcomes for students who have been affected by trauma, a recent study of teens that found 44% of youth from Kentucky aging out of the foster care system (a subset of children who have experienced abuse or neglect) had been incarcerated at some point by age 17 (the national average for youth aging out of foster

care was 36%) (KIDS COUNT, 2018b). One must wonder how harsh discipline from zero-tolerance policies in schools combined with teachers and administrators who do not understand how trauma manifests might have contributed to these numbers. Without a consideration for TIPE practices, trauma-affected students may experience insurmountable barriers to their participation in quality social justice and student-centered mathematics (or any mathematics at all).

Understanding mathematics as a gatekeeper for future economic and educational success (Douglas & Atwell, 2017; Gutiérrez, 2013; Martin et al., 2010; NCSM & TODOS, 2016; Riley, 1997), it is imperative that any approach to mathematics education focuses on ways to bring about equitable outcomes for students. Jong et al. (2020) call for access to rigorous curricula involving student-centered approaches within culturally-relevant content as a means of improving STEM educational outcomes (which includes mathematics outcomes) for racial and ethnic minorities. However, without the tools they need to participate fully in these educational experiences, some students who have experienced trauma will “struggle with meeting the academic demands of the classroom due to socioemotional stressors and triggers that persistently hinder these executive functions” (Crosby et al., 2018, p. 19). The TIPE framework bridges that gap for students by giving them the tools they need to participate in these meaningful and rich mathematical experiences.

### 2.3.7 Mathematics and Positive Behavior and Identity

While Trauma-Informed Positive Education (TIPE; Brunzell et al., 2016) is a holistic trauma-informed model for schools and is not specific to the mathematics classroom, it connects to several principles that are discussed in the literature regarding



mathematics education, including mathematics and the development of positive behavior and identity. Drawing on these connections, what follows is a discussion regarding these two areas of mathematics education research and the connections to TIPE and the preschool-to-prison pipeline.

#### 2.3.7.1 Mathematics and Behavior

There are two main ways that researchers have considered behavior in the mathematics classroom: reducing disruptive behavior and promoting positive behavior. The literature on reducing disruptive behavior discusses general management strategies (Bruskewitz, 1998; Thompson & Webber, 2010), the use of response cards (Armendariz & Umbreit, 1999; Christle & Schuster, 2003; Lambert et al., 2006), interspersing brief problems to keep students on task (Skinner et al., 2002), token economies (Alter et al., 2008), and support of students with identified emotional and behavioral disorders (Hirsch et al., 2018; Hodge et al., 2006; Levendoski & Cartledge, 2000). The literature on positive behavior is mostly school-wide and not mathematics specific, and centers on School-Wide Positive Behavior Support (SWPBS) (Bradshaw et al., 2012; Swain-Bradway, 2011; Vincent & Tobin, 2010; Vincent et al., 2011), SWPBS and Response to Intervention (RTI) (Fairbanks et al., 2007), SWPBS and the check-in/check-out method (Filter et al., 2007), and SWPBS and Social-Emotional Learning (SEL) (Osher et al., 2014). Additionally, there are articles discussing mathematics-specific positive behavior support and interventions including increasing helping behavior (Bents & Fuchs, 1996; Boaler, 2008; Webb & Farivar, 1994), opportunities to respond and teacher praise (Partin et al., 2009), and increased engaged behavior (Mcintyre et al., 1983).

These studies generally found that interventions can help increase positive behavior and decrease negative behavior in mathematics classes (Alter et al., 2008; Hodge et al., 2006; Partin et al., 2009; Webb & Ferivar, 1994; Webb & Fraviar, 1999), though the extent to which these interventions help support “traditional” academic achievement for minorities is still largely unanswered (Webb & Ferivar, 1994). The teacher’s role in promoting positive behaviors was found to be impactful (Bentz & Fuchs, 1996; Webb & Gerivar, 1994). While there is literature discussing the promise of SWPBS to decrease negative behavior and increase positive behavior (e.g., Bentz & Fuchs, 1996; Thompson & Webber, 2010), there is not much discussion regarding how these programs influence the mathematics classroom specifically. Nor is there much in the literature that discusses culturally-aware SWPBS programs, which is surprising given the evidence that SWPBS does not always lead to equitable disciplinary outcomes (Vincent et al., 2011; Vincent & Tobin, 2011).

There are limitations to the study designs used. The biggest limitation was the lack of supporting empirical evidence for some of the choices made in the study designs. For example, one study on disruptive behavior included items that were questionably disruptive (e.g., sucking on fingers) that could be responses to sensory needs and do not disrupt the lesson (Lambert et al., 2006). There was no justification given for this choice of inclusion. Additionally, Lambert et al. (2006) gave teachers a script to follow to ensure consistency in responses, but this script involved the teacher giving all students the correct answer following just two incorrect student answers. This choice was not justified with empirical data or theory and seems counterproductive to rich mathematical classroom discussion. In another study, Levendoski and Cartledge (2000) defined

academic productivity within their study as “the number of math problems completed correctly” (p. 214). This fails to take into consideration that mathematics is largely about working through failure and making progress in understanding (Tanenbaum, 2016). Additionally, Levendoski and Cartledge (2000) admit that their choice of measure on engagement (whether the student was looking at their paper) was limited, as they had a student who appeared entirely engaged, but turned in a paper full of doodles with no mathematics work. Lastly, the Response to Intervention (RTI) strategy employed by Fairbanks et al., (2007) included a shame-based component, requiring students to announce their behavior scores to the class and linking class-wide rewards to single students’ behavioral achievement. There was no justification given for this choice, but the potential for shame for the student may outweigh positive behavior impacts that may occur due to the overall intervention and negatively impact student and teacher relationships, a central component in trauma-informed classroom practices (Brunzell et al., 2016b).

An additional limitation is that many of these studies took place in mathematics classrooms that were teacher-directed and used traditional mathematics teaching practices (e.g., Christle & Schuster, 2003; Lambert et al., 2006; Webb & Ferivar, 1994 ). This limits the generalizability of these methods in student-centered and nontraditional classrooms, like those that employ Complex Instruction. Additional limitations included teacher nomination of students for inclusion in the study (Lambert et al., 2006) which could be affected by teacher bias or negative attitudes toward students, teacher as experimenter (Levendoski & Cartledge, 2000) which raises ethical questions regarding students’ choice to opt out of participating, and the fact that students may have behaved

differently based on the research collection procedures (Bentz & Fuchs, 1996; Lambert et al., 2006). Multiple studies were very small in sample size (e.g., Armendariz & Umbreit, 1999; Filter et al., 2007; Lambert et al., 2006; Levendoski & Cartledge, 2000), and two case studies did not justify why they chose the only student included in their case study (Alter et al., 2008; Bruskewitz, 1998). Lastly, sometimes deficit language was employed (Bruskewitz, 1998; Hirsch et al., 2018), which is a hindrance to discussion regarding positive contributions that are made in mathematics classrooms when all students are engaged, especially those the school system has not historically served in an equitable manner.

Gaps in the literature include discussion about how SWPBS affects mathematics, how behavior interventions impact students' thinking and beliefs about mathematics, and qualitative studies that can give rich understanding of the attitudes and beliefs underlying the quantitative data.

#### 2.3.7.2 Mathematics and Identity

Research on mathematics identity includes study about mathematics identity in general (Bishop, 2011; Boaler, 2006; Cobb et al., 2009; Darragh, 2013; Darragh, 2014; Fellus, 2019; Heyd-Metzuyanim & Sfard, 2011; Miller & Wang, 2019; Radovic et al., 2018), connections between identity and equity (Cobb & Hodge, 2010; Esmonde, 2009; Hodge, 2006), how Complex Instruction relates to identity development (Boaler, 2008; Esmond, 2009; Oslund, 2016; Santora, 2007; Wood, 2013), the identity development of students who are able to “turn around” their academic performance and excel in mathematics (Horn, 2008), and culture's impact on identity development (Nasir et al., 2008). There are also studies that focus specifically on identity development of girls

(Froschl & Sprung, 2016; Kim et al., 2018; Nosik et al., 2002; Watt et al., 2012). The papers on mathematics identity of racial/ethnic minorities consider special programs (Kennedy & Smolinsky, 2016; Rodriguez et al., 2004), counter narratives and breaking free of stereotypes (Berry et al., 2011; McGee & Martin, 2011; Wilson, 2016), and connections to meaningful experiences outside of mathematics (Nasir & Hand, 2008).

Generally, interventions for mathematics identity increased positive identity (Boaler, 2006; Darragh, 2013; Kennedy & Smolinsky, 2016). Many of the studies were concerned with how mathematics identity is formed (e.g., Berry et al., 2011; Cobb & Hodge, 2009; Betty et al., 2011), and some were concerned with what effects classroom practices have on identity (e.g., Nosik et al., 2002). Betty et al. (2011) found that traditionally-held (false) beliefs about mathematics, like students who are fast at computational problems are better at mathematics, were integral in the development of student identity. Factors outside of the classroom, especially parents and culture, were important to identity development (Betty et al., 2011; Darragh, 2015; Froschl & Sprung, 2016; Nasir et al., 2008; Wilson, 2016;), but teachers played a role in how students' mathematics identity was formed (Berry et al., 2011; Bishop, 2012; Cobb & Hodge, 2009; Heyd-Metzuyanim & Sfard, 2012; Horn, 2008; Narie & Hand, 2008; Wood, 2013), as they set the context for learning within their classroom. Stereotypes were often discussed as hindrances to positive mathematics identity formation, though studies have highlighted students who have used negative stereotypes as a motivator for success in mathematics (Berry et al., 2011; McGee & Martin, 2011; Miller & Wang, 2019; Nosek et al., 2002; Webb & Fraivar, 1999; Wilson, 2016;). In the broader context of STEM education, the discussion on STEM identity development of women (Kim et al., 2018)

largely resembles the discussion on mathematics identity, with the same considerations for the broader culture and the classroom context within which learning occurs.

Additionally, Complex Instruction (a pedagogical approach that focuses on creating equitable classrooms and is linked with reform and student-centered mathematics) impacts the identity development of both students and teachers, as well as academic outcomes (Boaler, 2006; Boaler, 2008; Esmond, 2009; Horn, 2008; Nasir et al., 2008; Oslund, 2016).

There were several literature reviews and meta-analyses of identity development (e.g., Cobb & Hodge, 2010; Kim et al., 2018; Nasir et al., 2008; Radovic et al., 2018), and they highlight the fact that identity is not easily defined and has been measured in many ways, including motivation, self-esteem, competency, participation, belonging, and interest. In addition, these meta-analyses point to the difficulty in coherently summarizing findings from the extant literature, as identity is sometimes considered as something you do and sometimes something you are (Darragh, 2015). This complicates the discussion on identity, and limits the ability to make concrete statements about “identity” largely, instead limiting us to discussing the value of certain types of interventions for certain types of identity definitions and measures.

There are some limitations to the methods and settings used in the included empirical studies. Some of the studies took place in settings outside of the mathematics classrooms (Briskewitz, 1998; Kennedy & Smolinsky; Rodriguez et al., 2004).

Rodriguez et al. (2004) found that students in their study of a highly selective summer program enjoyed the program, but generally said negative things about their home schools. These students “did not believe the same opportunities for learning and

development existed in their home schools as they had experienced during the summer program” (Rodriguez et al., 2004, p. 52). This points to the possibility that, while summer programs and extracurricular mathematics activities are beneficial for student mathematics identity development, the research may not translate easily into many classrooms.

Many of the limitations of the empirical studies are likely present because of the choice of qualitative methods, as qualitative data is expensive and time-consuming to gather and analyze (Bogdan & Biklen, 1997). One such limitation is the small sample sizes of some of the studies (Bishop, 2011; Darragh, 2014; Oslund, 2016; Wilson, 2016). Another is that there is often larger context missing from the data since the focus might be on one interaction (Bishop, 2011), one class period (Heyd-Metzuyanim & Sfard, 2011), or one specialized school (Nasir & Hand, 2008). As with much qualitative research, the findings cannot easily be generalized to broader contexts (Miller & Wang, 2019).

One of the major gaps in the literature is that only one of the studies discussed intentionally engaging students in the art and beauty of mathematics (Kennedy & Smolinsky, 2016). Mathematics involves creativity, and many of the studies consider how the students’ identities are formed when engaging in mathematics that is focused on the “science” and logic of mathematics with no creativity required (e.g., Cobb et al., 2009; Miller & Wang, 2019). This is worrying as “creative problem-solving tasks themselves may elicit Black students’ active engagement, which prevents negative interactions that culminate in disciplinary referrals” (Gregory et al., 2016, p. 186). Another gap in the literature is that much of the meaningful data regarding mathematics

identity for ethnic minority students seems to occur in settings outside of the mathematics classroom (Berry et al., 2011; Kennedy & Smolinsky, 2016; Rodriguez et al., 2004) or in a unique school environment (Nasir & Hand, 2008). As stated previously, there is also a dearth of quantitative research regarding mathematics identity. And although the teacher's role in student identity development has been discussed (e.g., Berry et al., 2011; Wood, 2013), none of the studies interviewed teachers on their perspectives on student identity development. However, one of the studies discussed the development of teacher identity within the context of a Complex Instruction professional development (Oslund, 2016). The impact that the Complex Instruction training had on the teachers interviewed and their professional identities could be an interesting starting point for a connection between how teacher identity is developed in the process of using this approach and how this approach may impact student identity.

#### 2.3.7.3 Connections to Trauma-Informed Education and the Preschool-to-Prison Pipeline

Much of the discussion surrounding trauma-informed classrooms concerns school-wide implementation of trauma-informed practices (Cavanaugh, 2016; Cole et al., 2016; Crosby et al., 2018; NCTSN, 2017), and there is a gap in understanding how this manifests in mathematics settings particularly. Yet, as can be seen from the above review of the literature, there is a wealth of information regarding promoting positive behavior in mathematics and positive mathematics identity. Much of the literature regarding these two concepts is linked to important components of Trauma-Informed Positive Education (TIPE; Brunswell et al., 2016), including the need for positive relationships in the mathematics classroom (Berry et al., 2011; Kennedy & Smolinsky, 2016; Nasir & Hand,



2008; Webb & Ferivar, 1994), the use of self-regulation techniques (Hirsch et al., 2018), and the use of growth mindset to develop positive psychological resources for students (Froschl & Sprung, 2016). Additionally, connections to the preschool-to-prison pipeline were also evident in the discussion about how traditional power and control techniques in schools impact mathematics identity (Nasir et al., 2008), as well as the obvious connection between challenging behavior and exclusionary discipline. With the known impact of trauma on learning and behavior, including the connection between trauma and maladaptive behavior in adults within the prison population (Cuadra et al., 2014; Fox et al., 2015; NSCH, 2018; Pickens & Tschopp, 2017), there is a need for a discussion regarding how trauma-informed practices might disrupt the preschool-to-prison pipeline. And while there is a need for discussion on holistic models of care within schools, this study seeks to close the gap between what is known about math-specific interventions for behavior and identity (as discussed here) and trauma-informed practices. With these connections (as well as connections to social justice mathematics, student-centered learning methods, and teacher bias) as a backdrop, what follows is a draft design for the current study.

### 3 METHODOLOGY

The need for considering how to disrupt the preschool-to-prison pipeline is urgent, as the data show an increase in the number of children being funneled through the justice system for behaviors exhibited in schools (Wald, 2012). Children who have experienced trauma often display behaviors in the classroom that are challenging for teachers, as defiance, aggression, withdrawal, and perfectionism are all common for students who have experienced trauma (Cole et al., 2005). Add to this the facts that youth who drop out of school are three and a half times more likely to be arrested than students who graduated, and eighty-two percent of adults in the criminal justice system dropped out of high school (Coalition for Juvenile Justice, 2001), and we see that it is critical to consider how to keep children who have been through trauma in school learning the skills they need to face the world. Without the proper understanding of trauma symptomology, “school staff may misunderstand trauma-related behavioral reactions as oppositional or defiant behavior, inadvertently use discipline strategies that can serve as triggers for traumatized students, and miss opportunities to support social, emotional, and academic growth” (Chafouleas et al., 2016, p. 154). It is the moral and ethical responsibility of educators to consider how they can work toward disrupting this pipeline. Mathematics educators have a special role in this endeavor, as mathematics can assist in improving communication skills, promote problem-solving and critical thinking, facilitate teaching empathy, and empower disempowered students, which are all important considerations when trying to reduce the potential for maladaptive and criminal behavior (Brown-Jeffy & Cooper, 2011; Cole et al., 2005; Cuadra et al., 2014; Gay,

2002; Wachira & Mburu, 2019). To this end, the following research questions guided the research into the potential for TIPE to disrupt the preschool-to-prison pipeline:

- 1) Research Question 1: How do secondary mathematics teachers believe they should respond to challenging student behaviors, with an emphasis on those that are typical for trauma-affected students, within the school setting?
  - a) What links do teachers draw between these behaviors and the likelihood that a student will end up in the criminal justice system?
  - b) How do teacher perceptions of challenging behavior change when they know it is a potential symptom of trauma?
- 2) Research Question 2: What do mathematics teachers believe about the ability of mathematics education to make a difference for students who present with maladaptive behaviors?
  - a) How does their perception of their ability to impact the student's behaviors change when they know that the child has experienced trauma?
  - b) How does negative behavior change their perception of the student's future success?
- 3) Research Question 3: What are secondary mathematics teachers' perceptions of trauma-informed positive education practices, and to what extent do they already use them in their classrooms?
  - a) How do mathematics teachers' perceptions of trauma-informed practices differ from those of teachers of other subjects, if at all?

### 3.1 Methods

This study used a phenomenological mixed-methods design with interviews and a quantitative measure of teacher perceptions of trauma-informed practices (ARTIC scale; Baker et al., 2016) to understand teacher perceptions of trauma-typical behavior and their ability to mitigate delinquent behavior, as well as teacher perceptions of the effectiveness of TIPE practices. This study also used the ARTIC scale to better understand the perceptions of mathematics teachers on key areas within trauma-informed education.

This study used a quantitative survey (ARTIC scale, Baker et al., 2016) and one-on-one phenomenological semi-structured teacher interviews to better understand the perspectives of mathematics teachers on the potential of trauma-informed positive education to disrupt the preschool-to-prison pipeline. There is a gap in the literature between the theory of trauma-informed education (Cavanaugh, 2016; Cole et al., 2016; Crosby et al., 2018; NCTSN, 2017) and the correlations between trauma's impact on learning and adult maladaptive behavior (Cuadra et al., 2014; Fox et al., 2015; NSCH, 2018; Pickens & Tschopp, 2017). And while there are some discussing the potential connection between trauma-informed practices, social justice, and the pipeline (e.g., Crosby et al., 2018), empirical studies are needed to better understand these connections. And while there is empirical research in the areas of positive mathematics behavior (for examples, see Bruskewitz, 1998; Hirsch et al., 2018; Lambert et al., 2006; McIntyre et al., 1983; Skinner et al., 2002) and identity (for examples, see Berry et al., 2011; Miller & Wang, 2019; Nasir et al., 2008; Radovic et al., 2018), there is a gap between math-specific interventions and trauma-informed practices. Finally, though there are studies regarding teacher bias and challenging student behavior (e.g., Abidin & Robinson, 2002;

Kozlowski, 2014; Westling, 2010) and studies done on discipline gaps among various stratified groups (e.g., Kokkinos et al., 2005; Scott et al., 2019; Zimmerman, 2018) there is limited empirical research that links these disparities to teacher bias. Teacher perspectives regarding childhood trauma are also limited (Alisic, 2012). This study was designed to begin to bridge these gaps with empirical data.

A mixed-methods approach was chosen because of the inability of the quantitative approach on its own to describe the experiences of individuals within the study, and because of the foundation of qualitative methods in challenging inequality and power structures, as well as the ability to give a voice to those who are seldom heard (Bogdan & Biklen, 1997; Cannella & Lincoln, 2011). Specifically, the ARTIC scale is a good measure of attitudes toward trauma (Baker et al., 2016; Parker et al., 2019). However, the “ARTIC is not only self-report, but is primarily a measure of attitudes (as opposed to behaviors). This puts any resulting scores at some remove from the real-world activities of educators and the educational environments they construct” (Parker et al., 2019, p. 223). The interviews gave insight into the perspectives of these teachers and how their experiences and behaviors have shaped their perspectives (Creswell, 2012).

The semi-structured interview design was chosen because it limits interviewer bias, but still allows for flexibility (Qu & Dumay, 2011). Data from semi-structured interviews are also easier to analyze than data from unstructured interviews because participants generally answer the same questions (Zhang & Wildemuth, 2009). One-on-one interviews were chosen due to the sensitive nature of the topics (Qu & Dumay, 2011). Interviews took place via videoconferencing because of the geographic dispersion of the participants (Creswell, 2012; Nehls et al., 2015; Sullivan, 2012) and the ongoing

global Covid-19 crisis that inhibits in-person interviewing. Interviewees chose the time and setting for these interviews, which allowed them to ensure they were comfortable and that their opinions were not overheard by someone who could threaten their ability to speak freely (Elmir et al., 2011).

The phenomenological approach was chosen because of the focus on the lived experiences of the participants (Bogdan & Biklen, 2007; Giorgi, 1997; Moustakas, 1994; Van Manen, 2016) and the focus on the gap between the theoretical and the practical in educational settings (Friesen et al., 2012). Phenomenological study has been used on the topic of mathematics and identity (e.g., Berry et al., 2011), and has likely influenced many of the studies on mathematics and positive behavior and identity, though they do not explicitly state the interview approach used (e.g., Cobb & Hodge, 2009; Rodriguez et al., 2004; Santora, 2007).

While there is freedom in how phenomenological studies are carried out (Bevan, 2014), the literature is clear that most phenomenologists believe in-depth, open-ended interviews are appropriate (Cypress, 2017; Moustakas, 1994; Seidman, 1991). Seidman (1991) structures in-depth phenomenological interviews as a series of three interviews: “focused life history”, “details of experience”, and “reflection on the meaning” (p. 17-18). This study structured interviews in this way, though did not adhere to Seidman’s (1991) rigid structure requiring three interviews that are 90 min each. As with any dissertation study, there are limitations to the resources available to conduct the study and there are time constraints that prohibit certain study designs (Bogdan & Biklen, 1997; Seidman, 1991). Instead, this study used the three-interview design, but had shorter context and visioning sessions to highlight the teachers’ lived classroom experiences that

inform their perspectives (see Appendix A for the interview protocol). The first two participants were notified that they were assisting in piloting the interviews to determine timing to ensure that teacher time was respected and that informed consent was accurate regarding the time commitments of the study (Seidman, 1991; Walsh, 2005). Their responses also helped shift the arrangement of the interview questions to help with the flow of the interview, though the semi-structured approach was retained throughout and not all teachers were asked the same questions in the same order based on their responses. This flexible design is a helpful feature of semi-structured interviews discussed by Smith and Osborn (2003)—as long as the questions are not wildly different, the teachers’ perceptions guide the interviews in this less rigid approach. The aim was to gain an understanding of the lived experiences of teachers (Moustakas, 1994) that would give insight into the potential (or lack thereof) of trauma-informed practices to disrupt the pipeline.

Teachers were contacted directly by the researcher or by faculty within the department who were supportive of this research project who knew teachers who “have the experience that I am looking for” (Englander, 2012, p. 17), which Englander (2012) says should drive the choice of participant in a phenomenological study. The direct contact was designed to avoid going through a gatekeeper, as there are ethical concerns with gatekeeper hostility, coercion, or trying to steer research in a particular direction (Bogdan & Biklen, 1997; Seidman, 1991; Walsh, 2005). This is particularly important, as the topic of the research is sensitive and powerful gatekeepers can pose a threat to sensitive research because they may not want their organization or community to be exposed to criticism (Lee & Renzetti, 1990).

### 3.1.1 Participants

The demographic for this study was secondary (grades 8-12) teachers who were currently teaching at a public school in a Kentucky school district with a trauma-informed care plan (see Appendix B for a description of these school districts). These districts were chosen because they already had programs in place for trauma-informed education, had a range of rates of minority enrollment (to compare the responses of teachers who have interacted with different numbers of students who are traditionally disciplined at disproportionate rates). These school districts were chosen because they had a stated commitment to having trauma-informed schools and had programs in place to implement these. Some districts that fit these criteria were not chosen for inclusion in the email list generated for solicitation (though teachers from these districts were still eligible to participate in the study should they learn about it elsewhere) because they did not have publicly available contact information, or the information given did not make it feasible to distinguish which teachers taught mathematics.

Kentucky was chosen for this study because the Kentucky state legislature passed the School Safety and Resiliency Act of 2019 requiring all schools to implement plans for a trauma-informed approach to education. The statute requires all Kentucky schools to have a plan in place by July 2021 for

- (a) Enhancing trauma awareness throughout the school community;
- (b) Conducting an assessment of the school climate, including but not limited to inclusiveness and respect for diversity;
- (c) Developing trauma-informed discipline policies;
- (d) Collaborating with the Department of Kentucky State Police, the local sheriff, and the chief of police to create procedures for notification of student-involved trauma;



and (e) Providing services and programs designed to reduce the negative impact of trauma, support critical learning, and foster a positive and safe school environment for every student. (School Safety and Resiliency Act, 2019, p. 3)

This statute requiring schools in Kentucky to plan for trauma-informed educational approaches makes Kentucky teachers' perspectives and descriptive data on trauma-informed practices relevant and timely. And Chafouleas et al. (2016) state the importance of teachers within trauma-informed educational approaches, saying:

[A]pproaches to trauma requires an educational workforce that is knowledgeable about trauma and its impact on development, and can employ skills and strategies that prevent, reduce, and ameliorate its effect on children. Without such knowledge and training, school personnel may not identify or understand the connection between a child's presentation, behaviors, and symptoms and exposure to trauma. (p. 154)

Teacher perceptions regarding trauma-typical behavior and discipline within the classroom assisted in understanding current teacher knowledge (or lack of knowledge) of trauma symptomology and will put into view gaps within their understanding.

Data were collected from secondary (8-12) mathematics teachers. All teachers were recruited from school districts in the state of Kentucky with trauma-informed care practices. One challenge that may have impacted the data collection was that there have been events within the last six months in a city that houses one of these school districts which could be traumatic for the participants, as well as a national climate that might make conversations regarding the justice system and trauma sensitive for interviewees (Lee & Renzetti, 1990). Care was taken to be sensitive to these issues and to give

participants freedom to discuss their feelings regarding these events when they came up during the interviews. Lastly, to mitigate potential harm to the researcher, time spent each day interviewing and analyzing was restricted and any distress discussed with support personnel (Newman & Risch, 2006).

Surveys were solicited through publically available email addresses on the school or district website. In all, emails were sent to over nine hundred potential participants whose information indicated they might be a current mathematics teacher in a secondary classroom (N=916). Some emails were unknowingly sent to teachers who were not currently mathematics teachers (a few responded that they were no longer teaching mathematics), since several of the school websites were not up to date (in sending 916 emails, only 27 bounced as undeliverable, indicating that most of the teachers contacted at least still worked within the district). In total, there were 886 teachers who received a series of three emails soliciting participation in the survey. There were 83 teachers who started the survey, and three of those were ineligible because they were not currently teaching a secondary mathematics course. In all, 68 teachers completed the survey.

Semi-structured interviews were conducted with secondary (8-12) mathematics teachers (N=7) within districts in Kentucky with trauma-informed care plans, though there were 16 total survey participants who indicated interest and who were invited to participate through a series of three emails. Teachers qualified for inclusion in the interviews for the study if they teach at least one mathematics course in one of the districts identified for inclusion in the study and completed the ARTIC scale measure for this study (N=68). Demographic information was collected on how long they have been teaching, student demographic information, types of courses taught, and school

information (rural, urban, suburban; number of students; presence of a school resource officer; special school type, like magnet, traditional, alternative) in order to consider patterns in the data by demographic. However, none of the demographic data listed were disqualifying for participation in the study.

Interview participant information is given in Table 3.1. “Personal” Prison Connection indicates whether the teacher discussed having someone they knew who had been in prison at some point. “Personal” Trauma Connection indicates whether the teacher mentioned either personally experiencing trauma or having a close connection to someone who had experienced trauma. Work Experience Outside of Education indicates whether the participant discussed previously being employed in a different field before becoming a teacher. Gender and age were self-selected by participants as part of the survey data collection. Other important information about these participants includes that Angela is a former mathematics teacher who is now a special education teacher who co-teaches mathematics courses. She qualified for participation since she is currently teaching a mathematics course. Additionally, Carrie was an administrator at one point in her career, which influences her thoughts on behavior and interventions.

**Table 3.1—Interview Participant Information**

	Dan	Debbie	Carrie	Lindsay	Angela	Alice	Corey
Male/Female	Male	Female	Female	Female	Female	Female	Male
Age Range	35-44	55+	35-44	25-34	35-44	25-34	25-34
“Personal” Prison Connection	Yes	Yes	No	Yes	Yes	Yes	No
“Personal” Trauma Connection	Yes	No	Yes	Yes	Yes	No	No
Work Experience Outside of Education	Yes	Yes	No	No	No	No	No
Alternative School	No	Yes	No	No	No	No	Yes
Grades Taught	9-12	8-12	9-12	8	8	9-12	8-12

### 3.1.2 Data

Mixed methods research can be used to “broaden understanding by incorporating both qualitative and quantitative research, or to use one approach to better understand, explain, or build on the results from the other approach” (Creswell, 2009, p. 205). Education is a complex field and mixed methods educational research helps to “capture the complexity of educational phenomenon” (Ponce & Pagán-Maldonado, 2015, p. 112). As this study is rooted in phenomenology and focused on the lived experiences of the participants, the mixed methods phenomenological research (MMPR) Phen-Quan approach described by Mayoh and Onwuegbuzie (2014, 2015) fits the purposes of the study and “allow[s] for a multi-layered analysis in order to present a clearer picture of the phenomenon of interest” (Mayoh & Onwuegbuzie, 2014, p. 21) and can “help improve the utility and generalizability of [the] phenomenological findings” (Mayoh & Onwuegbuzie, 2014, p. 16). This approach gives preference to the phenomenological qualitative data collection and analysis, using the quantitative data and analysis as secondary support.

This study used the concurrent transformative strategy (Creswell, 2009), which involves concurrent collection of data, an embedded approach to mixing the data, and is grounded in theory. This embedded approach is used when researchers need to “include qualitative or quantitative data to answer a research question within a largely quantitative or qualitative study” (Creswell & Clark, 2017, p. 68). As discussed, the greater weight was given to the qualitative data and analysis, with the quantitative data embedded into the study to provide additional information about the perspectives of mathematics teachers, namely how they think about trauma-informed care and how these perceptions may be different from the perspective of others who teach different content. As Creswell

(2009) recommends a visual model of the research design to be included in any mixed methods research proposal, a visual model is included in Figure 3.1.

This approach was appropriate for this study because “...the concurrent transformative approach is guided by the researcher’s use of a specific theoretical perspective as well as the

concurrent collection of both quantitative and qualitative data”

(Creswell, 2009, p. 215). In this study, there were three frameworks that drove the creation of the research questions and development

of the study: phenomenology (the methodological approach; e.g.,

Mayoh & Onwuegbuzie, 2014; Smith &

Osborn, 2003), Maslow’s Hierarchy of Needs (theoretical framework; Maslow, 1943,

1970, 1971), and Trauma-Informed Positive Education (conceptual framework; Brunzell

et al., 2016b). As this study is focused on strategies regarding major social justice

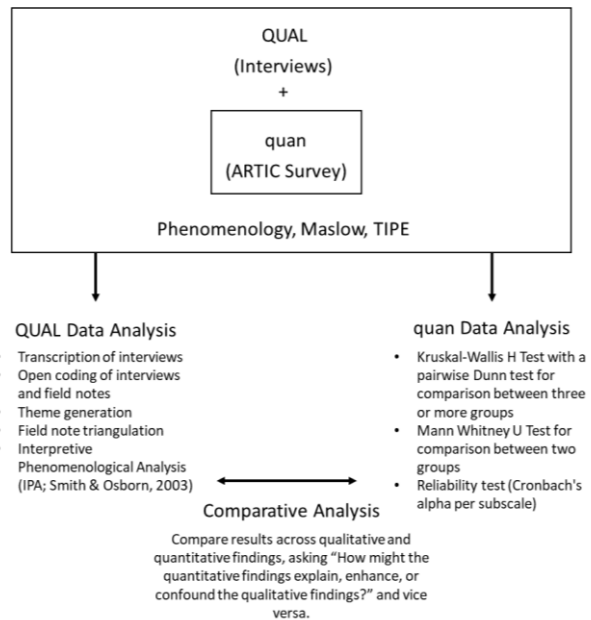
concerns (trauma and the preschool-to-prison pipeline), the theoretical considerations led

to transformational methods, which are the central focus of the concurrent transformative

approach. Although Creswell (2009) does not define “transformative” methods, a

definition of “transformational methods” given by Finley (2008) fits the discussion by

Creswell:



**Figure 3.1 Mixed Methods Approach**

Transformational methods are used to inspire positive social change. Researchers generally adopt transformational methodologies in their pursuit of social justice, socioeconomic or cultural equity, empowerment of marginalized individuals, or actions taken in a process of exposing and resisting hegemonic power structures. The ends of transformational research are not only taken as modes of restorative justice, but are also futuristic, formed in existentialist hope that the world we currently live in could be improved by breaking down power structures that result in oppression. (p. 887).

The goal of this study was to discover if trauma-informed positive education has the ability to assist in disrupting the preschool-to-prison pipeline. And the questions asked and methods of analysis were designed to discover how the lived experiences of mathematics teachers may speak into the existing power structures and (dis)empowerment of trauma-affected students. This further bolsters the argument for using the concurrent transformative approach, as Creswell (2009) states:

In a transformative study, the structure typically involves advancing the advocacy issue in the beginning and then using either the sequential or concurrent structure as a means of organizing the content. In the end, a separate section may advance an agenda for change or reform that has developed as a result of the research. (p. 220)

The central role in transformative studies of the agenda for change or reform combined with the urgency and necessity of the topics discussed in this study lent themselves to this research strategy.

Quantitative data were collected through the use of the Attitudes Related to Trauma-Informed Care (ARTIC) scale. The ARTIC scale was given to secondary mathematics teachers (N=68), while teacher interviews (N=7) were used to “supplement, validate, explain, illuminate, or reinterpret [the] quantitative data” (Bogdan & Biklen, 1997, p. 41). As Parker et al. (2019) point out, the ARTIC scale is helpful to measure attitudes, but cannot provide context. Interviews were chosen for this study because of their potential to assist in “understanding the lived experience of other people and the meaning they make of that experience” (Seidman, 2006, p. 9). Teacher perspectives on trauma and the preschool-to-prison pipeline are important to understand because “[s]ocial abstractions...are best understood through the experiences of the individuals whose work and lives are the stuff upon which the abstractions are built” (Seidman, 2006, p. 10). Teachers are the people implementing trauma-informed classroom practices in the classroom, so their experiences in utilizing these practices are vital to understanding how the TIPE framework works in practice and what teachers think of the suggested practices within the framework based on their own experiences. Since there is not a lot of data regarding teacher perception of the TIPE model (or any proposed trauma-informed education framework), the intent of study was to gain preliminary data that might inform future interventions within schools to train teachers in TIPE, as well as to understand the potential of the TIPE model to assist in disrupting the preschool-to-prison pipeline.

Interviews give us “a particular rendering or interpretation of reality grounded in the empirical world...that is useful in understanding the human condition,” (Bogdan & Biklen, 2007, p. 25). To this end, semi-structured interviews were conducted and teachers were asked questions regarding challenging classroom behavior, which

behaviors they believe warrant administrator-level discipline, what they believe about the inevitability of students ending up in the criminal justice system, their use of TIPE practices within their classrooms, and their perspectives on the effectiveness of those TIPE practices to mitigate maladaptive behaviors in the classroom (see Appendix A for the interview protocol).

Onwuegbuzie and Leech (2006) point out that not only do researchers need to discuss why a study is necessary, but also need to identify “the rationale for mixing quantitative and qualitative approaches” (p. 479). Further, discussing the research methods explicitly, especially in a mixed methods design, lends credibility and enhances validity of the study (Mayoh & Onwuegbuzie, 2014). Thus, what follows is a discussion on how the quantitative and qualitative approaches help to answer the research questions and how to protect the validity and reliability of each method.

#### 3.1.2.1 Qualitative Validity and Reliability

The definitions of reliability and validity within qualitative research are still debated, though there is some consensus among qualitative researchers on the issue of ensuring that the data collected meets rigorous scientific standards (Bogdan & Biklen, 2007; Brink, 1993; Cypress, 2017). Brink (1993) points out that “[m]any qualitative researchers avoid the terms validity and reliability and use terms such as credibility, trustworthiness, truth, value, applicability, consistency and confirmability, when referring to criteria for evaluating the scientific merit of qualitative research” (p. 35). And the meaning of the terms differ from that of quantitative studies, with qualitative researchers concerned with the accuracy and comprehensiveness of their data. Qualitative researchers tend to view reliability as a fit between what they record as data and



what actually occurs in the setting under study, rather than the literal consistency across different observations. (Bogdan & Biklen, 2007, p. 40)

To the qualitative researcher, validity refers to the accuracy of the data in measuring what it was intended to measure and reliability refers to the care that is taken in the process of collecting and analyzing the data accurately (Brink, 1993; Cypress, 2017). Strategies for ensuring validity and reliability must be employed throughout the entirety of the research process and not merely at the end (Brink, 1993; Cypress, 2017).

Perhaps validity and reliability in qualitative research can be better understood through the threats to validity and reliability throughout the research process. Brink (1993) identifies four main threats to reliability and validity: (1) the researcher, (2) the participants, (3) the context within which the research is conducted, and (4) the research methods employed. Each of these threats can be mitigated through the use of careful and intentional research practices. Below is an outline of how this study worked to ensure validity and reliability in the qualitative components of the study by discussing the protections against risk in each of the four categories suggested by Brink (1993).

#### 3.1.2.2 Researcher

Brink (1993) suggests building trust, undergoing extensive training in interviewing and qualitative methods, and examining personal values and assumptions in order to reduce researcher error. According to Cypress (2017),

[r]esearcher bias tends to result from selective observation and selective recording of information and from allowing one's personal views and perspectives to affect how data are interpreted and how the research is conducted. Therefore, it is very

important that the researchers are aware of their own perceptions and opinions because they may taint their research findings and conclusions. (p. 259)

Bogdan & Biklen (2007) also assert that reducing the bias of the researcher is a key to qualitative research, though they acknowledge that it is impossible to completely remove the researcher's experiences and attitudes from their research. Instead, they believe "[t]he goal is to become more reflective and conscious of how who you are may shape and enrich what you do, not to eliminate it" (Bogdan & Biklen, 2007, p. 38). With this in mind, the perspectives and experiences of the researcher as a former teacher were considered at every stage of the research in an attempt to minimize the impact of the researcher's own opinions and biases (Bogdan & Biklen, 2007; Brink, 1993; Cypress, 2017; Seidman, 2006). The researcher committed to reflexivity, which is a commitment to "actively engage in critical self-reflection about their potential biases and predispositions that they bring to the qualitative study" (Cypress, 2017, p. 259). The findings were sent to the interview participants prior to dissemination to give them a chance to determine whether their perspectives have been accurately represented (Walsh, 2005).

Additionally, the researcher has undergone doctoral-level training in qualitative research methods and has participated in the collection and analysis of data on a team of professional educational researchers, reducing the risk of error and enhancing validity and reliability for this proposed study (Brink, 1993; Cypress, 2017). And to work toward trust with participants to reduce error introduced from the researcher, solicitation of interviews also occurred through the recommendation of a professor in the college of

education who know the participants and can lend credibility to the researcher (Brink, 1993).

### 3.1.2.3 Participants

Included in the list of ways Brink (1993) gives to reduce the participant risk to reliability and validity are “making sure the informants are very clear on the nature of the research [e.g.,] why the researcher is there, what [s]he is studying, how [s]he will collect data, and what [s]he will do with it” (p. 36), confirming findings with informants, keeping detailed field notes, and making sure the informant is comfortable. To this end, validity and reliability of the results were enhanced through the use of an informed consent form that contained relevant information about the study, the writing of notes during and after each interview that were analyzed as field notes, the participants having the option of time and place for their digital interview for comfort, and the interview transcript being sent back to the participant to make sure they believed their words are accurately represented (Brink, 1993). Brink (1993) also suggests reducing the risk to validity and reliability pertaining to research methods by ensuring that you use “low inference descriptors” (p. 37) when discussing findings by quoting participants directly when possible and having the participant review the findings. Every effort was made to portray the participants’ perceptions as accurately as possible, with limited edits for clarity and to take out repetitive phrases for brevity. Field notes were referenced to begin the coding process, as themes emerged from these prior to interview coding. However, the initial codes from the field notes were not given preferential treatment in the coding process, as researcher bias may play a role in which topics stood out in the interviews. Instead, the initial assumptions from the field notes were compared to the interview data

after coding and some of the themes transformed over this process. For example, while relationships stood out from the field notes, there was much more nuance about this conversation that came out during coding the interviews (e.g., teacher-student relationship and student-peer relationships), which informed the discussion of this topic. Had the field notes been considered as of primary importance, the nuance from the discussions would have been missed. Notes were taken regarding what the teachers said, how they behaved (e.g., distractions), and the researcher's own questions or thoughts that came up during the interview to be able to revisit those thoughts and evaluate them during analysis for bias.

#### 3.1.2.4 Research Context

Brink (1993) also says that “the social context under which the data are gathered is an important consideration in establishing validity and reliability of data” (p. 36). Brink (1993) believes that specifying the context within which the data were collected is important, and that privacy should be considered when determining the location of an interview. Along the same lines, Cypress (2017) stated:

The understanding of the phenomenon is valid if the participants are given the opportunity to speak freely according to their own knowledge structures and perceptions. Validity is therefore achieved when using the method of open-ended, unstructured interviews with strategically chosen participants. (p. 261)

To mitigate these potential risks to validity and reliability within the situational context the interview took place, teachers were asked to choose a time and place for the interview that allowed them to speak freely about their experiences within their classroom. To limit researcher bias, instead of unstructured interviews, semi-structured

interviews were conducted. The virtual interviews were all either in the teacher's classroom at school or in their own home. Notes were taken regarding the potential threat to reliability and validity, for example, if the teacher was near a student or colleague at the time of the interview. These interruptions were limited, and teachers paused the conversation until the student or colleague exited the room or the phone call ended.

#### 3.1.2.5 Methods for Data Collection and Analysis

According to Cypress (2017), for qualitative studies, "the validity of the findings is related to the careful recording and continual verification of the data that the researcher undertakes during the investigative practice" (Cypress, 2017, p. 259). It is important to be mindful of the processes through which the researcher collects and analyzes data, and Brink (1993) states that being detailed in describing the data collection process is a necessary component of the process. Brink (1993) suggests keeping field notes to document observations, taking care in sample selection, and using memos during the coding process. Of the qualitative research sampling process, Brink (1993) says sampling is

based on the ability of the subject to provide data relevant to the research question.

To avoid inaccurate or insufficient data, the researcher must use his/her judgement based upon the best available evidence to choose subjects who know enough, can recall enough, and are able to respond precisely to questions asked. (Brink, 1993, p. 37)

Brink (1993) discusses the use of what is often called "thick description," which he defines as a "very detailed account of the context or setting within which the study

took place and a thorough description of the procedures from the beginning to the end” (p. 38). Using thick descriptions, researchers can enhance reliability and validity (Brink, 1993; Cypress 2017). This means including information regarding the personal interest of the researcher in the matter being studied, the purposes of the study, how the data were collected, how the data were analyzed, descriptions of the settings within which the interviews took place, and the nature of field notes taken (Brink, 1993).

To ensure reliability and validity of the data, the researcher provides a thick description of the research methods here (and throughout the Methods chapter), and kept careful field notes during the interview process. Field notes were taken regarding interesting or repeated points made by the participants, thoughts or questions that the researcher had during the interviews, and interruptions or distractions that were noteworthy. Pilot interviews were conducted with the first two interview participants to ensure the questions made sense to the participants and that the data collected were appropriate for answering the stated research questions. Interview questions were understood by participants in the pilot interview, the data collected were appropriate, and the order of questions was revised based on the pilot interviews. Since these interviews resulted in rich and appropriate data and no major changes were taken in subsequent interviews, the pilot interviews are included in the seven for analysis. The researcher also intentionally chose participants through purposive sampling for the survey based on the potential to provide “information-rich” cases (Merriam, 2015). And since transcriptions provide “the best database for analysis” (Merriam, 1998, p. 88), the interviews were recorded and transcribed for analysis. Data were carefully coded based on broad ideas or concepts that emerge from the interviews (Bogdan & Biklen, 2007) according to the

process described by Smith and Osborn (2003). Once the data were coded, it was analyzed for themes, broad categories, or common responses that informed an understanding of the stated research questions (Bogdan & Biklen, 2007; Smith and Osborn, 2003).

#### 3.1.2.6 Researcher Personal Interest

Sharing the researcher's personal interest in the topic studied is helpful for increasing reliability and validity of finding in a study such as this one (Brink, 1993). While I did not personally experience trauma as a child, childhood trauma has been largely present in many aspects of my adult life—first, as a high school mathematics teacher working with students who had been through hard things, then as a foster and adoptive parent, and lastly in the countless hours I have volunteered for a nonprofit that serves women who have all experienced some form of childhood trauma—abuse, neglect, assault, etc. I began to draw connections between my failures in trying to love and care for students who seemed to be on their way to a life in the justice system (several of those students have, unfortunately, ended up in prison) and the trauma symptoms I learned about in the course of my work with women and children who were trauma-affected. I wanted to explore the connections between behaviors that are symptoms of trauma and behaviors that end up placing students on the preschool-to-prison pipeline, and consider the perspectives of teachers regarding whether trauma-informed practices could disrupt the preschool-to-prison pipeline.

#### 3.1.2.7 Quantitative Validity and Reliability

The ARTIC scale was chosen due to the empirical evidence that it is a reliable measure of staff attitudes regarding trauma-informed care (Baker et al., 2016; Parker et

al., 2019), and because it has a form designed for use with school professionals. Baker et al. (2016) conducted a psychometric evaluation of the measure and found high reliability in their sample (Cronbach's alpha was .93). They also found that the test-retest correlations within their sample were strong, an additional indication that this is a reliable measure. Additionally, they found that there were appropriate correlations between the composite scores and related indicators of trauma-informed care implementation (Baker et al., 2016), indicating the scores are valid measures of staff perspectives. Baker et al. (2016) concluded "...the ARTIC has strong content validity, reflecting the constructs that are central to service providers' attitudes relevant to [trauma-informed care]....These findings provide promising evidence of the validity of ARTIC scores" (Discussion section). To consider the reliability within the sample in this study, once data were collected, reliability within the sample was measured using Cronbach's alpha for each subscale (Allen & Seaman, 2007; Sullivan & Artino, 2013; Warmbrod, 2014). For each subscale and the overall score, Chronbach's alpha was within the accepted range of values and indicated that the measure was reliable (e.g., Hinton et al., 2014; Nunnely, 1978; see Findings section for Chronbach's alpha values).

Additionally, to consider whether this measure is valid for considering trauma-informed practices within the TIPE framework specifically, the author conducted an analysis to consider the alignment of the ARTIC to the TIPE framework. The individual items were considered for alignment to the three main tenets of TIPE: repairing regulatory abilities, repairing disrupted attachment, and increasing psychological resources. Also, due to secondary stress that can come about by working with trauma-affected students and the holistic nature of trauma-informed education, the ARTIC



scale’s questions regarding the teacher’s perceptions of their work environment were assessed using these same tenets, with alignment considered for teacher regulation resources, teacher relationships and support from within the school, and psychological resources for teachers. Table 3.1 summarizes the alignment. Each of the 45 questions on the full ARTIC scale was compared to the TIPE framework as outlined by Brunzell et al. (2016b). Some questions are aligned with more than one domain and are included in each count.

Table 3.2—Alignment of the ARTIC Scale With the TIPE Conceptual Framework

Domain	Number of Questions	Example
Student Regulatory Abilities	7	“Being very upset is normal for many of the students I serve vs. It reflects badly on me if my students are very upset”
Student Attachment	9	”Focus on developing healthy, healing relationships is the best approach when working with people with trauma histories vs. Rules and consequences are the best approach when working with people with trauma histories”
Student Psychological Resources	7	“Students have had to learn how to trick or mislead others to get their needs met vs. Students are manipulative so you need to always question what they say”
Teacher Regulatory Abilities	5	“How I am doing personally is unrelated to whether I can help my students” vs. “I have to take care of myself personally in order to take care of my students”
Teacher Relationships and Support	9	“If I told my colleagues how hard my job is, they would support me” vs. “If I told my colleagues how hard my job is, they would think I wasn’t cut out for the job”
Teacher Psychological Resources	4	“The most effective helpers find ways to toughen up—to screen out the pain—and not care so much about the work” vs. “The most effective helpers allow themselves to be affected by the work—to feel and manage the pain—and to keep caring about the work”
None	14	(See discussion below.)

There were 14 questions that did not align with any of these domains, yet each of them does connect to some component of TIPE. One is assessing strengths-based attitudes, five are focused on self-efficacy (an important component of implementing trauma-informed practices; Baker et al., 2016), three are about general tenets of trauma-informed practices, one is about mindset, two are about the effectiveness of trauma-informed practices, and there are two regarding the commitment of the teacher to trauma-informed care. The subscales were also found to be in alignment with the tenets of TIPE, which is not surprising given the fact that overall the items were aligned with the TIPE model, which contributes to the validity of the scale for this particular study.

Lastly, the subscales that were used to determine the teachers' attitudes toward trauma-informed care were compared to the research questions to ensure that the purposes of the study can be fulfilled through the use of this measure. The first three subscales ("Underlying cause of problem behavior symptoms," "Responses to problem behavior," and "On-the-job behavior") relate to research question one, subscales four and five ("Self-efficacy" and "Reactions to the work") relate to research question two, and subscales six and seven ("Personal support of TIC" and "System-wide support for TIC") relate to research question three.

#### 3.1.2.8 Analysis

Analysis of the data occurred in multiple stages, with the theoretical framework of Maslow's Hierarchy of Needs (Maslow, 1943, 1970, 1971) and the conceptual framework of TIPE as the frameworks for analysis. Once data were collected using the ARTIC scale, descriptive results were summarized for each subscale score. A Kruskal-Wallis H test, which is an extension of the Mann-Whitney U test, was conducted as

advised by Allen and Seaman (2007) to compare the scores of mathematics teachers within different subpopulations, such as by school district. The Kruskal-Wallis H test is a “...rank-based nonparametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable” (Laerd, n.d.-a, Introduction section). The Mann-Whitney U test was conducted when there were only two groups (e.g., male/female). Since the ARTIC scale is a measure with Likert-style questions, a nonparametric test was most suited for analysis, though there is debate regarding this in the literature (for a discussion regarding the debate about whether parametric testing can be used with Likert data, see Harpe, 2015; Sullivan & Artino, 2013). However, this test can only determine if there is a difference between groups within the test, but not which groups (Laerd, n.d.-a). Thus, Dunn test was used pairwise on the categories to determine which of them differ when a difference was found (Dinno, 2015).

The interviews were recorded and transcribed, as this gives “the best database for analysis” (Merriam, 1998, p. 88). First, an initial rereading of the data with no analysis gave the author “a global sense of the data” (Giorgi, 1997, p. 245). Data were coded based on common ideas that emerged from the interviews and then was analyzed for themes that informed an answer to the research questions (Bogdan & Biklen, 2007; Smith and Osborn, 2003). As this is a phenomenological study, particular attention was paid to the lived experiences of the participants that inform their perspectives (Moustakas, 1994; Van Manen, 2016). Additionally, any notes taken during or after the interview were examined to consider how the researcher “has been influenced by the data” (Bogdan & Biklen, 1997). Each of these stages of analysis were considered through the lens of the

theoretical and conceptual frameworks (Brunzell et al., 2016b; Maslow, 1943, 1970, 1971).

#### 3.1.2.9 Evidence

To answer the first research question, interview questions were asked regarding behaviors the teacher finds to be difficult to manage, what behaviors they believe should be handled at the administrator level, and what behaviors or characteristics indicate that a student might end up in the criminal justice system (see interview protocol in Appendix A, Interview 1 questions 2-7, 14; Interview 2 questions 4, 5, 7b, 9, 10, 10a.i-ii, 10d, 12; Interview 3 questions 5, 7). The interview responses were analyzed with particular attention to whether responses indicated teachers link trauma-typical classroom behaviors with out-of-classroom discipline and delinquent behavior. Additionally, the data from the first three subscales of the ARTIC scale data were used to better understand teacher perceptions of trauma-affected behavior.

To answer the second research question, interview questions were asked regarding what types of behaviors teachers perceive need to be handled by administrators. Teachers were also asked about what they believe students need in order to keep them out of delinquent behaviors, which drew on their perception of the implications of Maslow (1943, 1970, 1971) for their students and their ability to make a difference in mitigating maladaptive behaviors. Teachers were also asked to give their thoughts about whether there are some students who will end up in the justice system no matter what they do, and they were asked to talk about how their experiences have shaped their position. This gave insight into how the teacher perceives their position in the life of the student and their ability to impact students. It also drew on how the teacher

perceives the other non-cognitive needs (Maslow, 1943, 1970, 1971) students might have that might hinder their learning, and what role the teacher believes they play in meeting those needs. (See Appendix A, Interview 1 questions 4-7, 11a.ii-iii, 11c, 12a.ii-iii, 13a.ii-iii, 13c; Interview 2 questions 2, 6, 8, 9f, 9g, 9, 10a.iii-iv, 10c; Interview 3 questions 2-6 for the questions that assisted in answering research question two.) In addition to the interview data, the ARTIC scale data from domains four and five were used to better understand mathematics teachers' self-efficacy and reactions to working with trauma-affected students.

To answer research question three, teachers were asked in the interview about how negative student behaviors impact their relationships with students to understand to what extent unconditional positive regard (Rogers, 1957; Brunzell et al., 2016b) may be used within their classroom. They were asked if students who exhibit challenging behaviors like and respect them in order understand the relationship dynamics of the classroom, since relationships play such a pivotal role in TIPE (Brunzell et al., 2016b). They were also asked to what extent they use activities within their classroom to prevent and manage challenging behaviors and their perceptions of the effectiveness of these activities. They were asked to share experiences they have had using these practices that have contributed to their perception of them as effective or ineffective. (See Appendix A, Interview 1 questions 6-11, 12, 13; Interview 2 questions 1, 3, 4h, 7, 10a.v, 11, 12; Interview 3 questions 1, 6, 7 for interview questions designed to answer research question three.) Careful attention was paid to whether teachers mention practices within the TIPE domains and whether they believe these practices are helpful in mitigating negative student behaviors. The ARTIC scale data was used to better understand how supported

they feel in implementing trauma-informed practices and their personal support of trauma-informed education.

In addition to the questions listed above, demographic data were collected to determine if there were notable patterns within the data set based on the participants' experience level as classroom educators, the type of school in which they teach, their student population, etc. This data may be useful in understanding differences in perceptions based on teachers' personal classroom experiences and settings, and whether these differences should be factored into the implementation of a TIPE model within a particular school or classroom setting.

#### 3.1.2.10 Ethical Considerations

There are additional practices that need to be considered when conducting qualitative interviews regarding sensitive topics. Sensitive topics in research can be broadly defined as topics that “seem to be threatening in some way to those being studied. Another way to put this is to say that sensitive topics present problems because research into them involves potential costs to those participating” (Lee & Renzetti, 1990, p. 511). Lee and Renzetti (1990) discuss potential research areas that might be sensitive, including those that are incredibly personal in nature, that are concerned with deviance, that might get in the way of powerful people, or that are concerned with something sacred to the participant.

Special care needs to be taken in studies on sensitive topics because of the potential for distress and harm to the participant (Lee & Renzetti, 1990; Walsh, 2005). Participants may be concerned that they will be embarrassed or professionally or personally harmed should they be identified as a participant or their views linked with

identifiable information (Bogdan & Biklen, 1997; Lee & Renzetti, 1990). There is also the potential for distress, although Newman and Risch (2006) and Elmir et al. (2011) discussed the findings in empirical research showing that many participants believe the benefits outweigh the costs of participation.

Researchers can reduce the risk of distress and increase the potential for benefit of the participant by being up front in their consent procedure about the potential for distress, ensuring the confidentiality of the participants by following appropriate data storage procedures, and choosing private settings for the interview where the participant can speak freely without fear of reprisal (Newman & Risch, 2006; Qu & Dumay, 2011; Walsh, 2005). Researchers can offer for the participant to choose the time and place of the interview to give them control over who might hear the interview or their level of comfort in their surroundings (Elmir et al., 2011).

Researchers should take special care to demonstrate empathy in interviews regarding sensitive issues (Elmir et al., 2011). Following ethical guidelines for sensitive topics is also essential when designing and implementing interviews. Additionally, researchers must be cognizant of the timing of the interview if there has been a recent traumatic event that will be discussed in the interview, and take into consideration how that might affect a participant's responses and distress levels (Lee & Renzetti, 1990). Allowing a participant to take a break when they become emotional can help provide comfort to the participant if they become distressed (Elmir et al, 2011; Lee & Renzetti, 1990).

An additional consideration is the potential for the topic to be sensitive to the researcher, with the possibility for vicarious trauma or the threat of stigmatization for

studying the topic (Elmir et al., 2011; Lee & Renzetti, 1990). Researchers need to ensure their personal wellbeing by discussing their own distress with support staff or restricting the amount of time spent on interviews or data analysis each day (Newman & Risch, 2006).

#### 3.1.2.10.1 STEPS TO MITIGATE POTENTIAL ETHICAL ISSUES

Traditional ethical research guidelines were followed, including submitting research designs to the appropriate governing board (IRB) at the university, using informed consent, being truthful in reporting facts, and committing to do no harm (Walsh, 2005). Newman and Risch (2006) point out that just like “all research, trauma-focused research requires that ethical principles regarding autonomy, beneficence, fidelity, justice, nonmaleficence and truth be considered and weighed in the research design and implementation” (Newman & Risch, 2006, p. 29). Care was taken in the research design to consider how to best implement these practices.

Research into teachers about the abuse and neglect of their students is particularly sensitive because, as Walsh (2005) suggests, studies are sensitive when they consider harmful behaviors and practices which, if exposed, could adversely affect teachers' reputations and incriminate parents or other school center/staff....it challenges established ways of dealing with problems and the vested interests of institutions...[and] it deals with values and ideals which are important to participants. (p. 69)

This study falls into each of these categories, and is thus sensitive. To mitigate the effects of issues regarding research on sensitive topics, confidentiality was maintained to the extent possible, using secure electronic cloud storage to store participant



information and keeping paper copies of interview notes that could identify participants in a locked filing cabinet, destroying them after data analysis was complete. Identifiable information was removed before publishing, and a copy of the findings was sent to participants prior to publication to allow them to review the conclusions prior to dissemination (Walsh, 2005). The informed consent form contained information regarding the duty to report certain information to authorities, such as the disclosure of abuse or neglect or the intent to harm oneself or others (Walsh, 2005).

While this study did intentionally seek the perspectives of those who have directly experienced trauma, there were likely participants who are “invisible” survivors (Newman & Risch, 2006) and some openly discussed their own traumatic events. Additionally, some participants experience secondary trauma in their role as they work with students who are trauma-affected (Newman & Risch, 2006). To reduce unexpected distress and honor the participants’ well-being, the informed consent was honest regarding the potential for distress and the potential benefits to the participant, clearly indicating the participants’ right to end the study at any time or to skip questions for any reason (Walsh, 2005). Additionally, this information was repeated at the beginning of each interview to remind the participant of their rights. The researcher requested permission to record the interview. If a participant needed a break due to emotional distress, but wished to continue the interview, this request was honored by pausing the interview until they were ready to proceed (Elmir et al., 2011). It is important to note that research has documented that, while there is a potential for distress for trauma survivors when they are interviewed and discuss their experiences, most participants do not experience much unexpected emotional distress and view the benefits as outweighing the

distress (Newman & Risch, 2006). And “[u]nlike the traumatic event...ethical research practice includes clear efforts to enable participants to exert control, including the ability to terminate participation at any time” (Newman & Risch, 2006, p. 32). Additionally, since the topic of the study involves groups that are often stigmatized or marginalized, care was taken to use strengths-based language and avoid deficit language throughout the process, in both interview protocols and reporting of results to mitigate the potential for the study to perpetuate stereotypes or stigmas (Tangen, 2014).

### 3.2 Covid Impact and Changes to the Study Design

Due to ongoing issues related to Covid-19, specifically the increased load and expectations on teachers, the study design was slightly modified to allow for a smaller sample size and a larger number of districts were targeted for inclusion to maximize response. Originally, three districts similar in setting and demographic makeup of their students were chosen, but the expansion included a range of district demographics and sizes. This addition of districts allowed for a richer analysis, with comparisons made between the sizes and rates of minority student enrollment.

The planned structure of the study accommodated an Interpretive Phenomenological Analysis (IPA; Smith & Osborn, 2003) approach, since the basic tenets of phenomenology (e.g., understanding lived experiences, using semi-structured interviews as the best approach, having transcripts as the best form of data analysis; Bogdan & Biklen, 2007; Giorgi, 1997; Moustakas, 1994; Van Manen, 2016) are present in the IPA structure, but the focus of the analysis is more narrow and suitable for smaller sample sizes. Since response rates were low, likely due to the timing of the research and

the lack of financial incentive for participants, IPA offers the best small sample size analysis. In fact,

[a] distinctive feature of IPA is its commitment to a detailed interpretative account of the cases included and many researchers are recognizing that this can only realistically be done on a very small sample – thus in simple terms one is sacrificing breadth for depth. (Smith & Osborn, 2003, p. 56)

Smith and Osborn (2003) define IPA as

explor[ing] in detail how participants are making sense of their personal and social world...[T]he main currency for an IPA study is the meanings particular experiences, events, states hold for participants....The participants are trying to make sense of their world; the researcher is trying to make sense of the participants trying to make sense of their world. (p. 53)

The distinction for this analysis method is that it incorporates both understanding the participants and also asking critical questions of the texts from participants, such as the following: “What is the person trying to achieve here? Is something leaking out here that wasn’t intended? Do I have a sense of something going on here that maybe the participants themselves are less aware of?” (Smith & Osborn, 2003, p. 53). These questions guided the data analysis for this project and helped frame the reading and coding of the responses of the participants.

Since IPA focuses on a deeper level of understanding of each individual case, “the aim of the study is to say something in detail about the perceptions and understandings of this particular group rather than prematurely make more general claims” (Smith & Osborn, 2003, p. 55). Smith and Osborn (2003) discuss the richness of the data and

constraints for the researcher (e.g., time, resources) as determining factors for how many participants to have in the study, as well as the availability and willingness of people to participate. The richness of the more than 22 hours of interviews, the clear emergence of meta-themes of their responses, and the lack of additional willing participants made it clear that the seven participants in this study made for a good stopping point for data collection and gave rich enough data for a deep analysis using IPA. The decision to move forward with the data from seven participants was in line with the purpose of this study, which was exploratory in nature and not intended to generalize or finalize any particular theory. This decision is also supported by Creswell's (1998) often-cited suggestion for at least five participants for a phenomenological study.

A final consideration in determining that seven interviews was an appropriate stopping point was thematic saturation, in line with the purpose of the study which was to explore teacher perspectives on trauma-related practices, classroom behavior, and the preschool-to-prison pipeline. Saturation is defined by Guess et al. (2006) as "the point in data collection and analysis when new information produces little or no change to the codebook" (p. 65). And Guess et al. (2006) noted in their study of data saturation from qualitative interviews that the number of new codes dropped dramatically after 7-12 interviews in their study. And while they recommend 12 interviews as a starting point for researchers, this number seems based on their methodology of choosing multiples of six to consider (interviews 1-6, 7-12, 13-18, etc.), and their data also showed a significant number of the codes were created within the first six interviews. The choice to proceed with seven participants was also in line with the recommendation that smaller study sizes can produce saturation depending on the richness of the data (Fusch & Ness, 2015), and

the finding of Hennick et al. (2017) that showed that “a small number of interviews can be sufficient to capture a comprehensive range of issues in data; however, more data are needed to develop a richly textured understanding of those issues” (p. 607). In this study, since the purpose was not necessarily to determine a comprehensive theory regarding these topics, but instead to gather a general understanding of potential connections between trauma-informed education and disrupting the preschool-to-prison pipeline, the smaller number of participants is still appropriate given the thematic saturation achieved in the interview phase of the study. Additionally, no new codes were generated beyond the fifth interview, supporting the decision that saturation had been reached (Guess et al., 2006).

No changes were required in the quantitative data analysis plans, as the nonparametric tests used (Kruskal-Wallis, Mann-Whitney, and Dunn tests) can accommodate small sample sizes, so the sample for the survey was large enough (N=68) for analysis using these tests. The only adjustment was combining response groups when there were less than five participants in a category (e.g., training levels), as groups this small are not appropriate for these tests.

## 4 RESEARCH FINDINGS

To begin, a high-level view of the ARTIC survey data are given, followed by the findings for each research question. As the ARTIC survey data are supplemental to the qualitative interview data so as to highlight the experiences and perspectives of the teachers interviewed (Mayoh & Onwuegbuzie, 2014) the connections between the survey data and interview data are in the discussion section for each question for the sake of continuity and clarity as the participants' views are elevated throughout the findings.

### 4.1 ARTIC Survey Results

The results of the ARTIC survey data analysis are below, starting with the reliability scores, then a look at the statistically significant findings. These findings are given here to aid in conciseness, but are referenced throughout the discussions for each research question. The subscore names are abbreviated throughout this text for brevity, though the full name and description (Baker et al., 2016) is given here alongside the abbreviated name to assist in understanding the measure and the results. The first subscore is "Underlying cause of problem behavior/symptoms" (Underlying Causes), a measure of the teacher's beliefs about whether behavior is malleable or fixed. The second is "Responses to problem behavior" (Responses), a measure of the teacher's beliefs about whether behavior should be responded to primarily through relational interventions or rules and consequences. The third is "On-the-job behavior," which is a measure of the teacher's beliefs about empathy verses control when it comes to challenging behaviors. The fourth is "Self-efficacy," a measure of the teacher's beliefs about their ability to meet the needs of their students who have been impacted by trauma. The fifth is "Reactions to the work" (Reactions), a measure of the teacher's recognition

of secondary trauma and willingness to seek help. The sixth is “Personal support of TIC” (Personal Support), which is a measure of their support for and confidence in implementing trauma-informed care practices. The seventh subscore is “System-wide support of TIC” (System-Wide Support), which measures their beliefs about the support of colleagues, administrators, and their school system for trauma-informed care practices.

#### 4.1.1 ARTIC Survey Reliability

To start the discussion on secondary mathematics teacher perceptions of trauma-informed positive education practices, we turn to the results of the ARTIC survey analysis. First, before considering differences based on demographic information, we will consider the reliability of the test scores for each subscore and overall ARTIC score using Chronbach’s alpha values: Underlying Causes,  $\alpha=.794$ ,  $N=67$ ; Responses,  $\alpha=.732$ ,  $N=68$ ; On the Job Behavior,  $\alpha=.731$ ,  $N=66$ ; Self-Efficacy,  $\alpha=.819$ ,  $N=68$ ; Reactions,  $\alpha=.656$ ,  $N=67$ ; Personal Support,  $\alpha=.860$ ,  $N=36$ ; System Support,  $\alpha=.846$ ,  $N=34$ ; Overall ARTIC score,  $\alpha=.870$ ,  $N=31$ . These alpha values are within the accepted range (e.g., Hinton et al., 2014; Nunnely, 1978). Overall, we see that the subscores are measured reliably by the items, though it is more difficult to measure the reliability of the overall scores and the personal and system support subscores because of missing data (skipped questions) or the N/A choice on the last two subscores that are recorded as missing data. The high alpha values for these three scores indicates that for those who answered all questions, the reliability of the measure is high. The lowest Chronbach’s alpha score was for the Reactions subscore, which is similar to the findings by the creators of the ARTIC survey who also found this subscore had the lowest reliability score.

#### 4.1.2 Scores

For each subscore and the overall ARTIC survey score, the mean, standard deviation, minimum value, and maximum values are presented here. Note that the lowest subscore was Reactions to the Work, indicating that there could be more training needed on the impacts of secondary trauma and where to seek help if needed. Also note that the maximum possible value is seven, minimum is one. These average scores are similar to the average pre-intervention scores in the study by Parker et al. (2019). In their study, scores improved after training. Future study could test whether further training in these trauma-informed districts would impact teacher attitudes relating to TIC. There is currently no baseline ARTIC score for being “trauma-informed,” but the measure is helpful in considering strong and weak subscores, and for comparing between groups to determine whether there are training needs (Baker et al., 2016). A higher score indicates a higher level of understanding and buy-in with trauma-informed care practices (Baker et al., 2016).

Table 4.1—Mean ARTIC Scores for Secondary Mathematics Teachers in Kentucky from Districts with Trauma-Informed Care Plans

	N	Mean	Standard Deviation	Max Obtained Score	Min Obtained Score
Underlying Causes	68	5.12	.85	7	3
Responses	68	5.62	.79	7	3.43
On-the-Job Behavior	68	5.58	.77	7	2.14
Self-Efficacy	68	5.6	.85	7	1
Reactions	68	4.99	1.43	7	1
Personal Support	45	5.46	.77	6.86	3
System-Wide Support	57	5.39	1.13	7	1
Overall Score	68	5.42	.60	6.67	3.07



#### 4.1.3 Mann-Whitney U Test/Kruskal-Wallis H Test Results

The plan for quantitative data analysis was to consider differences in scores based on several important demographic data points: gender, race/ethnicity, age, number of years of experience, demographics at the school, and school district size. While there was not enough variation in participant race/ethnicity to consider differences based on this, the results of the tests from the other categories is discussed below, both for the overall score and each subscore.

##### 4.1.3.1 Gender

A Mann-Whitney U Test was performed to determine if there were differences in ARTIC scores and subscores between male and female respondents. The difference in median scores for the Underlying Causes subscore between female (median = 5.14; mean rank = 36.94) and male (median = 4.71 ; mean rank = 26.27 ) were statistically significant,  $U(N_{\text{female}}=41, N_{\text{male}}=24)=330.500, Z=-2.200, p=.028$ . Female respondents had higher scores, indicating that they were more likely to believe that behavior is malleable. The difference in scores for the Reactions subscore between female (mean rank = 36.80) and male (mean rank = 26.50 ) were statistically significant,  $U(N_{\text{female}}=41, N_{\text{male}}=24)=336.000, Z=-2.128, p=.033$ . Female respondents had higher scores, indicating that they were more likely to recognize the impact of secondary trauma and seek help, as opposed to ignoring or minimizing its effects.

##### 4.1.3.2 School District Size

A Kruskal-Wallis H test was performed to determine if there were differences between overall ARTIC scores based on school district size. “Large” districts were

considered to be districts with 20,000 or more students (41 participants representing two school districts), “mid-sized” districts had 10,000-19,999 students (14 participants representing four districts), and “small” districts had less than 10,000 students (13 participants representing nine districts). The only statistically significant result was in the Personal Support category, with school district size impacting teacher scores in this category. Small school districts (mean rank = 23.30) and large school districts (mean rank = 25.40) had higher scores in this category than teachers in mid-sized school districts (mean rank = 10.92),  $H=6.083$ ,  $df=2$ ,  $p=.048$ . Dunn’s test for multiple comparisons was used to consider statistically significant differences between the individual groups, with only the differences in scores between teachers in large school districts and teachers in mid-sized school districts having statistically significant differences,  $Z=2.465$ ,  $p=.041$ . Teachers in mid-sized school districts scored lower in the personal support category than those in large school districts. This indicates that teachers in large school districts were more likely to indicate confidence in and support of implementing trauma-informed care practices than those in mid-sized school districts.

#### 4.1.3.3 School District Demographics

School districts were separated into category based on the racial/ethnic demographics. The three groups were schools with more than 40% minority student enrollment (four districts, 46 participants), 20-39% minority student enrollment (six districts, 12 participants), and less than 20% minority enrollment (five districts, 10 participants). A Kruskal-Wallis test did not find any statistically significant differences in scores for any subscore or the overall score based on school district demographics.

#### 4.1.3.4 Teaching Experience

Participants self-selected their teaching experience from several categories: 0-5 years (N=18), 6-10 years (N=15), 11-15 years (N=10), 16-20 years (N=10), and 20+ years (N=14). A Kruskal-Wallis test did not find any statistically significant differences in scores for any subscore or the overall score based on years of teaching experience.

#### 4.1.3.5 Age

Participants indicated their age, self-selecting from categories 18-24 years old (N=8), 25-34 years old (N=20), 35-44 years old (N=19), 45-54 years old (N=13), and 55+ years old (N=7). There were no statistically significant differences in scores for any subscore or the overall score based on age of the participant in an analysis using a Kruskal-Wallis H test.

#### 4.1.3.6 Training Level with Trauma-Informed Education Practices

Teachers indicated their level of training by choosing from “none at all” (N=7), “a little” (N=25), “a moderate amount” (N=23), “a lot” (N=4), and “a great deal” (N=9). A Kruskal-Wallis H test was performed to compare teacher survey responses by training level. To compare scores by training level, teachers indicating “none at all” or “a little” training were considered having “little-to-no” training, and teachers reporting “a lot” or “a great deal” of training were considered to have “significant training.” Teachers reporting “a moderate amount” of training were considered to have “some training.” The difference in scores for the Self-Efficacy subscore between teachers who had different levels of training in trauma-informed practices was statistically significant,  $N=68$ ,  $H=11.872$ ,  $df=2$ ,  $p=.003$ . A Dunn test was conducted to determine which groups had statistically significantly different scores, with significant differences between teachers with little-to-no training (mean rank= 28.69) and those with significant training (mean

rank = 50.92),  $Z=-22.236$ ,  $p=.001$ , as well as between teachers who had significant training and those with some training (mean rank = 33.30),  $Z=-16.619$ ,  $p=.010$ .

The difference in scores for the Personal Support subcategory between teachers who had different levels of training was also statistically significant,  $N=45$ ,  $H=12.159$ ,  $p=.002$ . A post hoc Dunn test indicated significant differences between teachers with little-to-no training (mean rank= 16.50) and those with significant training (mean rank =33.46),  $Z=-16.962$ ,  $p=.001$ , as well as between teachers who had significant training and those with some training (mean rank =19.93),  $Z=-13.533$ ,  $p=.003$ .

Similarly, the differences in scores between teachers of different training levels was statistically significant for the System Support subcategory,  $N=57$ ,  $H=6.671$ ,  $p=.036$ . The post hoc Dunn test showed similar differences, with teachers indicating significant training (mean rank=39.35) having statistically significant differences with both teachers with little-to-no training (mean rank=26.74),  $Z=-12.607$ ,  $p=.028$  and teachers with moderate amounts of training (mean rank=25.07),  $Z=-14.275$ ,  $p=.015$ .

And again, there were statistically significant differences between the same groups for the overall ARTIC score,  $H=6.726$ ,  $p=.035$ , with teachers with significant training (mean rank=47.23) significantly different from teachers with little-to-no training (mean rank=30.92),  $Z=-16.309$ ,  $p=.012$  and teachers with some training (mean rank=32.28),  $Z=-14.948$ ,  $p=.029$ .

In each of these subcategories and the overall ARTIC score, higher levels of training were associated with higher scores, indicating that training is an important factor in how teachers think about trauma-informed care practices, particularly their view on their ability to meet the needs of trauma-impacted students, their support and confidence

in implementing the trauma-informed care practices, and their feelings that their colleagues and school are on board with trauma-informed care practices.

#### 4.1.3.7 District Trauma Care Plans

A Mann-Whitney U test was performed to see if there were score differences between teachers who knew that their school district had a trauma-informed care plan in place and those who did not. Since all teachers were currently teaching in school districts with trauma-informed care plans at the time of the survey administration, it was interesting that 42 of the 68 (just over 61%) survey respondents said that they were teaching in a school with a trauma-informed plan. Yet, there were no statistically significant differences between the two groups (those who said “yes” to their school having a trauma-informed care plan in place and those who said either “no” or “not sure”).

#### 4.1.3.8 Participation in the Interviews

To gauge whether participants who completed both the survey and interview (N=7) differed significantly in scores from those who completed only the survey (N=61), a Mann-Whitney U test was conducted between the two groups. There was no statistically significant finding for any of the subscores or the overall score.

#### 4.1.4 Implications for this Study

These findings informed the analysis of the interview data, as careful attention was given to statistically significant findings and whether these differences were apparent in the interview responses. Each of these is discussed in greater detail in the discussion sections for each research question.

## 4.2 Research Question 1

Here, we consider the answer to Research Question 1: How do secondary mathematics teachers believe they should respond to challenging student behaviors? (a) What links do teachers draw between these behaviors and the likelihood that a student will end up in the criminal justice system?

### 4.2.1 Challenging Behaviors

In order to understand how participants believe they should respond to challenging behaviors, it is important to consider which behaviors they find to be challenging. Withdrawing, absenteeism, and perfectionist behaviors were three behaviors that the participants had trouble knowing how to respond to within their classroom, while behaviors like extreme emotional responses, disrespect, and other disruptive behavior tended to be viewed as challenging but manageable.

#### 4.2.1.1 Withdrawing and Apathetic Tendencies

Teachers found behaviors that indicate an unwillingness to participate in classroom activities were particularly challenging to address. For example, Alice finds that when a student shuts down, it is difficult to know what to do. She said:

It's just hard as a teacher because you want to do everything that you can to help a student be successful, but when they shut down and their door's closed to wanting help, it's...one of the most challenging behaviors...I can't deal with a student that's not open to, to being taught....If you have a trick for that, let me know because I don't know it.

She talked about students who have “a total blankness” as being unreadable and difficult to reach with relational means. And Carrie similarly had trouble engaging with students

who would not engage with her, especially when they are on their cell phones as a means of escape: “ I have no idea how to teach a kid who will not engage in any way, shape, or form.” Angela talked about it as an urgent matter, saying:

What do you do when you have that one kid who just wants to come in with their head down every day and you can't you can't get through? But you know that he's a big enough of a twerp, you cannot cross your fingers and hope that some high school teacher is going to love them.

For Angela, students who withdraw are especially challenging, but she feels more urgency to help them because she does not have confidence that anyone else will. Corey talked about this phenomenon in terms of apathy, saying

You know apathy is a really difficult one to deal with, because if you don't care...there's nothing. You know, silence when you're trying to run a conversation based class if they're shut down, shut out...there's not a lot going on.

Corey noted that students who are apathetic in class are often too overwhelmed by their outside circumstances to participate.

#### 4.2.1.2 Perfectionism

Teachers also found that perfectionist behaviors were difficult to respond to well (e.g., student throwing away a paper or becoming agitated because they made a mistake). Angela talked about the danger of telling a student struggling with perfectionism that their work is okay even when it is not perfect or complete, saying that if you tell them that it is okay,

if it's not in their mind, then...they lose the trust with you because it wasn't okay but you said it was....I mean, it's like quicksand. Like you got in it before you

realized you were in it and now you're up to your knees....So perfectionism I really think is a hard one.

When asked about students who struggle with perfectionism, Lindsay also struggled with knowing how to respond to their behavior, saying,

Oh, gosh. Those kids are fun....I don't really know what to do with those kids, I'll be honest...you have to get them to relax because they're a perfectionist for a reason....[T]hey'll throw away their work, their handwriting is not perfect in one little spot....I feel like with them, the more relaxed they feel around the teacher, the less perfectionism you see.

Lindsay talked about trying to convince them that she did not mind when they made mistakes on their paper or wrote in different colored pens, but does not necessarily think that her interventions are successful.

#### 4.2.1.3 Truancy

Physically being absent was a consistently discussed challenging behavior that is closely related with emotional withdrawal and apathy in how teachers discussed their lack of understanding in how to handle these behaviors. Alice's comments on the matter nicely summarize the way the teachers feel about absenteeism:

Because if they're not here...we can't help them, we can't form a relationship with them, we can't show them and care. We can't let them have that restorative justice experience. We can't show them what real boundaries look like for behavior and learning. So I'd say probably absenteeism is probably the number one indicator of ending up in prison.



Corey also associated absenteeism with more challenging future outcomes, saying that students who are often absent are ones who do not see a future for themselves within the educational system. And Debbie talked about truancy being a barrier for student success. None of the teachers had great solutions to truancy, except perhaps taking the student home themselves, which they recognize as not a real option to help all students who have been impacted by trauma. Carrie, Corey, and Lindsay all talked about sometimes wishing they could take the student home to mitigate their challenging circumstances.

#### 4.2.1.4 Other Challenging Behaviors

Teachers were generally confident in their ability to respond to other challenging behaviors. The list of behaviors they generally found to be challenging, along with behaviors they associate with trauma and behaviors they associate with an increased risk of incarceration are listed in Table 4.2 by participant.

Table 4.2—Behaviors Interview Participants Labeled as Generally Challenging, Associated with Trauma, and Associated with an Increased Risk of Incarceration

	General Challenging Behaviors	Trauma-Related Behaviors/Symptoms	Behaviors Linked to Risk of Incarceration
Dan	<ul style="list-style-type: none"> <li>• Trying to get removed from class</li> <li>• Inappropriate comments to other students (especially sexual)</li> <li>• Overt disrespect of teachers</li> <li>• Fighting</li> </ul>	<ul style="list-style-type: none"> <li>• Short fuse/easily angered</li> <li>• Inappropriate sexual behavior</li> <li>• Extreme introvertedness</li> </ul>	<ul style="list-style-type: none"> <li>• Inappropriate sexual behavior and comments</li> <li>• Using and selling drugs</li> <li>• Criminal activity</li> <li>• Gang activity</li> <li>• Violence at an early age</li> </ul>
Debbie	<ul style="list-style-type: none"> <li>• Absenteeism</li> <li>• Apathy</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme changes in behavior from what is “normal” for the student</li> <li>• Clinginess</li> <li>• Fight or flight responses to non-threatening behavior</li> <li>• Angered easily</li> <li>• Fighting</li> <li>• Causing pain to others</li> <li>• Hurting themselves</li> <li>• Isolation</li> </ul>	<ul style="list-style-type: none"> <li>• Gang involvement</li> </ul>
Lindsay	<ul style="list-style-type: none"> <li>• Withdrawing</li> </ul>	<ul style="list-style-type: none"> <li>• Withdrawing</li> </ul>	<ul style="list-style-type: none"> <li>• Refusal to make good decisions</li> </ul>

	<ul style="list-style-type: none"> <li>• Inappropriate language (cussing)</li> <li>• Outbursts</li> <li>• Fighting</li> <li>• Bringing weapons to school</li> <li>• Not taking responsibility for their actions</li> </ul>	<ul style="list-style-type: none"> <li>• Gender-specific disrespect of authority figures</li> <li>• Intentionally getting kicked out to avoid embarrassment or relationship</li> <li>• Constantly being in fight or flight mode</li> <li>• Avoidance</li> <li>• Fighting</li> <li>• Extreme behaviors</li> </ul>	<ul style="list-style-type: none"> <li>• Fighting</li> <li>• Constant fight or flight mode</li> <li>• Impulsivity</li> </ul>
Alice	<ul style="list-style-type: none"> <li>• Not listening at all</li> <li>• Trying to get kicked out</li> <li>• Being the “class comedian” and constantly disrupting the class</li> </ul>	<ul style="list-style-type: none"> <li>• Isolation</li> <li>• Acting out</li> <li>• Disrespect of authority figures</li> <li>• Gender-specific disrespect of authority figures</li> <li>• Just existing (apathy, refusal to work)</li> </ul>	<ul style="list-style-type: none"> <li>• Absenteeism</li> </ul>
Angela	<ul style="list-style-type: none"> <li>• Explosions over little things</li> <li>• Not starting work right away</li> <li>• Work completion</li> <li>• Banter impacting other students</li> <li>• Disrespect toward others</li> <li>• Refusal to work</li> </ul>	<ul style="list-style-type: none"> <li>• Quick tempered</li> <li>• Hesitation to trust others</li> </ul>	<ul style="list-style-type: none"> <li>• Unmanaged rage</li> <li>• Not being able to let things go—having to have the last word</li> <li>• Drug dealing</li> </ul>
Carrie	<ul style="list-style-type: none"> <li>• Cell phones</li> <li>• Withdrawing</li> <li>• Apathy</li> <li>• Challenging and talking back about everything</li> <li>• Constant disruptive behaviors</li> <li>• Disrespect for authority</li> <li>• Attitude</li> <li>• Skipping class</li> <li>• Guns</li> <li>• Drugs</li> <li>• Doing nothing in class</li> </ul>	<ul style="list-style-type: none"> <li>• Truancy</li> <li>• Withdrawing</li> <li>• Acting out (destruction, talking back, oppositional behavior)</li> <li>• No control over emotions</li> </ul>	<ul style="list-style-type: none"> <li>• Quiet/social isolation</li> <li>• Always on the phone</li> <li>• Withdrawing</li> </ul>
Corey	<ul style="list-style-type: none"> <li>• Attendance-based issues</li> <li>• Manipulation</li> <li>• Reactive Attachment Disorder-type behaviors</li> <li>• Open defiance</li> <li>• Challenging the teacher</li> </ul>	<ul style="list-style-type: none"> <li>• Flying off the handle</li> <li>• Outbursts</li> <li>• Fighting against the things that they actually want because they expect to lose it anyway</li> <li>• Feelings of desperation, confusion, apathy</li> <li>• Fake carefree attitude</li> </ul>	<ul style="list-style-type: none"> <li>• Apathy</li> <li>• Immortality complex</li> </ul>

## 4.2.2 Response to Challenging Behaviors

Teachers described relational and regulatory techniques for responding to challenging student behaviors, and described the tensions that exist when trying to care for students who have experienced trauma. The teachers were honest about the struggles they face in addressing these behaviors despite what they believe they should be doing. The teachers who participated sometimes discussed challenging student behavior in ways that are outside of the school rules or norms. What follows is a discussion on their responses.

### 4.2.2.1 It's Not About You

One of the most commonly discussed responses to challenging student behavior was an acknowledgement that the behavior is most often not personal, and the behaviors that are a direct response to the teacher are ones that can more easily be addressed. Alice said:

I used to always think this is about me, like this outburst, this child's behavior is because of me, because I'm not able to handle it, or it's offensive towards me, or they're trying to get back at me...[R]ather than thinking that way, we need instead think 'Okay,...what has gone on with this child today that is causing this reaction? This is not about me.' Like that has to be our first thought. This is not about me. Because most of the time it's not about you, and if it is about you, then we can fix it.

Corey also talked about having to learn that it was not personal, saying that his first year he took student outbursts personally and thought he was directly influencing them. Corey learned that most of the outbursts he witnessed were not because of him or about him.

The teachers believe that their responses to the behavior must first start with understanding the reason behind the behavior, which they find to most often be outside of themselves or their control. They learned over time that student outbursts are not generally directed toward them.

Angela pointed out that sometimes, outbursts are a result of the student feeling comfortable enough with the teacher to finally let out the emotions from whatever else has happened to them that day. Talking about student outbursts that are directed toward her, Angela said, “If I'm the one who started it, I want to be the one who can fix it. If I'm the one you are comfortable enough to blow up on, there was a reason for that.”

Carrie talked about how sometimes a student's disrespectful behavior was also not about her, but was sometimes something that was learned over time as a survival mechanism. Carrie said:

It's not necessarily me as a person. It's just that that's ingrained in them that they have to say the last word...[T]hat's how they survived up until this point. That was the way that they acted. And so I try not to take it personally.

Corey also talked about how disrespect and outbursts were sometimes aimed at a teacher, but ultimately were not personal to the teacher, saying, “They may get done cussing me out and then seeing the look on their face is like, ‘That wasn't aimed at you, that wasn't because of you.’” Dan had similar thoughts, saying that “when you say good morning to someone and they start shouting at you, that's probably not you. You know they're, they're probably already having a bad day.”

Dan talked about the emotional aspect of handling challenging behavior, noting that while he knows that the behaviors aren't about him, it is still frustrating:

I'm human...[Y]ou'll get angry, you'll get frustrated, especially when you are trying desperately to help somebody and they won't let you help them....[B]ut you know, again, you're the adult...you realize it's not about you. Most of the time they're already mad when it's, you know, eight o'clock in the morning and they're already going off and something happened at home. And so, you know, it's not about you. Just try and have a conversation with them. Get them alone or to the side somewhere where you can talk with them and find out what the problem what the real problem is. But, but, yeah, it's definitely frustrating.

Even though he feels like his reactions to their behavior are effective and generally understands that they are not personal, Dan still finds himself becoming frustrated because he wants to help students who sometimes do not want help.

#### 4.2.2.2 Relationship and Connection

Every teacher interviewed mentioned relational strategies for how they believe they should respond to challenging student behavior, including trust-building, using strategies to help students feel safe and comfortable, and using conversation to understand the student better in order to respond more effectively to their behavior.

##### 4.2.2.2.1 PREVENTATIVE RELATIONAL INTERVENTIONS

Some of the relationship building takes place before challenging behaviors occur, leading to a preventative tool for teachers. Corey talked about how relationship building means “showing that they do have a support system, they do have somewhere that they can trust and lean on.” Alice says it can be as simple as asking them a question about their day to build trust. Alice always “[tries] to find some sort of connection with them.” Carrie talked about how building relationships can lead to students completing tasks they

otherwise would not complete: “[T]hat that was the pull that I had with that kid...he was going to do it because I particularly asked him to and I wanted him to do it. I think that's the biggest thing with challenging classroom behaviors.” She believes that her relationships with students help them to make more positive choices and prevent challenging behaviors. Alice agrees that positive relationships help prevent challenging behavior from occurring. Alice said, “I think just having one on one conversations with kids lets them know that you care and it creates a relationship with them. Like I said multiple times, it's all about relationships with kids.”

#### 4.2.2.2.2 REACTIONARY RELATIONAL INTERVENTIONS

While teachers try to prevent challenging behavior, some of the relational strategies teachers discussed are reactionary to challenging student behavior. Alice talked about having conversations with students before or after class if her reminders about expected behaviors are not heeded during class. Dan also uses hallway conversations to get to the bottom of challenging behaviors: “Generally what I'll do is I'll take them out into the hallway, try and have a conversation with them. And, you know, ‘Okay, what's the real problem?’ But just getting them to the point where they'll have the conversation with you is sometimes, sometimes difficult.” He works on relationship building throughout the year as a means of encouraging students to participate more readily in those hallway conversations. Dan also uses this time of building relationships to understand which techniques to use with which students when responding to their behavior, noting that some students need a more stern approach and some require more gentle responses.

Debbie notes that her relational strategies help students to feel a sense of trust and belonging at the school:

When they have been there for a while and they know that it's a safe environment they respond a lot better than when they do when they first come in...[S]ome of these kids come in, they don't know you, they don't trust you...[S]o you have to allow them to be who they are until you can reach that trust level a little bit. And so you always reach out, you do what you can to engage. "How you doing? What are you doing? Tell me about your family. Oh hey, not gonna talk about that? Okay, well tell me what you like to do, tell me where you're going."

She talked about how students need to have a teacher they connect with so that they can feel important. Debbie finds, like the other teachers interviewed, that responding to challenging behaviors has to first be rooted in a relationship with the student. Dan agrees, noting that sometimes,

the kids are...this football. Getting kicked around between the different groups trying to figure out [what] to do with them when really, for the most for the most part, what they really need is somebody to listen to them and just, you know, figure out what's going on and why they're behaving the way they're behaving.

He believes that it is his responsibility to build these relationships in order to better understand student behavior and help students succeed. Carrie also believes that responding to challenging student behavior starts with a conversation:

I think number one is you have a conversation with the kid. I mean, I always have a conversation with the kids after they have a fight or after we have an issue

in my classroom. I pull them out...in the hallway and I'm like “Hey, what's going on? Why are you acting like this?”

The teachers discussed challenges to forming relationships with students, including absenteeism and attachment issues stemming from traumatic experiences. Alice talked about not being able to connect with students who are not present in school as a primary barrier for helping them achieve success. And Debbie talked about attachment struggles stemming from trauma that impact students’ ability to form relationships with students. She talked about a student she had who had been bound and placed in a restrictive space in his home as a means of punishment. She said,

When I first met him, I thought, “Man, this kid is awesome. Where did he come from? You're not supposed to be here. What happened?” And then the more familiar he became, the more he knew you. And the more he knew you cared, that's when he started acting out. Because it seemed like the people that were supposed to...care for him, are the ones that did him the biggest damage...He just kept waiting for the other shoe to drop. You know, it's like “Okay when you're going to get me?”

Since relational strategies were some of the most talked about responses to challenging student behavior, these barriers to forming relationships are especially important to note, as teachers can feel their toolbox for challenging behaviors is limited with students who cannot accept or are not present for relationship.

#### 4.2.2.3 Give Them Space When Needed

Since the teachers all use relational strategies with their students as a means of responding to challenging student behaviors, they also noted that they know their



students well enough to understand that sometimes they just need space when presenting with challenging behaviors. Alice mentioned that sometimes she allows the student to choose to go to the in-school suspension room if they need space that day. Talking about an incident with a trauma-affected student, she said:

[S]omething probably happened this morning to put them in this mood where they are incapable of learning in your classroom today...[T]hey need to go to a safe place and if that's the [in-school suspension room] today, then that's fine for today, but tomorrow when he comes back into your room, you, you have to act like everything is fine and...you have to teach in a way that he can he is feel safe and comfortable in your classroom environment.

Alice believes that giving the student the space they needed was the appropriate response, but that welcoming the student back into the classroom with relational strategies was just as important to the process. Similarly, Angela believes that it is important to give withdrawn students space for a little while, but also resorts to relational strategies if it continues:

[M]ost of the time if they're withdrawn, if it's for like one day I let it go because I assume that there's something that's going on. If it starts to carry on and I try to just kind of get the class going and then during that independent partner time or whatever I go sit with them and just say, like, "Hey, it's been a while." And they'll start talking. "So what's going on?"

Debbie also has noticed that sometimes, students are unable to continue to function in the classroom environment and that giving them space is the best response in those situations. She said, "[I]f they're having a bad day, like I've got one and goes '[Ms.

Debbie], don't talk to me. I'm having a bad day.' And it's like, 'Well, okay, least be polite bud, I'm sorry'...and then we'll move on." She allows students who can handle the responsibility of self-management in the hallway to walk the halls in order to give them the space they need. Like Angela, Debbie also allows self-isolation for a time and then uses relational strategies to engage the student. Debbie said:

It will depend on what the reason is that they're isolating themselves. I might let them isolate for a while. You know, not for weeks. You know, maybe for a day or something like that. If it's something that I don't know, I'll say, "Hey, are you doing okay? Is there something that you need to talk to me about?"

Unfortunately, Lindsay has trouble with using student breaks effectively in her school because the breaks are also used as a form of discipline for student misbehavior:

So one of the things that we do at [my school] and maybe, I don't know if this, this doesn't really feel restorative. But maybe that's how [my district] looks at it...I can do, it's called a tab, TAB, which is 'take a break.' Right, it doesn't work. I don't really know why they do it, but they want to say that it works. And so you send a kid to another classroom. So I have to watch them walk across the hall and go sit in the other room. And then there, I usually give them a timeframe to come back.

In Lindsay's experience, these "formal" and structured breaks are unhelpful as a form of discipline. The other teachers' experiences are less discipline-focused and more informal responses to student behavior, which might explain why the less structured breaks seem more effective. Lindsay also allows students space within her classroom in informal ways and finds them to be helpful, saying "that's like my number one thing to take when

it comes to trauma and stuff like that is it has to just be okay to have a bad day.” She allows students to put their heads down or take the day off from working in her class, as long as it does not become a habitual problem because she recognizes the importance of student self-regulation. She finds these non-disciplinary breaks to be more effective than the school-imposed disciplinary breaks.

At Corey’s school, they encourage giving space both as a means of discipline and as a means of prevention, and unlike Lindsay, he finds both to be effective. Corey said, “We’ll typically give the opportunity for space, one of the things that we have...basically it's like a self-called timeout where they can go,...they've got to walk, they can't go nap....[I]t's an opportunity to remove from the room, so if we have one outbursts like that we’ll typically have a teacher inspired [time out], but our SRO is good with this and giving them the opportunity to go walk outside go somewhere where that energy can be dispersed.”

Having that additional support in the building could explain why his experience is different from Lindsay’s in the disciplinary timeouts, as Lindsay’s school is understaffed.

#### 4.2.2.4 Regulation Techniques

Several of the teachers believe responding to challenging behaviors, particularly outbursts and other extreme emotional responses, should involve the use of regulation techniques. Corey’s school staff discussed their office discipline referrals (ODRs) and put a plan in place to respond to an increase in student referrals after lunch. He said, “we implemented a five to 10 minute mindfulness time immediately following [lunch]....and we actually did see a reduction in how many ODRs and how many discipline events we had coming out of that.” They realized that students needed that regulation time to

refocus on the content and worked to prevent further challenging behavior by implementing the mindfulness time. Alice also talked about using regulation techniques, saying:

I can deal with outbursts....“That's fine, you can have your little outbursts like, that's what you needed. Great. But we're going to come back down, we're going to calm down, and we're going to do this, you know even if it's hard we're going to do it.”

She uses regulation techniques to help in the “calm down” phase to reintroduce the student to the classroom. Lindsay, talking about students who have outbursts, said,

They're the ones I feel like that usually need something just like to hold on to....[J]ust like a cool down corner....[I]t's the idea of just like go sit there for like five minutes and just take a minute to cool down or even like sometimes that's a reason for me to send a kid into another room. Just being like, “You're not in trouble. I just want you to kind of remove yourself for a minute.” So I have done that before too...I always want to clarify to them. It's not a consequence. I just want to give you a minute to cool down.

Corey said, “anything that gives the student a moment to or a means to bring themselves back into that comfort zone to that whatever they need is majorly beneficial for our kids.” He models appropriate tone when they are elevated to help them regulate their response in conversation.

Carrie uses regulation strategies and models them for her students when she becomes frustrated as part of her response to their challenging behavior:

Frustration, anxiety, sometimes anger... if I'm on like a one to 10 scale, they'll start out like four or five....When it gets higher into that, seven, eight, that's when I walk out of the classroom and I'll leave the door open, but I'll walk out and I'll take some breaths. A lot of times you do that and the kids are like, "Whoa, she's really mad me. We were really mean to her. We should like get it together. Why do you have to say that to her, don't act like that," you know, sometimes they'll come to bat for you.

She has found that a healthy, regulated adult is better able to respond appropriately to challenging student behavior and uses regulation techniques to manage her emotions when faced with these behaviors.

#### 4.2.2.5 Get Additional Help

While almost every teacher explicitly mentioned believing that teachers should respond to most behaviors themselves, they also acknowledge that sometimes it is healthy to have an additional adult as part of the response team to these behaviors. The teachers often brought in outside help in the form of school administrators, guidance counselors, school psychologists, and parents in order to assist them in responding to challenging behavior. Alice said:

I think teachers definitely need to know how to be mediators of behaviors that are, that are concerning...and they need to know at what point does a behavior become something that is of concern to guidance and/or student assistance coordinator, or something like that.

All teachers seemed to agree that there is a point at which outside help should be brought in to assist, though they disagree about how effective this help is and when it should be

requested. Carrie, when first asked what should automatically be referred to administrators, said, “Nothing. Nothing should automatically be referred to an administrator...[Y]ou've lost all the power in your classroom if you have to call an administrator to deal with every single thing that happens.” However, she acknowledges that there are some issues that teachers are not contracted to handle in the classroom (e.g., guns and behaviors requiring physical restraint responses) and does write referrals for skipping because that is not something that she thinks can be responded to by the teacher. Angela also does not refer often to administration, saying, “Yeah, I don't really call admin a lot. It's a trust issue.” For Angela, the administration's responses make her less likely to continue asking for their help. Carrie and Angela both believe that administration involvement should be used as a means of responding to behavior that is outside of their ability to control or respond to in the classroom.

There are some behaviors that teachers believe should automatically be referred to administrators, including isolation and aggression (Alice), direct threat and derogatory insults (Corey), “over the top comments” toward other students (Dan), being a harm to themselves or others (Lindsay), fighting (Angela), skipping (Carrie), and repeat offenses (Debbie). They also discussed guns and drugs as automatic referrals to the office for safety and liability reasons, as well as physical violence in the classroom.

The teachers talked about needing additional help as a primary motivator for seeking outside help in responding to the behavior. When talking about responding to students who are withdrawn, Carrie said that if a conversation with the student does not resolve the situation, she reaches out for additional help:

I would also reach out to the counselor. So we have a social worker. We have a psychologist...[W]e have a variety of mental health experts in our school. And so I reach out to them and say, “Hey, I noticed and so and so is really withdrawn. I don't know if you know anything already.” Or “If you could reach out and talk to them because, again, I'm not the expert. I don't really know what to do there. All I know is what I know.”

Carrie also uses these resources when students are failing her class, sending an email to the parents and including mental health experts and school-based social workers in the conversation to make sure that students have the support they need to be successful.

Alice speaks similarly on outside help, saying,

[W]hen I get to the end of myself, like I can't do anything else to help this child, that means that I've got to find somebody else that can...because obviously this student needs extra support beyond what I can provide in my classroom.

The teachers believe that they should first attempt to respond to student behavior in the classroom and refer to outside help once they feel like they have no other tools or do not have the capacity to help the student in the classroom. Corey described a situation similar to Carrie's and Alice's experiences where he attempted to engage the student first and then referred to guidance:

[A] lot of times we'll try to give them their space...so if I see them [withdrawing], they'll show it by not answering questions that are asked directly at them or shutting their book and putting their head down....[W]hen I see things like that I try to quickly come up with an individualized task that the kids can do...and then I'll slide over and attempt to engage them...or give them an opportunity to

process, “[H]ey, do you want to go grab a drink of water?” And if they continue shut down...that's when I'll message our guidance counselor and just say, “Hey, so and so has gone into their shell won't respond to this...can you pull them for a second?” Because again in my experience, typically what that means is whatever has been living on their mind has finally overwhelmed them they can't focus on the classroom right now that's all they want to so get them somewhere where they can actually talk to somebody.

The teachers acknowledge that circumstances sometimes present themselves where students need help that they cannot provide, usually due to circumstances they are facing outside of school. Carrie said that when she refers a student to a counselor or administrator, it is because “a lot of times it's that...there's some reason that they feel they have to act that way in my classroom.”

While sometimes outside help is used in response to challenging behaviors because the teachers feel that it is outside of the scope of their control, sometimes teachers utilize outside help to manage relationships with students and parents. Alice talked about “protect[ing] the teacher-parent, teacher-student relationship” saying that if you're involved in a situation beyond...the students daily work and grades, and things like that, then it can sometimes get sticky and really negatively affect your ability to...continue a positive relationship with the student with the parents, especially if the parents feel like you're the one that's referring their child to guidance...[T]hey can see that as a threat....So you got to really stay out of that situation and let...guidance and administration handle it.



Angela also talked about maintaining student relationships by asking administrators to be the ones who are the “bad cop” with the student, saying:

[I]f we're trying to build a relationship with the kid, we can't always be bad cop...[Y]ou're not in my room every day trying to make a connection with this kid. So if...they need to be pissed off at somebody, it needs to be you and not me.

Unfortunately, Angela does not always find the relationship preserved when administration plays the “good cop” role and does not take the referral seriously. She rarely writes office discipline referrals, so when she does, she wants the administrator to take it seriously and try to take some of the “bad cop” responsibility off of her. Other issues arising from bringing in administrators included administration not following through on their part of a student behavior plan (Carrie) and administrators not knowing what really happened in the classroom when students tell their side of the story to the administrator (Angela).

#### 4.2.2.6 “I’m not a counselor”

One complication that came up was knowing when to get outside help, as sometimes teachers feel like they are being asked to play the role of guidance counselor when building relationships with students who have experienced trauma and responding to their behavior. The teachers knew that teachers are not guidance counselors, but sometimes feel pressured to behave as if they are. The lines between guidance counselor responsibilities and teacher responsibilities can be blurred because of the relational interventions they use for challenging behavior. Alice noted that some teachers in her building have a hard time with caring for trauma-affected students and she said they

object to trauma-informed practices because they are not equipped yet for the relationship-building aspect. She said,

[W]hen you give them the information and you empower them...I think that they're going to stop saying "Well, I'm not a counselor." "Great I didn't ask you to be a counselor. All I asked you do is form a relationship with kids and know what's going on in their lives, well enough to know whether or not their behaviors are a concern for somebody other than you."

Alice notes that it is not the teacher's role to diagnose or counsel, but that teachers need to know what behaviors to refer to an adult of the classroom and when relationship-building can make the difference for a student.

Carrie does well to balance the relational interventions with referring to a counselor, saying that she relates her struggles in life with what students are going through,

Always with my caveat of "I'm not a counselor, so don't, don't expect me to give, you know I'm not going to give advice, but I can tell you my experiences and what I've been through...I can kind of relate on on those levels of how I dealt with stuff." So I think my role is to support them. But again, my role is really what I'm hired to do is to teach math. And I keep that as the forefront.

But for Dan, the lines are a little more blurred because he sees colleagues who do not want to take on relationships with students as a means of helping trauma-affected students and instead prefer administrators to suspend the students more often for challenging behavior. Dan said:

[A] lot of teachers think they don't have time to be the counselor in, you know, in the classroom and I look at it is, I don't see how you have time not to. You know you, you've got to because we have so many kids that have so many issues...and when you think about Maslow, if you're worried about get beat up at night or whatever you're not sure where your foods coming from, then you're not interested in algebra.

While Dan was talking about relational interventions (e.g., conversations with students, understanding their circumstances, finding out what they like and do not like, etc.), he views his role in responding to challenging behavior as more of a counselor role, setting aside the content as of primary importance.

#### 4.2.2.7 Disincentivize, Squash, Document, Restore

Most of the responses to challenging behavior involved finding ways to disincentivize the behavior or stopping it right when it starts. Alice noted that some of the most challenging student behavior to respond to is when they are constantly disruptive, like when a student tries to be the class comedian. She notes that if she can find a way to disincentivize it by not giving the student what it is that they are aiming for (e.g., if they want to get kicked out, keep them in the classroom), then the student is less likely to engage in the behavior in the future because it was not rewarded. For Angela, she often just lets things go when possible, saying

I've let so much stuff go at this point I'm, honestly, my only hard line that I have not dropped is how they speak to each other. You can say a lot to me and I'm going to be like okay, but I cannot hold in if you say something to someone else.

She still tries to have a conversation about what happened before resorting to discipline referrals, but tries to just overlook challenging behavior when possible because the lack of negative attention helps disincentivize it for the future. Carrie tries to use jokes to lighten the mood when things begin to escalate in the classroom, uses proximity to stop distracting behaviors, and says she tries to “squash” behavior and move on whenever possible. Similarly, Corey tries to use proximity to stop disruptive behavior without having to escalate further, and redirects students before they face any consequences for their disruptions. And Dan uses proximity and asking questions to try to reengage off-task students and stop challenging behavior from continuing. For Dan, giving them the benefit of the doubt is important:

I'll give them the benefit of the doubt at first, and then if it's constantly disruptive and they're giggling and that kind of thing, then I'll walk over and I'll stand next to them, and I'll continue my lecture just standing by them and that's generally enough to, to, you know, stop it, for the time being. And then if, if that doesn't work, then I'll give everyone in the class something to do...and then I'll go talk to them at their desk, you know, quietly and like, “Hey, you know, what's going on? Is there something that you need me to clarify? Is that why you were talking?”... [A]nd figure out why they are talking about whatever.

Generally, the teachers are not bothered by disruptive behavior and do not take any challenging behavior personally, preferring to move on from it and prevent it when possible.

For most of them, they try to set up their classroom so that it prevents challenging behavior from impacting their classroom. For example, all of them structure their

classroom with student-centered learning activities and group work to give students time to talk to one another, giving a lot of leeway for off-topic conversation as long as students are completing their work. Carrie believes that this group work prevents unnecessary talking and disruption because she gives them that space to talk about other things. Similarly, Lindsay structures her class with lots of student-centered activities that allow students to talk to one another:

I don't have a lot of talking because I only teach for maybe five or 10 minutes. Because it's like, "All right, here's the general idea. Now I want you guys to go and kind of explore on your own."... I let them talk because I have found over, in my fifth year teaching, I can sit there and fight them on it, but it's literally a never ending fight you will never get them to stop talking.

Lindsay also believes that the teachers who do not structure their classrooms in a way that allows for students to have conversations are "the ones that have instilled so much fear in those kids that they don't have relationships with them...as long as you're learning and getting your work done, you're kids, like socialize, socialize properly."

Another way that the teachers try to prevent challenging behavior from happening is by structuring their class so that mathematics mistakes are normalized, encouraged, and expected. Corey normalizes being wrong in mathematics class:

Because again in an alternative environment...in math class, the idea that you sometimes learn by being wrong, the kids can't get that and in the moment you just try to explain to them that it's alright to make mistakes... I make mistakes all of the time up at the board, and when I do, I actually talk about it and say you

know “I’m wrong here, and this is what it told me, this is what it showed me.” So you know, trying to normalize being wrong.

In the gifted and talented program, Dan finds that perfectionism hinders student success, so he also welcomes students to point out mistakes he makes on the board and does not get upset when they do to show them that mathematics mistakes are inevitable and expected. Dan said:

[O]ne of the first things that I teach all of my kids is that the way we all learn is by messing something up fixing it, and then not repeating the mistake...that's how learning takes place. So messing up is perfectly okay.

When prevention does not work, teachers prefer to document challenging behavior in case it escalates, not necessarily for discipline in the moment but to have a paper trail. Alice and Angela both talked about the need to document behavior as part of their response when prevention doesn’t work. Angela’s school has documentation referrals that help track student behavior and Carrie uses the provided grade management software to document conversations with students.

Regardless of whether they are able to prevent the behavior, can stop it when it starts, or have to document it, most of the teachers talked about moving on from that as an important part of their response, using restorative practices when needed. Lindsay wishes her school district did a better job at incorporating restorative practices as a whole, but does what she can to bring the student back into her classroom in a restorative way following removal from class. Alice gave an example of a time when she used restorative practices to help understand why student behavior occurred after she had lost her patience with the student. She told the student:

“This is hard for me, like you have got to improve your behavior in my classroom because I cannot handle you acting like this. What is the deal? What is going on? Why are you acting this way?” And then you start to learn...it sometimes it takes that breakthrough moment where you lost your patience with a student, to be able to have that restorative conversation and start to develop a relationship with the student. And when you admit you're wrong doing to a student that's something that they do not ever hardly experience.

Alice believes that restorative conversations between student and teacher should be required for reentry to the classroom following any type of removal for challenging behavior. And Corey uses restorative practices without using that term. He has hallway conversations to talk about what happened, what the expectations are, and to listen to the student as they try to restore their relationship following an explosive incident in the classroom. Lindsay also uses these restorative conversations, wishing that she could completely rewrite the school handbook and discipline code to include restorative practices at all levels. Lindsay said, “I wish there was more of the restorative practice, you know, I mean, I wish there was more of the conversations. I wish there was a little bit less of just nothing but punishment.” Finding a way to move on from the behavior in a healthy way was an important component of the response to the teachers.

#### 4.2.2.8 Responding Outside of School Norms

The teachers who participated sometimes discussed challenging student behavior in ways that are outside of the school rules or norms. Dan said he was proud of a kid who fought back when a student was bullying him. Lindsay has had students reveal they accidentally brought knives to school and instead of turning them in, she encouraged

them to put them in their bag or kept them in her desk until the end of the day. Debbie will say things to students that she says she “ought not be saying,” like telling a student who was acting like they were going to punch her that “I would have taken you out.” She was building rapport with this student by bantering with him about what had happened. Carrie will tell students who are about to fight to “take it in the hallway because I don’t want to do the paperwork” in order to attempt to diffuse the situation. The common thread throughout each of these was that the teachers want to do what they believe to be best for kids when challenging things happen, even if what is best doesn’t fall within school norms or guidelines.

#### 4.2.2.9 Disconnect Between Thoughts and Actions

There was a disconnect sometimes between what they want to do and how they respond in the moment because they became overwhelmed by the situation and acted in a way they cognitively know is not the best. While these teachers had lots of stories of doing things according to what they think they should do to help students who present with challenging behavior, there were also examples they gave that were not what they wish they had done. For example, Alice wrote a referral for a student, saying:

I can't even really tell you what happened, I was probably just in a bad mood if I'm going to be honest with you. But I think that the student probably just would not listen, no matter what I tell him...I wasn't listening to my own advice, giving...four positive comments for every one negative comment...[I]t was everything...the student was doing that day was wrong...I was probably...just in a bad mood and I was done so, they were gone, you know, like “You're going.” And the student was confused like “What you're sending me out?” “Yeah and I'm



sending you out, get out of my room...I will send this referral later just get out of my room and go to the office.” And then, obviously later I'm like “Why did I do that?” like you know, I was just it was a bad moment for me, I was just frustrated.

Alice has lots of strategies in her toolbox for challenging behaviors, but frustration overwhelmed her and she acted in a way that she normally never would. Similarly, Angela was honest about a time when she acted in a way that was contrary to what she believes she should have done, saying:

I'll be honest, I've referred a kid once just because I knew we were going to do a project the next day, and I wanted to maintain the sanity of my room. You know, kid acts the same way every single day of the year, but I'm like okay, “I want to try to be successful with this project and I know you're not going to do it.

Because you don't know enough of the information to be successful. So I'm just going to go ahead, you're going to do something dumb today, I guarantee it. And I'm just gonna go ahead and write you up so that way you can be out,” that's horrible to say but like that would be honest.

Angela also talked about having times when she wanted to do something to help the situation, but watched it spiral out of control like an “out of body experience, you're just watching it knowing, ‘[Angela], like you're screwed. Like, you know, you're screwed.’ ...[Y]ou're watching it, but you can't stop it.” Debbie also talked about a time when she was yelling at a student despite knowing that yelling is not how she wanted to respond to the situation. She said, “I kind of laid into her a little bit. I thought ‘this is not really helping because this is what she's doing to everybody else.’” These examples give a realistic picture of the challenges the teachers face every day and their frustrations they

experience when responding to challenging student behavior. Alice talked about the restoration she seeks when she does not respond well, saying that it is important that she apologize and model positive relationships with her students.

#### 4.2.2.10 Considering Teacher's Role in What Happened

The teachers also discussed a belief that their response (and the response of administrators) to challenging student behavior should also hinge on the role of the teacher in what happened. Alice talked about how a lot of people put all of the blame for challenging behavior on this student, but she believes “you have to say... ‘What have I as the teacher done or not done to prevent this kid from being as successful as they possibly can be?’” Corey talked about accidentally “creat[ing] the environment for the students to screw up in” and that sometimes he might not prevent student misbehavior by the way he structures his class. He takes this into consideration when responding to challenging behavior, being more lenient when he feels like he was at fault for the environment. For Corey, his school leadership plays a role, saying, “[O]ur principal's pretty good at holding us accountable when something goes wrong that was probably in our sphere of influence.”

For Carrie, as a former administrator, she acknowledges that the teacher often plays a role in the challenging behavior of their students and took this into consideration when disciplining students for challenging behaviors. This carries over into her response to behaviors as a teacher, with an understanding that teachers have the opportunity to respond well or respond poorly to students when they behave in a challenging way.

Carrie said:

[Bottom line, they're the kid. I'm the adult. Their job as a kid is to push my boundaries. My job as an adult is to hold those boundaries or to allow them to be flexible, if that's what I decided to change in the moment, but I'm the adult and they're the kid.

She talks about the importance of the adult helping reteach behavior (or maybe teach for the first time) when students are struggling, and noted that if the teacher has not tried to reteach the student proper behavior, they are part of the problem.

Personality clashes were also a problem that teachers saw as a potential consideration that played a role in their response to behavior. If their personality was not meshing with a student's personality, sometimes they felt that the best response to consistent misbehavior was simply to have another teacher take that student into their class if possible. Both Carrie and Lindsay talked about being okay with a student being moved from their class to another teacher if that is what is in the best interest of the student when personality clashes impact student learning.

#### 4.2.2.11 Tensions

As teachers consider how to respond to student behavior, there are several tensions that they wrestle through that impact their decision about how to best respond, including the tension between caring about the student who exhibits the challenging behavior and also caring for the other students in the classroom, the tension of knowing how lenient to be considering how the behaviors students exhibit now will be unacceptable later, and the tension of wanting to allow students to start fresh and the reality that certain conduct impacts relationships, including their relationship with the student. Each of these is discussed in this section in greater detail.

#### 4.2.2.11.1 IMPACT ON OTHER STUDENTS

One of the most commonly-discussed considerations for the teachers in how they believe they should respond to challenging student behavior was the impact of the behavior on the students in the class. Their responses to behaviors are very much influenced by how the behavior affects other students, whether it is the other students' emotions (e.g., Dan intervenes when a student says something to another student making fun of a (dis)ability), their behavior (e.g., Alice intervenes more seriously when the comic relief becomes a distraction to the rest of the class, causing other students to engage in disruptive behavior), or their learning environment (e.g., Angela removes students whose disruptions impact her English Language Learners' abilities to understand the lesson).

Corey talks about this balance, saying:

[W]e kind of have to have the sliding scale in our head of how important is it for this kid to remain in the classroom and not have consequences verses how important is it for the students to not have a disruptive environment to work and how important it is for these kids to have their environment preserved. And a lot of times that's where, you know, we make that and say, "We gave you your chances but you're now treading on these students."

For Dan, one of the lines drawn is inappropriate sexual comments and behavior, noting that he had a student who was making inappropriate sexual comments and groping female students, saying, "It's certainly not acceptable for the for the female students in class." Dan also noted that removal from class was this student's goal and so the removal from class reinforced the behavior in some ways because the student knew that all he had to do was behave inappropriately and cross a line and he could leave. So Dan protects

the female students by removing the instigator, knowing that it might not be what is best for the student in the long-term to be removed from class. Similarly, Angela talked about how inappropriate racial comments have to be addressed because they impact the student they are being directed toward, but she also views this as something that she can handle in her classroom with a conversation about respect instead of sending them to the office, which she views as a last resort if it continues. She believes that respect toward others is an important skill for students to learn and works hard to help them to learn it.

All of the teachers talked about being able to handle comments directed toward them, but noted that disrespect toward the student's peers was the line that changed how they responded to the behaviors. For example, Lindsay said:

[T]hey have to be disrespectful to their peers. Because if they're being disrespectful to me, it's more of a conversation, but I'm really big about, you know, let's not belittle each other in front of other people because it's not, especially in middle school, it's not really a good thing to deal with.

One of the common responses to behaviors that impact other students directly (e.g., rude comments directed toward another student or acting in a way that prevents others from learning) was removal from class. Alice is understanding that every student will have a bad day, but removes students when they disrupt the class:

I mean it gets to a certain point where, yes, everybody is understanding that everybody has bad days. But if you are a disruption to the classroom environment, to the point where you can no longer be a part of this classroom environment, unfortunately you're going to have to spend the day somewhere else.

This is a last resort for her, as she tries general reminders of classroom expectations, conversations with the student, and redirection before removing them. But ultimately, she believes that the classroom environment for other students needs to be preserved, even if it means removing a student from class.

Angela talked about how giving more attention to students who exhibit challenging behaviors can impact relationships with other students:

[T]hen the other kids who are maybe the observers of that relationship also start to get hurt. You have some kids who are upset that you're giving so much time to a kid who doesn't care when there is a kid who does care. And that actually I have had students call me out on that. You know, "Miss [Angela], why do you put so much time up with him like he doesn't even want to do his work? Like, I want to work"...and then I feel completely also guilty. Like, "You're right."

For Angela, the relationship-building is such a key component of helping students who have experienced trauma, but notes that sometimes forming those relationships can hinder relationships with other students. Lindsay also talked about this tension, saying:

[M]y part of the argument is like relationship building and fix it. But really, the other part is like, "Okay, so I'm spending so much time with these kids. What about these?" But it does affect the classroom...sometimes it can cause that trigger effect of like it reminds them of their own stuff that they're going through, and then you kind of lose the class at that point.

Carrie talked about how it impacts the classroom when behaviors are not addressed, saying that it can cause other students to engage in similar behaviors and lead to an unmanageable classroom environment:

With the other kids. I do have that anxiety that if I don't nip this in the bud that they're going to start doing it too, and my whole class is going to become anarchy. And so I try sometimes to make that a relationship where I'm asking them for help. You know, "I need you to be a leader in my classroom."

Dan also talked about this issue, noting that when a student is particularly over the top and particularly constantly disrespectful to you then often...the other students will see that and then they'll start testing the waters, too. So that's, that's why it's important to try and...stop the behaviors as soon as possible.

These interruptions can also cause trouble for students who are struggling themselves to work in the classroom, as Corey pointed out about his students in the alternative school setting:

I talked earlier about sometimes having to remove a kid from class. Because I have other kids that are fighting their own battles their own demons to be in the classroom and be productive. And that's getting interrupted and they're getting frustrated and they are starting to fall apart because you are, so it's protecting those other students' abilities too.

For each of these teachers, balancing the needs of students who exhibit challenging behavior and the needs of the other students in class played a big role in how they believed they should respond to different behaviors.

#### 4.2.2.11.2 BALANCE OF LENIENCY

Teachers really wrestled with finding the right amount of leniency with students because they want students to know that they can have grace for their mistakes, but also

know that they will not always be given the same leniency and do not want students to continue in believing that they can get away with inappropriate behavior in other settings. Corey has students who view grace as an opportunity to get away with the behavior: “Again, the kids thrive sometimes on subverting the rules and being able to successfully argue their way out of it, instead of viewing it as grace, viewing it as ‘I beat the system, the system can't touch me now.’” The students at his alternative school have viewed the legal system letting them off without punishment in the same way as when they get out of consequences at school, as an opportunity for doing the same behavior again. Debbie also works in an alternative school and works within the same tension, saying “Not that I think that these kids need greater consequences because of you know whatever they're dealing with, but regardless of what you're dealing with, you still have to have a touch of reality.” For both of them, they give students opportunities for making progress without immediate consequence, but also believe that students need to understand that operating in the “real world” means taking responsibility for their actions and respecting other people. For example, Corey lets his students say whatever they want to say to him, as long as it is in private, but he counsels them that they will not have the same opportunities with coworkers or family members. Angela had similar struggles with knowing how to balance leniency:

“We're being lenient, we're being caring with you, but you're going to reach a point where as an adult, you're not going to get that leniency,”...having that real conversation. Like, I think that's kind of your job is to say, “Not that your trauma's not important, and, and you may not need to counsel through it, at some



point you have to grit through it and realize, ‘Until I change my circumstances, I still have to be a productive citizen.’”

Carrie had an issue with struggling with wanting to be lenient, but also wondering why administrators have a rule if they are not going to enforce it. Their struggles with understanding the balance of being lenient and sticking with assigned consequences tended to be amplified by a student’s trauma history, as they wanted to be more understanding with students who have been impacted by trauma.

#### 4.2.2.11.3 UNCONDITIONAL POSITIVE REGARD AND REAL RELATIONSHIPS

The teachers talked about the tension between knowing that they should be giving students unconditional positive regard (Rogers, 1957) and knowing that real relationships are affected by hurtful comments and disappointing behavior. The teachers all talked about giving students a fresh start after challenging behavior and moving on from it, but there were a few times when they discussed teaching students that teachers are human and that their behavior does affect people around them. They viewed this as important for positive attachment down the road, as students cannot treat everyone terribly forever and expect other people to be understanding and not have their relationships impacted by their behavior. Corey talked about this, saying:

[F]or a lot of our kids that we deal with, they have these reactive attachment things where...anytime they feel that they're getting close to somebody, that's when that person breaks it off disappears and goes away. So they want to be the ones that are in control of doing that...[T]his kid may have said something about my mother, whoever and the next day I greet him with a smile....But at the same time, I do express some frustration with them in the moment because I do want

them to know there is some level of disappointment, whether it is in an academic performance or if it's a behavior choice...I do invest myself some and how the kids perform and how they behave and all of that. So I'm not opposed to like actually showing some of that frustration, or you know, I've been known to do an angry feet stomp in the middle of class when we hit one of our struggle moments. Similarly, Angela recognized that she has been told that students should get a fresh start every day, but said that that does not always happen in real life, saying “[Y]ou don't always get a fresh start the next day....It's okay to be mad for a while. It's okay to be upset and hurt for a while.” She still welcomes them into her classroom and wants them to know that she cares about them unconditionally, but demonstrates her frustration as a teaching point for the real world.

#### 4.2.3 Links to Incarceration

Considering the behaviors that teachers explicitly linked with incarceration, they tended to be behaviors they find should be referred to an administrator (e.g., drug dealing and use, criminal activity, gang involvement, fighting). They talked about how they typically do not have connection with what happens with students when they are referred to administrators, making it challenging for them to be part of the solution to these behaviors. This might explain why they linked incarceration with these behaviors—the less impact they viewed they could have, the more likely they were to view the behavior as having the potential for incarceration. For example, absenteeism was linked with increased risk because of their inability to help these students. For example, Carrie talked about students who “float in and out of my classroom. They're there for two weeks. I don't feel like I have a whole lot of impact on them.” She noted that every student has the

ability to make good choices, but that when she does not have the opportunity to teach them how to make those choices and they do not have the opportunity at home, they are more likely to make choices that will lead to incarceration. She also said, “I don't think any kid that I've ever taught, no matter what happens, they're going to go to jail.” Alice also talked about attendance issues being an indicator of future incarceration, noting that

when you found the root cause of the attendance and if it's something like that where...“I don't come to school because I don't have clothes to wear and I feel like I stink because I, you know, can't turn the water on my house,” like those things we can fix but we can't fix your your parent telling you they don't care whether or not you go to school. You know the, you have no boundaries at your home.

Alice's view was similar to Carrie's, which is that when students are not at school, it makes it challenging to make an impact on them, but almost anything else can be helped with teacher or school intervention.

Another thing that they linked to increased risk of incarceration was the student's own belief that they would end up incarcerated, which teachers felt helpless to change. Angela talked about students who believed that prison would be a better option for them than what they are currently experiencing, saying:

I guess one of the ones that upsets me the most is some kids just think that that's their option. And like, I've had kids tell me, like I said, the one I had a few years ago, he told me he would get more meals in prison than he would get at home. I don't know how to respond.

Alice had a similar student interaction, with the student saying “I'm going to go to prison anyway” and her realizing that she did not know how to respond. She said, “You know

and that's the hard part is that those are the kids that are sometimes the easiest to give up on because they, they are showing you that they don't care.” Corey talked about a student who similarly openly said that they were headed to prison. Corey said, “[His] mindset had already been cemented by the time, at least for me personally, by the time I got to interact with them. His comment was, ‘within three years I'll be in jail.’ And he was.” Corey saw that this student’s attitude of thinking that incarceration was the only option impacted his ability to intervene and help the student. Similarly, Debbie has had students who believe prison is just part of life: “And so, a lot of these kids due to the nature of the life they live, you know ‘[T]hat's...just as a part of life. So what? Big deal.’” This attitude makes it challenging for her to get through to students who exhibit challenging behaviors and impacts her perception of their likelihood they will end up incarcerated.

#### 4.2.4 Discussion

Behaviors that teachers found to be challenging often aligned with behaviors that are symptoms of trauma, including withdrawal, perfectionism, and extreme emotional responses (Anderson-Ketchmark & Alvarez, 2010; Crosby et al., 2015). The behaviors they discussed also were in line with the behaviors that Westling (2010) found teachers believe to be challenging, including defiance and socially unacceptable behavior. The teachers also spoke of seeing challenging behavior that results from poor communication skills, like overreacting or misreading a situation (Cole et al., 2005). And they see the link between a student’s sense that safety needs have not been met and their tendency to react to situations in a way that does not make sense to those around them (Maslow, 1943). Their relationship-centered interventions are in line with the literature on best

practices for responding to challenging student behaviors, particularly trauma symptoms (Brunzell et al., 2016b; Chafouleas et al., 2016; Crosby et al., 2015; Crosby et al., 2017).

The tensions they discussed highlight the difference between the ideal world and the real one, as teachers try to navigate between what they know they should do and how they feel and react as things are happening in real time. For example, they talk about the tension between wanting to care for students who experience trauma, yet also knowing that taking more time to care for them means spending less time caring for other students (Alisic, 2012). The findings from this study are in line with Kokkinos et al. (2005), Brunzell et al. (2018), and Abidin and Robinson (2002), as teachers reported stress and frustration impacting their responses to student behavior in the moment, contrary to what they believe they should do. However, they do desire to always respond in a caring way to help fulfill the students' needs for love (Maslow, 1943), as they know that students who have been impacted by trauma often act out because their ability to form healthy attachments can be diminished because of the trauma they have experienced (Brunzell et al., 2015; Brunzell et al., 2016a; Brunzell et al., 2016b; Cole et al., 2005; Pickens & Tschopp, 2017).

One interesting note is that the teachers tended to believe that their interventions with students can work, but then have a more pessimistic view of their capacity to help students who seem to be on their way to a life in the justice system. It is a chicken and egg conundrum—do they believe that students are on their way to a life in the justice system because they cannot help them with the interventions they currently have in their toolbox? Or do they not believe they can help them because they believe that they are on their way to the justice system and are therefore beyond help at this point? They tended to

view behaviors that were outside of their control or ability to impact as more likely to lead to incarceration. More research is needed to determine the reasons why teachers might view students as beyond their ability to help.

Connecting to the results of the ARTIC survey, female survey respondents were more likely to view behavior as malleable and able to be changed by intervention resulting in higher scores, on average, in the Underlying Causes subscore. This difference was not present in the interview responses, as all of the teachers similarly struggled with the tension of the possibility of changing student behavior and the reality of challenges they faced, regardless of gender. The question remains if this is because of the impact of the presence of the interviewer or not, or factors of the particular participants and their experiences. Perhaps teachers respond differently when their results feel anonymous versus when speaking with a researcher. As far as the interview participants' scores in the Underlying Causes category, male respondents, Corey (6.14) and Dan (6.00) were neither the highest (Lindsay, 7; Carrie, 6.43) nor the lowest (Debbie, 4.71; Angela, 4.86) on this subscore. One potential explanation might be that both Dan and Corey have personal connections to trauma (e.g., personally experiencing it, having many students who have experienced it), so their scores might stand out compared to other male respondents who had less personal exposure to the impact of trauma on development. Further study is needed to understand this connection between teacher gender and the teachers' view of behavior as malleable or fixed. Additionally, while Baker et al. (2015) found a correlation between the Underlying Causes, Responses, and On the Job Behavior subcategories and personal familiarity with trauma-informed care,

this study found no statistically significant differences in these categories based on amount of training received.

In the discussion about connection to a life in the justice system, there were mentions of bias in discipline in schools for challenging behavior that lead to Black students being more likely to end up in the justice system (Angela, Lindsay). The two teachers who most often spoke of this have Black and biracial family members (children, husband, ex-husband, etc.) and were more sensitive to racial aspects of school discipline as a result of their proximity to family who may face these problems. Since these disparities are well-documented and teacher bias plays a role (e.g., McIntosh et al., 2014), the teacher responses about challenging behavior were analyzed for hints of racial bias. Aside from the conversations regarding concern over disparities, the teacher interviews did not contain comments that would suggest racial/ethnic bias, either positive or negative, toward any racial/ethnic group. However, there were hints of gender bias in the way the teachers viewed challenging behaviors, as well as bias based on socioeconomic status and learning (dis)ability. Teachers were more likely to ascribe overtly disrespectful, aggressive, and disruptive behaviors to male students (e.g., Alice, Angela, Carrie) and withdrawing and attitude to female students (e.g., Carrie, Dan). There was also discussion about other teachers having negative bias toward students with (dis)abilities (e.g., Allday et al., 2011; Gregory et al., 2018), though the teachers interviewed believed that their students with learning and behavioral challenges needed rigorous mathematical tasks and tried to hold them to high behavioral standards (e.g., Corey, Angela, Carrie). Their belief that students need to be held to high standards while loving them through their trauma symptoms is in line with Cole et al. (2005) who found

that when standards are lowered for a student, they can perceive that the teacher believes they are incapable, which can impact their own self-worth. Angela was particularly passionate about this as a mathematics-turned-special-education teacher, consistently seeing lowered expectations, both behavioral and educational, for her students with (dis)abilities. And teachers were more likely to bring up a student's socioeconomic status when talking about their challenging behaviors or trauma if they were not from an affluent area (e.g., Carrie, Dan, Lindsay), so the deficit perspective that Lafferty and Pang (2014) were trying to fight against using their intervention with teachers was present in this study.

Several of the teachers either explicitly talked about restorative practices (e.g., Anyon et al., 2016; Gonzalez, 2012) or use restorative practices without calling them by that term. While they might not all use them as formally as Alice or Lindsay, most of the teachers find ways to restore relationships after challenging behavior leads to a removal from the classroom, and most of them wish that administrators used an approach more similar to restorative justice in their interactions with students.

It is also worth noting that the behaviors teachers associated with office discipline referrals and suspensions, which are associated with the pipeline (e.g., fighting, disrespect of authority, flying off the handle) were generally behaviors they can respond to. The teachers believed they can make an impact on these behaviors. Yet trauma symptoms also appear in the incarceration risk category for many of the teachers (e.g., inappropriate sexual behavior, fight or flight response, impulsivity, violence at an early age), and teachers had trouble viewing themselves as able to impact these through trauma-informed practices. This suggests that the whole-school approach to trauma-informed care (Cole et



al., 2005; McInerney & McKlindon, 2014) is needed to help fill in the gap for the behaviors that teachers are unable to react to effectively with trauma-informed care practices. Other negative outcomes aside from incarceration (e.g., teen pregnancy, early death) were also discussed as resulting from challenging behavior.

### 4.3 Research Question 2

Here we consider the answers to Research Question 2: What do mathematics teachers believe about the ability of mathematics education to make a difference for students who present with maladaptive behaviors? (a) How does their perception of their ability change when they know that the child has experienced trauma? (b) How does negative behavior change their perception of the student's future success?

#### 4.3.1 Mathematics Education and Behavior Intervention

The teachers speak about mathematics education in terms of the teacher's relational choices and their content choices (and there probably should be discussion as to whether content choices and relational choices actually can or should be separated), and the teachers made a clear distinction between their ability to help students as a mathematics teacher and the ability of the content they teach to make an impact on students. They believe that teachers have the ability to make an impact on students, though with some limitations, but their role as mathematics teachers was more challenging for them to discuss, as was the impact that mathematics content has on the students. This section starts with a discussion on their perceptions of their impact as teachers in terms of the relational choices they make, then goes into the distinctions they make about specifically being a mathematics teacher and their content.

##### 4.3.1.1 Teacher Impact

The first thing to note is that the participants believe that in their role as teachers they can and do impact students who present with challenging behaviors, though they do believe there are limits to their impact. For these teachers, their relational choices were more central to their impact on students than the content they teach, and when they talk about their role with students as their mathematics teacher, they often do not even mention mathematics content as part of the impact they have on students. Alice talked about how the questions during the interview made her rethink how she viewed herself as a mathematics teacher:

And I think that this interview has just really opened my eyes on like like when you use the word mathematics like when you like put the adjective mathematics before teacher it's just like different because, like I've never really thought about...how impactful it is for me, me to be their math teacher versus me just to be their teacher.

For a lot of the teachers, many of their comments could be made about general teachers of any content area, as they talked in general terms about impacting their well-being, their decision-making, and their future plans and interests.

#### 4.3.1.1.1 IMPACT ON STUDENT WELL-BEING

The teachers' experiences with students who exhibit challenging behaviors in the classroom have led them to the belief that teachers can impact student well-being through love, care, support, and encouragement. Dan tries to use empathy to reduce their stress: "I try to empathize with them understand where they're coming from and how what I do impacts them and try to take away from their stress and their stressors, as opposed to

adding to it.” And Alice also views her classroom as a refuge for students who present with challenging behavior because of her encouragement to them. She says her role is

[t]o be a supporter and understander or listener, encourager...I'm somebody that they can go to even when they're not in my class. Because I hopefully...they can see that I am willing to understand them, maybe more than other people, so when maybe in other other rooms, they might feel misunderstood, or like they're not being heard, they might be able to come in here and take refuge.

Corey talked about being a support system for his students who present with challenging behavior so that they have someone to trust and lean on, noting that consistency is key in his interactions with them, saying, “I think...one of my biggest roles is consistency.

Again, consistent responses, consistent expectations, consistent emotional investment.

Again, when they're there I'm glad to see them and I make sure they know that.” He also talked about their physical well-being, noting that he does what he can to impact students by meeting physical needs (e.g., winter coats and food). Carrie similarly talked about “being an example of Christ” and giving these students a “safe space to talk sometimes, to open up.” Lindsay also talked about giving students a safe space, and Dan talked about meeting needs for students with challenging behavior, saying:

[I]n addition to trying to teach them algebra or whatever, it's just to be an advocate for them...to be a sounding board...whatever is that they need....[E]verybody's different. Everybody has different needs. And so I'm just trying to help fulfill or get them to the person who can help them fulfill whatever it is that they need individually.

Alice noted that when she thinks about students with challenging behaviors, particularly students who have been impacted by trauma, she thinks about her impact on their well-being as primary:

This is so funny because it's just...I don't think about the mathematics. Like I just think about the kid and like teaching the kid and like loving and caring for them like I keep saying. So it's like I'm still going to love and care for them in the same way, and maybe even loving care for them a little bit more, and like encourage them in the math, but like I'm really just trying to show them that somebody loves them and cares for them.

Based on their experiences, the teachers believe that it is possible to impact students who present with challenging behaviors by caring for them and meeting both emotional and physical needs.

#### 4.3.1.1.2 IMPACT ON STUDENT DECISION-MAKING

The teachers also discussed their impact on students who present with challenging behaviors in terms of their impact on the students' decision making skills and ability to make healthy and positive choices. Lindsay talked about how helping them understand the differences between making positive choices and negative choices may lead to better behavioral and life outcomes, though she was hesitant to say for sure:

[T]hey have the responsibility to make decisions and they have the just those lessons in school of, "Okay, there are decisions, you can make a good one or a bad one." Maybe just knowing that can help them prevent making a bad one. You know, I mean, maybe, hopefully.

Debbie also believes that she can help students make better choices, saying: “My poor kids hear, ‘Choose wisely. Choose wisely. Choose wisely.’ all the time, even in the midst of this stuff that they're doing.” Debbie’s rules have always been “Be respectful, be the best you can be, grow,...choose to do one thing more each and every day, choose to be better, choose to make the life of somebody else better, do something for somebody outside of yourself.” The common theme is that she believes that not only can she impact her students, but that they can impact the world by making good choices. She works to teach them what behaviors are acceptable in the “real world” and holds them to a “higher standard on a consistent, constant basis” to help them make better choices. Similarly, Carrie believes that every student has the ability to make right choices, so she focuses on teaching students who behave in challenging ways how to make better choices in life:

So you have to teach them how to say no and how to stand up and make those right choices and they don't get that. They don't get that opportunity. They don't get that at home because maybe even at home, people are making those wrong choices already, and so we have to teach them how to make the right choices. So you got one kid who's going to have 10 opportunities to make a wrong choice and one kid that's going to have one opportunity to make the wrong choice. So those kids really need a lot more attention on how to say “no” and how to make the correct choices.

Carrie also believes she makes an impact for students, both those who exhibit challenging behavior and those who see the behaviors of other students, by modeling appropriate behavior for them:

They've probably already seen kids get shouted at, getting written up so to have a teacher not do that I think makes an impact on...humanity and how people can choose to react and behave. So I think being an example of that for those kids...that just because somebody doesn't do what you...want them to do, there's other ways to respond besides just yelling at them or writing a referral. So I think that impacts my classroom a lot and I think it makes an impact on the kids who are exhibiting the behaviors, because you know, what do they want from the behavior? Do they want my attention? Do they want the other kids' attention? So if I remove them from the classroom where I remove those things from them, we can get to the heart of, like, "What's really going on here?" That might be one of the first times people have ever actually listened to them....It just gives them another way.

The teachers believe that showing students how to make better choices is an impact that their relationships have on the students who behave in challenging ways.

#### 4.3.1.1.3 IMPACT ON STUDENTS' FUTURES

Teachers also believed that they can impact students who present with challenging behaviors by changing their perceptions of life and helping them to become productive citizens. For Dan, training students in order to change their future for the better is an essential aspect of his job:

We're kind of training to be more productive citizens, overall, instead of just the education. Not to say that education isn't so important because it is, I mean you have to have a base knowledge of something or a base understanding that you got

to work toward something to make things happen. But you also care about the person.

Dan believes that teachers can change the trajectory of a student's future by interesting them in something "more than whatever it was that was getting them in trouble."

Alice talked about changing their futures by helping them become more productive members of society:

I think sometimes it depends if people continue to pour into them and show that they care. And oftentimes then finding the adults that they need to support their development until their brains can develop well enough for them to be able to support themselves is really critical. And unfortunately, some of them might not find that after high school and it does not go well for them...

Alice's belief in the ability of a teacher to make an impact on students who present with challenging behavior is strong, but she also sees that sometimes students do not receive the kind of love and support in high school that leads to healthy boundaries and decision-making.

Lastly, Carrie talks about being an example for students so that they can see that relationships can be positive and so that they can make positive choices in relationships in the future:

You know, like, being an example for them. Again, the choices that people can make even when you're hurt or even when they treat you like crap. But showing them that people aren't always bad. I think that's the impact that I have more than the mathematics.

Overall, teachers believe that they impact students' futures in their capacity as their teacher.

#### 4.3.1.1.4 LIMITS TO IMPACT

Teachers both strongly believe in their ability to make an impact and believe that there are limits to their impact. Lindsay believes that teachers can make an impact on students who present with challenging behaviors, but thinks it is hard to say how much of an impact she is making, saying:

I would like to think I have had a lot of impact...I think every teacher wants to be that one teacher that changes a kid's life and it does happen. I mean, it's very possible....[As] a middle school teacher like you don't really know. Just every once in a while you hear if one of your former students who got shot or something like that, which is horrible, [or] went to jail because that has happened, but I don't know, it's kind of hard to tell what my impact is just because of the time period that I have them.

Lack of perceived support in other parts of the school leads Lindsay to be more pessimistic about her ability to make an impact on students she feels are likely to end up incarcerated, noting that she could spend her entire life trying to help students, but she's "just one person" and it takes the support of an entire school to make an impact for students who seem to be on their way to the justice system.

Even with the limits they believe hinder their ability to make an impact, they still speak hopefully. For example, Corey said, "It's troubling seeing some of these and we're doing all of these interventions that we can and just hoping and praying." He feels a sense of desperation when helping some students, but still hopes for their future. And Dan,



even when he feels like he does not know what to do to help a student, believes there always is something that can be done to help:

I wouldn't say no matter what I do...I would say more, I don't know what to do.

But there's something that someone could do to help these kids. It's just we got to figure out what it is, but there, there are definitely kids that I worry about them going to prison.

Even with a student who “gropes and makes horrible comments and things like that” whose “earliest memories of sexual fantasy are so outside the norm,” Dan believes that this student could follow that negative pattern, but that “there's bound to be something that will help him.” This balance of hopefulness that something could help these students and the reality that some of them are still going to end up in prison was a common theme in the interviews.

#### 4.3.1.2 Impact of Mathematics

While many of the examples given were based on relational choices by the teachers, sometimes they viewed the content they teach as able to make an impact on students who present with challenging behaviors by refocusing their energy and giving them the opportunity for a better future. They also viewed their ability to make an impact through mathematics as limited.

##### 4.3.1.2.1 CHANGE IN FOCUS

One theme that came out of these conversations was that some of the teachers viewed mathematics as an escape for students, turning their focus onto things that would improve their future and decrease the likelihood that they would continue to engage in behavior that negatively impacts their future success. For example, Lindsay said:

The more educated you are on everything, maybe the less likely you'd be to kind of get involved in some of that stuff. I mean, I feel like there's a...correlation. Not necessarily. I mean, you know, there's some very bright people who have made bad decisions. But I would like to think there's a correlation of, if I can help educate these kids, maybe I can help prevent them from making bad decisions. Which I know is unrealistic, but wishful thinking.

For her, funneling students into mathematics content is helpful, though you can tell there is a hesitancy in her comments, as she seems to think that there is a potential for it to help but is also realistic about barriers students face. Dan also believes that refocusing student energy from challenging behaviors into the beauty of mathematics can change their trajectory:

I view math as, most problems are puzzles and so it's, it's like a game. And so when learning something can be fun, because if you can convince them to just play the game until you figure it out...then hopefully they will refocus their obsession.

Dan gave the example of how he became fascinated by the proof of the theorem that the length of the diagonal of a square with side length one unit is irrational; he realized that sometimes that students can funnel the energy they are putting into negative behavior into exploring these types of mathematical ideas. He said:

if you could get them to be fascinated with [math] instead of, you know, making 100 bucks by carrying...this brick of weed from here to there,...if you can change/refocus their obsession then I think that you might have a chance to keep them out of prison.

Carrie also views the mathematics as having the potential for changing the focus of the student into a more productive outlet, saying:

[M]y number one goal is to make them understand that math is not terrible. You know, to teach math and to make sure that they don't hate it when they leave me. Maybe they don't love it but to really see the beauty of mathematics and you know, I think if we focus on that then that gives them an opportunity to see things in a different light overall, in everything that they do.

Corey also believes that having content that has practical significance helps funnel student thinking into a more productive outlet:

You know, when you turn school into something essential of “Hey I can actually use this to benefit my family, I can use this,” to this rather than this superficial idea of intelligence, intelligence that I'll demonstrate at a higher learning...you can aid in some of that immediacy of results.

#### 4.3.1.2.2 MATHEMATICS IMPACT FOR THE FUTURE

Similar to their view of relational choices, mathematics teachers viewed their content choices as having an impact on students by giving students who present with maladaptive behavior a chance at a better future. For example, Debbie talks to them about their future career choices as a framework for why they have to learn mathematics. When her students tell her that they will just “use a calculator” or “figure it out,” she uses real-world examples (e.g., having to take exams without calculators to become a nurse, being able to write bids for construction jobs by understanding how much material they need) to help them see the value of mathematics in their future career. Dan also thinks about the impact on their future career, saying:

In general education, but particularly math...[t]here's so much need for it in the modern world with technology and so on. And there are so few people who do it well as adults....If they can get good at it, they can be incredibly successful. They can write their ticket to almost any job and certainly a better future than the criminal justice system. So, you know, I would just appeal to...make the, the obvious choice. Pick education over prison.

For Dan, framing mathematics in terms of how they can use the content in the future gives his students a framework within which they can see themselves making better choices for their life in general. He also talked about specific lessons he has done to try and help them understand how mathematics can be used to change their perspectives on their decisions:

[T]hen we looked at statistics and did a statistical analysis of...the average lifespan of gang members and you know, annual income and... I don't know how much impact that made [on] all the kids, but I certainly hope that there's somebody who's paying attention.

Another way that teachers talked about the impact of the mathematics content was the impact on students to retrain their brains to think logically and be able to solve problems, even ones that are not directly related to mathematics. Debbie said, “[M]athematics is a basic thought process, you know, a way to think logically and think through things. It's a problem solving technique, it is a follow the problem to a logical solution, you know, a reasonable solution.” She believes that teaching her students how to think mathematically changes the way they face the problems in their lives:

[I]f they're taught to think logically,... systematically,...to play with a problem and work it, stretching, molding, and shaping, moving in different directions...,there are so many ways that they could come up with a different solution....[O]ne, don't go to jail, but it might be a totally different thing. You know, I might need to, you know, go to a foster home, I might need to...get out of my environment...,to apply myself more to school...,have a mentor to walk with. I mean, all of those are viable possibilities to get the same result. Don't go to jail.

She has hope that teaching them mathematical thinking skills will improve their chances at managing the circumstances that often lead to their challenging behaviors. Dan also talked about mathematics as a means of logical thinking, saying, “[M]ath teaches you to think logically. It teaches you to solve problems in more ways than just math problems because you, you learn to attack...a situation from a logical standpoint, you know, systematic repeatable processes.”

Teachers also believed that they could impact students who exhibited challenging behaviors by teaching them coping skills within the mathematics context. For example, Angela said:

I would say that my role...is to make sure that they know that you don't have to be perfect at it to continue at it because then that's your life lesson for everything else...you're going to fail, you're going to get something wrong. That doesn't define who you are. That doesn't define your future. That doesn't mean you can't get this job because you, you know, couldn't do this. And so for the math part,...[my] goal of making these students turn into members of society, I think

that my role is to give them coping skills, if you will, of how to recognize their stress.

She believes that mathematics provides a unique context within which to learn coping skills and fail productively. Alice also talked about helping students by

retraining their brains to do things that are hard and to be able to use maybe some of the coping mechanisms that they've learned in life...to continue mathematics when it gets hard, or when you don't have a frame of reference for how to do it or if you do something wrong the first time, like being able, being able to have that opportunity to do it again, or to shift to/for somebody to care enough about you to, to try to walk you through a problem too, so that you know how to do it on your own. You know hold your hand and walk beside you...

The teachers believe mathematics is a good context for teaching students how to cope with failure and mistakes in a productive way.

#### 4.3.1.2.3 LIMIT TO THE MATHEMATICS IMPACT

Similar to the limitations they see on their relational choices to make an impact, they also viewed mathematics content as having limited ability to help in students in certain circumstances. Despite the potential for mathematics content to change the trajectory of his students' futures, Corey also notes that “[f]or some kids [prison] almost feels inescapable.” And many of the teachers have a desire to make an impact, believe that impact is possible, but feel ill-equipped to help kids who are on a bad trajectory, partially because they think they are only able to have a limited impact this late in the child’s educational career (grades 8-12). Lindsay talked about this, saying:

I think some of it's just because...you see them already making bad decisions and refusing to make good decisions that it kind of leads you to be like, "Well, if you're already starting to involve yourself in some of this stuff, what's going to happen later?" You know, we know that the pipeline exists. It's unfortunate but you know, we've got to figure out something.

She believes that mathematics can make a difference for students, but sees that the impact is limited by the choices that students continue to make despite her best efforts to help them. And in Alice's experience, the limitation is rooted in the fact that she has them so late in their mathematics career. For example, she talked about a student she had who struggled with challenging behavior and had negative life outcomes after graduation:

I didn't have them until they were, I think, a senior repeating my class so at that point, I don't really have enough time with them to make enough of an impact, I can try as hard as I possibly can, and I do with the hopes that it will, it will work but sometimes it just doesn't.

She did not give up on the student while she had him in class, and believes that mathematical thinking can help students like him, but sees that her impact was limited by the choices the student was already making when he entered her class.

#### 4.3.1.3 Change in Perception Due to Trauma

Teachers' perceptions of students who exhibit challenging behaviors as a symptom of the trauma they experienced were similar to their perceptions of any student who exhibited challenging behavior, with their perceptions of challenging behavior being rooted in the idea that students behave in challenging ways because of unmet needs or things that have happened to the student. Like their general perceptions of their impact,

they did express difficulties in making an impact for some trauma-affected students.

Debbie, for example, said, “Some of them are doing okay. Some of them, not so much.”

Carrie’s experience is that trauma-impacted students can be challenging for her to reach, saying:

I don't know that I always have the opportunity with...traumatized students because...they won't open up to me. A lot of times we talked about them being more introverted sometimes....So they're that kid that sits in the corner, you know, that I might check on but they won't ever tell me about what's going on in their life....My role is the same for all students, regardless of what they've been through, but I, I do like to open myself up and be there in case in case they do want to reach out.

Carrie notes that all students have something going on in their life that is impacting them, but notices that trauma-impacted students are less open with her about their life and more difficult to reach through relational interventions.

As far as differences between trauma-impacted students and those who have not experienced trauma, Dan believes that he can make an impact on students regardless of trauma status, but noted that trauma-impacted students seek a way for their needs to be met at school more frequently than other students, saying:

In my experience, a lot of the trauma affected students have missing needs and missing pieces that they're kind of hunting for....while non trauma affected students can benefit,...and a lot of times we'll, we'll still try to meet those for them so that there...isn't this like singling out...a lot of times they don't necessarily seek those needs out or do things that call for that. So I think there are different roles.



For him and for other teachers, the way to impact trauma-affected students looks different. Alice talked about how she thinks differently about students who have experienced trauma because of the impact trauma has on brain development:

I don't blame them. You know it's not their fault, I know that because I formed a relationship with them, but I'm sure I'm sure teachers that [talk]...about students...that they envision going to prison, that you then told them about all the trauma. I can guarantee you that if they're a decent human being, as I said earlier, that they would have a change of heart. But that's why we need to know those things before they exhibit the behaviors.

Alice believes that teachers can make an impact on any students who exhibit challenging behaviors, but believes that knowing that they have been impacted by trauma can make teachers more understanding and then impact the choices they make when helping those students. Debbie also talked about the difference in the way that she can impact trauma-affected students, saying:

I know we're talking about traumatized kids. But if you look at it, just a plain old normal person that appears to be happy...they've got trauma in their lives as well. It's just that they have learned to adjust accordingly and the levels that our kids have is more like a pressed down, shaken together, overflowing kind of a bowl as opposed to one that's manageable....[I]f you've got a bowl and it's overflowing to where everything just kind of comes out everywhere is what happens to trauma, because even if it's one where they're not the volatile ones, you know, all the yuck comes out and everything they do it comes out in their demeanor. It comes out in expressions, it comes out [in] feelings. And so I guess part of our job, I guess, is

to get some of that out of there. So they've got room to allow good things in because you've only got enough room for so much of whatever.

For Debbie, it is important for her trauma-impacted students (which is most of the students she has in her class at the alternative school) that she focuses on helping them get to a healthier level of functioning. And for Angela, their status as trauma-affected makes her impact more urgent:

I think my mental state is a little different, like you can't give up on one that you think is trauma affected. Whereas like another one, you're like, "Oh, that cute little girl, somebody else will take her under their wing." And it sounds bad to say, but like the trauma ones, the ones that you know are tough, the ones who you know are going to fight back, like I feel like my role is different because I can't give up on them. Because there may not be another teacher this year, there may not be another teacher next year.

In Angela's experience, trauma symptoms can make it more challenging for other teachers to care for these students, so she views her impact as significant for them more so than for other students.

As for their impact in terms of mathematics-specific education, the teachers tend to view mathematics as having little impact for trauma-affected students. Carrie spoke about one trauma-impacted student she worked with, saying that on the days when the student would engage with her, she found that she made an impact on her educationally, but not necessarily personally, saying that she has impacted her mathematical confidence and understanding, but also noting, "as far as the overall, you know, being able to deal with the trauma, I don't know that my encouraging her in mathematics has really helped

her deal with her trauma.” Other teachers talked about content as less important for trauma-impacted students than for students who have not been impacted by trauma, saying that what makes the impact for them is the relational aspects of teaching, like the love and care they show to students. For example, Alice spoke of the interview as “awakening,” saying:

[T]he students that I think we've kind of clearly distinguished...even as a trauma informed instructor I've kind of clearly...separated the camps almost like this camp of trauma-affected or you know misbehaving and maybe just try to pass and get out of this class and students that maybe they have a little bit of trauma but I'm not seeing it and I see them as potentially going into a career field that requires...them to be strong in STEM. So I think that those students that I would put in this camp, I think I push them harder in class...I will push them to you know explain more you know, give me more than what I would expect of this student. I'm okay with a certain level of mediocrity...[S]o you know I think I myself need to, to be willing to, to a certain point push the student beyond maybe what my own expectations say that they can get to because I think I'm, in some cases I'm probably limiting them.

For Alice, as the interviews progressed, she began connecting the dots between what she says she believes about students who have experienced trauma and her treatment of their mathematical skills. She firmly believes that she can impact them through trauma-informed practices, but realized she limits them in terms of content importance because of her own perception of its importance for them as they deal with the ramifications of their ongoing trauma. Angela also talked about the content as less important for trauma-

affected students than relational choices, noting that their “pretty darn rigorous scheduling pacing map” gets in the way of being able to relate to their students:

[You] take a step back to, like, “Hey, what are you doing for lunch today? Do you care to come in here and sit?” to kind of remind yourself. Because you know how it is at the start of the year. You watch some motivational clip and you got told that you're the greatest teacher and you're ready to fix every student and then it starts to fade and you go through, because you're so stuck with the content.

Angela has made a conscious choice to put the student’s emotional needs ahead of getting through the content, noting that she feels comfortable to set aside the content when needed because she is tenured and does not worry about ramifications. She said that beginning teachers may not be as forgiving of students not completing tasks because “you don't have time to be empathetic, or even sympathetic if you're worried about your own job, you know, you're worried about losing your job if you don't stay on a pacing map.”

The idea of setting aside the content to care for students’ emotional and physical needs came up quite often, and Corey summarizes the reason why well:

I mean it's, [math content is] not existent to them...their priorities pretty much live with: “Do I have somewhere covered to lay my head, do I have food tonight, do I have money to buy things for fun? And is my phone charged?”

Debbie talked about having to set aside the content to deal with what students are going through and to help them process, saying:

If we could get through a whole day with, you know, having a whole class and...being productive mathematically, that would be awesome. But a lot of

days...we just have to stop. We'll go for a walk... [or] do a little isolation...[You] work as hard as you can to accomplish the things that need to happen, but being flexible enough to allow the kids to feel safe enough to have their meltdown...to basically help them head off the overactive explosions and be productive in [a] community environment.

The teachers recognize that sometimes, students' trauma impacts their ability to process at a higher level and that their role as their teacher is primarily to help them get through their trauma.

#### 4.3.1.4 Challenging Behavior and Perceptions of Future Success

The teachers see many impacts that challenging behavior has on the students' future success, from having trouble with future mathematics courses to struggling to meet the needs of their future family because they cannot get a job or end up incarcerated. Here, we consider how teachers view challenging behaviors as impacting student self-perception of future success, the student's future employment, future educational opportunities, and risk of incarceration.

##### 4.3.1.4.1 STUDENT SELF-PERCEPTION OF FUTURE SUCCESS

For some of the teachers, the impact of the behavior of the student's success was based on a student's self-perception of their futures because of their current patterns of behavior. For example, Dan said:

I think it does have impacts...if they can't show certain consistent normalized societal behavior...instead of getting in their head that they can fix it, they can adjust it when we call it out on it, there's a potential they pick up this idea of: "This is just who I am, this is how I am, this is how I'll be, I guess, I need to

adjust my life goals to fit this is how I am.” So I think it does have a negative impact on them if they can't make those changes.

He believes that the student's choice to pursue different goals because of their views that they cannot change because of their current behavior can define their future trajectory if a teacher cannot intervene. Corey also saw a similar future for students who believe their own futures are set based on their current choices, noting an interaction with a student that was disheartening: “...because their mindset had already been cemented by the time, at least for me personally, by the time I got to interact with them. His comment was, ‘within three years I'll be in jail.’ And he was.” For Corey, this student's mindset being made up made it challenging to intervene. Angela also has tried to talk to her students about making better choices, but sometimes they seem content to go to prison in the future:

I guess one of the ones that upsets me the most is some kids just think that that's their option. [A kid] I had a few years ago, he told me he would get more meals in prison than he would get at home. I don't know how to respond.

Angela, like Corey and Dan, saw that students were capable of making changes that would lead to better future outcomes, but their students did not see the same future for themselves.

#### 4.3.1.4.2 FUTURE EMPLOYMENT

Another impact teachers viewed their current behavior had on their future success was in the student's ability to get a job and maintain it. Carrie talked about this, saying, Well, if they keep doing them it's going to [have] a big impact on your future success. And that's why we really have to go back to that reteaching...[B]ecause

society doesn't really like people who are going to yell when you put the wrong thing on their hamburger...[S]o they have to learn how to do that code switching, that things they do at home are not the same as what they can do in the classroom and our classroom is like our job right now. So we have this opportunity in the safe space that we can practice how we might act on a job.

Carrie noted, for example, that cussing at someone who did not do something right might be the way that students talk to one another, but it is inappropriate to do in many workplace environments. She believes that if students do not learn how to make different choices and instead persist in challenging behaviors, their future success will be limited. Corey also saw their current behavior as impacting their future success if they do not change, especially in the way they talk to people. He gives his students leeway in how they communicate with him, but then says

[I]f they do take me up on my offer to go take me to the woodshed verbally, we have that conversation at the end and say, "Look I'm giving you an opportunity to say this, this is not a normal things. You're not going to be able to go if you have a job and run your manager down like this, or run a coworker down like this...But my goal right now is to try to keep you in the classroom."

In Corey's experience, it is a difficult balance between giving them the option to vent their frustration and also preparing them for the future where they will not be able to make the same choices later. Angela also saw their challenging communication choices as impactful in the way their future unfolds, saying, "[I]f this person goes into their job and starts to lose their temper and uses any of that language with their boss, their co-workers, heck, the person who came in, you've just lost your job." Angela is frustrated

with the way that her school handles cussing at teachers, believing that their leniency is not preparing the students for the way that they will be received in the workplace with the same language. There was a pattern of how the students' behavior in response to frustrating situations impacted the teacher's view of their future success, the more the student lashed out in their anger or frustration, the less likely the teacher was to view their future as having potential.

#### 4.3.1.4.3 FUTURE EDUCATIONAL OPPORTUNITIES

When the teachers talked about future success, sometimes they talked solely about their success in terms of future mathematics courses or STEM careers. Alice, talking about future success, said, "Somebody who understands what they're going through emotionally and build trust both with the teacher, with the school building, with math more, and then they might have more of an opportunity to be successful in future, future math courses." She believes that change is the key to a more successful future for the students who are exhibiting challenging behaviors. Dan also views education as a way for these students to lift themselves out of their current situations, saying:

Education in general is the quickest way for a lot of the kids that I teach [who], not only have they experienced trauma, but they come from lower socio-economic backgrounds. The easiest way to lift yourself out of lower socio-economic standing is through education. It's the easiest, most direct way. Now, is it easy? No, is it the only way? Plenty of kids, you know, grow up to be basketball stars, football stars, you know, rappers influencers, whatever. But that's a very, very, very small percentage of the population.



He believes that without an education, a lot of the students who exhibit challenging behaviors will have a difficult time finding success, noting that mathematics-based careers give students the ability to make more money for their families. Teachers noted that success in their class and future mathematics classes is impacted for trauma-affected students who exhibit challenging behaviors because it can take a lot of time to establish trust and relationship. Angela said that strained relationships with students who exhibit challenging behavior make it difficult for them to build a relationship. She said:

[A]most like just in that February-ish time period of the school year do you finally feel like you're making headway to connect to actually get to where you feel like you're getting information from them that is worth talking about and like, you know, past the surface stuff.

Alice had similar experiences, saying that it can take up to thirteen weeks for students who exhibit challenging behaviors as a symptom of trauma on board, and that this makes it difficult for them to be able to pass her class. She said:

It takes a long time and it's...challenging and sometimes you just want to give up and you want to go home and you want to just scream...because you're done, you want to be done. But then finally when they finally get it, they understand the expectations of the classroom, they understand that, no matter what they do you're still going to love them and you're still going to care for them and you're still going to want them to pass your class and you're still on their team....It's sweet, it's cool because they actually want to work really hard. The sad part is...when they don't have the mathematics foundation to support their new desire to learn

and do what you need them to do they still fail. That's when it's really hard as a teacher...

For Alice, she believes that students who are trauma-affected and exhibit challenging behaviors can have a successful future, but that mathematics courses can be incredibly challenging for them to get through when they miss so much instruction due to their challenging behavior. Corey also notes that their challenging behaviors that result in being removed from the classroom make it difficult for them to succeed academically, saying:

[W]e've tried to streamline it to where they're out for as little time as possible. But there's no other way around it. The kids that already have missed enough instruction time in their elementary school ages, any other time that they missed from the classroom puts them farther behind makes it more likely for them to have their shut down moments, because...they don't understand that they can't make that connection.

Angela put it bluntly, saying that challenging behavior in middle school can absolutely affect your future because once you get to high school, it's harder to hit that reset button. Once you start to fail classes and get behind and not be on track to graduate, it's, it's a snowball. Once you're, I mean, let's be honest, if you're not on track to graduate, why are you in school? Just drop out.

Angela believes in the impact of teachers on students who exhibit challenging behaviors, but this comment is an example how each of the teachers can become frustrated by the academic impact of student behaviors because it is challenging to catch students up in mathematics.

#### 4.3.1.4.4 INCARCERATION RISK

Incarceration was another commonly-discussed impact of behavior on the students' success from the perspective of the teachers. Dan talked about how suspending students for challenging behaviors ends up in a cycle that resembles the cycle of people who have trouble staying out of prison, with students missing instruction and then intentionally getting kicked out again because they do not understand the instruction they receive when they get back. Dan said:

[I]t's a vicious cycle, and prison is very much the same thing where you have poor skills and you resort to crime and then you go into prison when you get out. It's hard to find a job because you still have poor skills because you have a prison record now. And so you end up going back to prison. We create the system where no one ever actually tries to fix the issue and I very much wish that we would start with schools because, generally speaking, the offenses are much less and the fixes are much easier. And so if we can fix it when they're in school, then hopefully they won't end up in the prison to begin with.

For him, the behavior patterns that students exhibit can lead them to prison, but he does believe in the education system's potential for disrupting the cycle for students if done well. Alice sees this as well, with student thought patterns about their challenging behaviors leading to a life of incarceration if not stopped:

And it's so hard because it's so ingrained in them and their brains literally almost have the inability to understand that there is an option other than going to prison. Like it takes so much work and so many positive relationships and so much rephrasing of everything you know all the things that come out of their

mouth...“Well, it doesn't really matter if I do this assignment or not.” That's the same attitude that...you have about going to prison....“Doesn't really matter I'm going to go to prison anyway”...[Y]ou know and that's the hard part is that those are the kids that are sometimes the easiest to give up on because they, they are showing you that they don't care.

Dan believes that it is sometimes a “self-fulfilling prophecy...where they see failure, they become a failure, they act like a failure.”

On a more positive note, both Corey and Debbie mentioned the potential of their students who exhibit some of the most challenging behaviors to do something great with their lives if they channeled their energy into “good and not evil” (Corey). Corey said, “[I]f they put their powers towards good, they can be world class lawyers.” And Debbie noted that they have ingenuity and if they “would apply that to something that's reasonable and something that's productive...[they're] like a Bill Gates in the making, you know, let's, let's do something here.” None of the teachers believe that incarceration is the only option for any of their students, but recognize the potential for this negative outcome if their behaviors do not change.

#### 4.3.2 Discussion

At times, teacher definitions of what mathematics is seemed at odds with what they believe they are teaching. To the teachers, mathematics is “perseverance through problem solving” (Alice), “looking for patterns that exist and making those connections to make things easier” (Carrie), “methods for problem solving” (Corey), “a series of logical processes to solve problems” (Dan), “a basis of life...a way to understand [life] in a concrete way” (Debbie), making the complicated simple (Angela), and “data analysis

and solving equations” (Lindsay). Most of them have broad definitions of mathematics that encompasses a way of thinking. Yet when you ask them questions about being a mathematics teacher and what their potential impact is on their students or the potential impact of the mathematics on their students, they all revert to the idea that mathematics is algebra, geometry, trig, etc., with maybe a passing remark about problem solving that they hand wave as not really content they are teaching. Their thoughts on the impact of the mathematics content were tied to whether they thought that the content they were teaching in these classes was important to students. But they rarely referred to the other interesting mathematical practices they were using in their classes (e.g., group work, grounding their lessons in data that are interesting to students, etc.). They have a student-centered mathematical structure to their classrooms (McCombs and Whistler, 1997; Meece, 2003) and use autonomy and student self-monitoring to give students freedom (Lee and Hannafin, 2016). They talked about teaching their students to see the world around them through the lens of mathematics (Gutstein, 2006). All of them use problem-solving techniques that could impact student thinking in a positive way to discourage criminal thinking patterns (Cuadra et al., 2014). Some of the teachers (e.g., Dan, Lindsay, Carrie) also talked about opportunities for giving autonomy and control to students in the classroom when appropriate, like what Crosby et al. (2018) talked about needing to impact trauma-affected students. And some of them (e.g., Dan, Carrie, and Debbie) mentioned culturally-relevant, caring-centered classroom practices in line with the type of caring mathematics classes that Brown-Jeffy and Cooper (2011), Wachira and Mburu (2019), and Gay (2002) talked about as having the potential to impact students. Yet, even with all of these rich mathematical structures in their classrooms, they had

limited view of what exactly the “mathematics” was they were teaching and what it meant to be a “mathematics teacher.” Their views of these mathematical practices were that they make an impact on students who present with maladaptive behavior, but they did not talk about them when asked directly about the benefits or impact of mathematics on their students or their role as their mathematics teacher. As an example, Alice said:

To be honest with you, algebra one, geometry, algebra two,... I honestly think that, my heart, I don't really think that algebra one, geometry, and algebra two have a lot of benefit to them in a career outside of STEM or construction, you know, so I think that's, that's part of maybe my own problem.

For them, the mathematics they teach (which to them is separate in some way from mathematics as they define it) has narrow applications which are reserved for students who are continuing on in their education beyond high school or using mathematics in bidding for construction. There is a disconnect for most of them between mathematics as an abstract, overarching way of viewing the world and the mathematics they are teaching, which is perhaps why most of them felt that “mathematics” might not make an impact on their students. They often talked about the importance of problem solving and understanding the real-world connections of mathematics (e.g., Cole et al., 2005; Cuadra et al., 2014), but then will say that algebra is not important for students who exhibit challenging behaviors, who are likely to become incarcerated, or who are trauma-affected. This disconnect is important to consider for teacher educators. What exactly is mathematics and the value of mathematics to the students they teach? And if mathematics teachers believe mathematics is not important for all students, then where have teacher education programs gone wrong? One potential explanation for why teachers have this

disconnect between trauma-informed teaching and the mathematics content is that none of the trauma-informed training they had was specific to mathematics or included any content-specific suggestions for trauma-informed educational practices. Additionally, the teachers had a hard time balancing the need to care for the student as a person while trying to teach them mathematics, which they sometimes believed to be opposing goals (Kokka, 2015).

As far as the teachers' descriptions of their ability to impact students who present with maladaptive behavior, their responses that relationships are the most important aspect of their teaching is in line with the TIPE framework (Brunzell et al., 2016b), along with others who state that building relationships with students can prevent maladaptive behavior from continuing (Chafouleas et al., 2016; Crosby et al., 2015; Crosby et al., 2017). Their responses also support the findings of Brunzell et al. (2015) that trauma-impacted students have difficulty trusting and can present with additional challenging behavior in an attempt to disrupt the teacher's desire for a positive relationship with them. This impacts the teachers' perceptions of the students' futures, leading them to link challenging student behavior with future failure, including prison. Their responses are also in line with Brunzell et al. (2015), who found that teachers can establish trust and safety by establishing relational interventions with students.

The teachers connect trauma, maladaptive behavior, and negative future outcomes, but are rooted in hopefulness for their students. They speak about students who are likely to go to prison in similar ways as students who exhibit trauma symptoms. For example, teachers view mathematics "content" (e.g., the standards they teach) as unhelpful, but they view mathematics as they define it (e.g., problem solving.) as having

the potential for making an impact for both sets of students. They believe that education can make an impact for students who seem to be on their way to a life in the justice system, and they think that relationships are key for these students similar to their emphasis on relationship with trauma-affected students (Brunzell et al., 2016b). There were links drawn between the two groups, with teachers pointing out that many people who seem to be on their way to the justice system have experienced trauma (Fox et al., 2015; Sarchiapone et al., 2009; Smith & Thornberry, 1995). There is a lingering question that warrants further investigation, which is whether there is a point at which it is too late to intervene for students who are on the pipeline. Some teachers said they believed that students' fate is more than likely sealed early in their academic career when they are so behind other students that it is impossible to catch up (e.g., Alice, Angela). Despite the work these teachers are doing to impact students, they still retain a somewhat pessimistic attitude when students are significantly academically behind because they see this as impacting their future academic career. This is because they see that the students have so many unmet needs (e.g., love, safety) that they do not have the capacity for cognitive pursuits until those other needs are met (Maslow, 1943).

As for the connections to the ARTIC survey results, both interview data and survey data indicated that females were more likely to recognize the impact of secondary trauma. In the interviews, Lindsay and Carrie talked about the impact that working with trauma-affected students occasionally had on their emotional state, and discussed using strategies to reduce the impact of secondary trauma (e.g., Lindsay talks to her husband and debriefs at the end of the day, Carrie uses self-regulation techniques when students push her past her breaking point). Angela and Debbie talked about the emotional impact



that working with trauma-affected students has on them. Dan and Corey did not talk about these things, instead focusing on the impact of trauma on the students.

Additionally, the ARTIC survey results were supported by the interview data in the differences that training level has on the Self-Efficacy subscores. Dan, Corey, and Lindsay had high self-reported levels training in trauma-informed practices and Debbie, Carrie, and Angela had low levels of self-reported training. The second group were more hesitant in their interviews to say how they impacted students or to view their efforts as successful for trauma-affected students, aligning with the finding that more training leads to higher Self-Efficacy scores on average on the ARTIC.

Lastly, as in extant literature, many of the interventions teachers discussed that occur within their classroom take place within more rigid mathematical activities and are not housed within the context of the beauty and art of mathematics (e.g., Cobb et al., 2009; Miller & Wang, 2019). One notable exception was Dan's discussion regarding the beauty of irrational numbers and his desire for students to come to know the beauty and art of mathematics. He believes that if students are drawn to beauty in mathematics, they might become fascinated enough to be pulled away from maladaptive behavior as they continue to fulfill their need for beauty (Maslow, 1970). It may be that the teachers are overwhelmed trying to meet the students' love, safety, and physiological needs that they do not think the students' cognitive and aesthetic needs are ready to be fulfilled (Maslow, 1943, 1970, 1971). More research is needed to determine the impact of the beauty of mathematics on student maladaptive behavior.

#### 4.4 Research Question 3

This section considers the answers to Research Question 3: What are secondary mathematics teachers' perceptions of trauma-informed positive education practices, and to what extent do they already use them in their classrooms? (a) How do teacher perceptions of challenging behavior change when they know it is a potential symptom of trauma?

##### 4.4.1 How Teachers Define Trauma-Informed Classroom

Before considering how teachers perceive trauma-informed classroom (TIC) practices, we first turn to a brief discussion of their definition of TIC. They each had slightly different perspectives when asked to define TIC, but for each of them, the primary focus was on understanding that trauma impacts students and that teachers need to be aware of this fact. Alice said, "Teaching the whole child with an understanding that students are doing the best they can with what they have and assuming the best first about a student." She spoke throughout about the impact of trauma on the brain, and her understanding of this shapes how she responds to them and how she views "doing the best they can." Carrie's definition was broader, saying that it is "knowing ways to work with kids, specifically that you know have endured trauma, but also knowing how to work with all kids with a grain of salt." For Carrie, since she believes that all students have challenges they face that impact their performance at school at some point, her definition of a TIC is broader and includes finding ways to care for all students in trauma-informed ways. Debbie also believes that TICs start with being aware that students have experienced different kinds of trauma that all impact their development and behavior, including physical, emotional, psychological--and that some of them are "to the point

where they're creating trauma for themselves by the choices that they make. But it's all they know, so therefore it seems normal.”

Lindsay’s definition was focused on the impact of the trauma, beginning with recognizing that everyone is aware of “what trauma is and what it can do to people” and that sometimes when students act out, “it’s not because they want to act out, it’s because of trauma.” For Lindsay, “the trauma-informed classroom is that understanding of what [trauma] is, what it can do, and how we can manage it and help, kind of help erase it...trying to move past it.” Corey’s definition was also behavior-focused, as he recognizes behavioral symptoms of trauma as a primary stumbling block for trauma-impacted students in their academic career. For him, it starts with meeting students where they are at with a strengths-based approach

that doesn't ignore the trauma, but it also doesn't highlight...[I]t's a mutual interaction with the students saying “I understand there's a reason why these behaviors show themselves, [but] that doesn't make it necessarily okay for these behaviors to be there.”

Dan also sees that responding to behavioral symptoms of trauma are a main focus of TICs, saying that a TIC is “being sensitive to the fact that there are students in your class that are not going to behave like other students because they’ve experienced trauma”. Lastly, for Angela, TICs start with “the teacher recognizing that kids need that safe space.” Now that we know how they define TICs, we will turn to their perception of the implementation of TIC principles.

#### 4.4.2 Informally Learned and Implemented

One important note is that the teachers informally learned most of the TIPE techniques they use for trauma-informed education through trial and error or in tangential settings (e.g., Lindsay learned about trauma-informed practices in a previous job that was not education related). The techniques they use that are more formally learned are trauma-informed, but they did not always call them trauma-informed practices (e.g., Carrie talked about MTSS practices that are in line with TIPE, all of the teachers talked about growth mindset). Alice has had the most formal trauma-informed education training and uses the most formal TIPE language, but all of them use TIPE practices to an extent and have perceptions based on their experiences. They had to figure out the hard way how to care for and teach their students who have experienced trauma, but they all said that relationships are the most important part of that.

#### 4.4.3 What do Teachers Think About TIPE Practices?

Though none of them has been formally introduced to TIPE as a specific model of trauma-informed education (TIE), their thoughts about trauma-informed practices and the way they implement them align with TIPE. Here, TIPE and TIE are used interchangeably, as there were no deviations from the TIPE model in their implementation of general TIE practices. (This is not to say that they all implemented every facet of TIPE completely or even correctly, but that their view of TIE was in alignment with TIPE.) There were several ways that teachers reported their teaching practices being positively changed by TIPE practices, including how they view discipline and their empathy for students. They also believe that TIPE helps them focus on creating

a safe space for students. These are discussed here, along with their belief about the effectiveness of these practices.

#### 4.4.3.1 Discipline

One way that they viewed TIPE as helpful was in their implementation of new disciplinary practices, as TIPE changed their perception of discipline from punitive to restoration and healing. For them, TIPE causes a constant reevaluation of disciplinary practices, which leads to better outcomes for students. Alice said that if she had never heard of TIPE, she “would probably be more rigid...a lot of misunderstanding and a lot of punitive punishment and not much restorative justice.” For her, having a principal point out that she was too rigid with students early on in her teaching career was a turning point in considering TIPE practices, which led to a positive transformation of her view of discipline. Corey also talked about how TIPE leads to a more meaningful approach in evaluating discipline, with his school going back and forth about what practices are effective and what practices are not helpful. For Corey, having a better understanding of how to help students who have been impacted by trauma is essential for discipline, saying, “Yes, there does need to be discipline, there does need to be consequences, even when there is trauma...involved. But what those consequences look like need to be specially catered because of [the student’s] circumstances.” Lindsay talked about how TIPE practices make her better equipped to discipline students who have been impacted by trauma, recognizing that it is not as simple as “here’s your consequences for your action.” She believes that if she had not heard of TIPE, she would rely more heavily on administrators and would handle less behaviors within her classroom. She believes that her school district would do well to have a better, more restorative approach to discipline

because of her experiences and successes using TIPE practices. Dan similarly would also have a very different discipline strategy without his TIPE practices, saying he would use discipline that is

for lack of a better term, old school authoritarian...“You must follow the rules”....[I]stead of trying to figure out what the reasoning for something is, just, “[Y]ou're not following the rules, the rule is the rule.” And...more willing to write kids up just for minor infractions.

The teachers view TIPE practices as a positive change for them because they are now able to approach discipline in a way that helps them to help students instead of simply punishing them for challenging behavior.

#### 4.4.3.2 Empathy

TIPE also changed their level of flexibility because they are more empathetic. Lindsay talked about how she did not have a lot of trauma in her childhood, so without knowing about TIPE, she would likely have a “lack of understanding and that lack of patience,” wondering “Why are kids acting out?” Alice and Dan both talked about having a deeper understanding of the why behind behavior that leads them to more empathetic responses. And Angela said that without TIPE, she would “probably expect every kid to...suck it up, like ‘If you're here, it's time for school. Nothing that happened before school matters. Nothing that you're going home to matters, there's no excuse to not have your homework.’” She would have more of a focus on rules, deadlines, and what she wanted without TIPE, but because she understands trauma and its impact on students, she has a more student-centered approach to teaching that starts with empathy.

#### 4.4.3.3 Safe Space

The teachers view trauma-informed mathematics as making a positive impact on students because of the safe space it offers to students to increase their self-esteem, for them to make mistakes, and for them to learn how to create positive attachments.

Angela's focus on having a safe space for students as central to TIPE gives her the perspective that trauma-informed mathematics is knowing that a lot of students will come into her classroom thinking they are not good at mathematics and that some of them will have self-doubt, and helping them recognize that they can still be great at mathematics. She wants students to know that she is a safe person to talk to about both mathematics and other things, saying that

probably one of the hardest things but also one of the best is for a kid to understand that if the lesson plan doesn't happen that day, it's okay. Like if a kid mentioned something and you're like, "Okay, obviously, that's what we need to talk about," then you don't do math that day.

In Angela's experience, the benefit of TIPE practices is as much about helping students personally as it is about mathematics. She said, "Whether or not your math skills are on grade level or to par, you are still a good human who is worth being here and worth going forward."

Carrie also talked about self-esteem as a benefit of TIPE practices, especially for students who have negative perceptions of their mathematics ability. She believes that the mathematics classroom is

a really great place to find to be able [to] make mistakes in an environment where it's okay to make mistakes...it gives you an opportunity to have failure and to learn from your failure...it is a place where you can learn and change...[Y]ou

aren't born good or bad at math. You learn how to make mistakes and to persevere and that's what makes you a good mathematician.

She talked about how trauma-informed mathematics classrooms are safe places to learn that failure is an opportunity to get better at something and to learn from mistakes because it gives a place where there is consistency when there is no consistency in any other part of a student's life.

Corey also talked about trauma-informed mathematics classrooms being a place where students can find increased self-worth and view themselves as having the potential to succeed because they view mathematics as the “upper echelon” of school, saying that his students think, “If you do well in math, you're smart, you're bright.” Dan talked about the downside of this view that students have of mathematics being the determining class that tells if a student is smart or not, noting that some students will intentionally get kicked out of class to avoid looking “dumb” in front of other people. Each of the teachers mentioned this idea that some students act in challenging ways in order to avoid having to participate in mathematics because they do not believe that it is something that they can do. However, they also believe in the power of TIPE practices in mathematics classrooms to impact students in a way that gives them the confidence and assurance that mistakes are encouraged and failure does not define them. In their experience, mathematics in context of trauma-informed practices gives students the safe space they need to develop (mathematical) confidence.

#### 4.4.3.4 Effectiveness

Additionally, teachers seem to think that TIPE practices are important, use many of them in their classrooms, but don't necessarily think that they are always effective for



trauma-affected students. The level of trauma a student has experienced and how the student's symptoms manifest tends to impact their view of whether techniques can be effective in curbing their trauma-symptomatic behavior (or other challenging behavior) and whether the student will buy in or not to the activity, which Debbie, Angela, and Alice all talked about specifically. They talked about how unique students are—their personalities and experiences can make them either buy-in completely to the TIPE techniques the teachers are using or make them completely reject them. For example, Debbie said, “[E]very person is unique. And the traumas that are given to them are going to cause unique reactions, depending on their individual makeup.” She recognizes that for some students, they have a harder time trusting because of what they have been through. And Alice talked about these unique differences between students making an impact on how TIPE practices are implemented for that student, saying, “Every student’s coping mechanism for their trauma is so different.... You don't know until you have formed relationships with kids to get to know them, to know what their background is.” The teachers believe that most students will buy-in once they trust them. But they noted that trust can take time to build with these students and sometimes they find that trust is built too late in the semester for it to make an academic impact on the student, with Alice, Angela, and Debbie specifically talking about the length of time that it has taken for their students to buy into their TIPE practices and buy into general classroom practices that hindered their ability to make academic progress.

#### 4.4.4 Use of TIPE Practices

Despite the fact that almost none of the teachers interviewed had formal training in TIPE, they all used practices from the TIPE model in their own classrooms and had

strong opinions about their impact on students. They talked about relationships as central to helping trauma-impacted students, as well as techniques they use to develop positive attachment styles, increase students' psychological resources, and help students regulate their emotional and physical symptoms of trauma (Brunzell et al., 2016b). We consider each of these next.

#### 4.4.4.1 Relationships

One of the most consistently-referenced TIPE practice was building relationships with students, with every teacher mentioning relationship building throughout the interviews as a consistent, daily practice in their classrooms. Teachers noted a variety of reasons for why they use relationship building with students who have been impacted by trauma. Alice talked about how central relationship building is in helping trauma-impacted students, saying “it’s all about relationships with kids.” She believes that it is important to have a relationship with a student in order to know how much to push a student. She said if you do not know a student well, it is difficult to gauge how much you can challenge them without them shutting down because of a fear of failure. She also believes that relationships help teachers to know whether there is something deeper behind challenging behavior that needs to be referred to guidance counselors, school psychologists, or social workers. Corey also talked about how important relationships are with his trauma-impacted students. He gave an example of a student who he has a strong relationship with, saying that he can share hard truths and speak frankly with this student. He knows how to approach the student on any particular day, also noting that this student has limits to his trust levels because of the impact of the student’s trauma.

Debbie also believes that relationship building is the foundation of TIPE, and believes that building relationships on a daily basis with students is important because it helps her to “figure out what it is that makes that particular person tick at any given time, in order to make them...a more resilient, whole, functioning person at any given time.” She focuses a lot on her ability to help students become productive members of society, and her consistency in building relationships is her way to start that process. She noted the challenges, stating that sometimes she cares more about the student than they care about themselves.

Each of them have specific ways that they implement relationship building. Debbie, Corey, Alice, Carrie, and Dan all talked about conversation about non-academic subjects that the students are interested in as their go-to relationship building tactic. Angela also talks about sharing about her own personal interests and her life, which she believes helps students to be more open about their interests. She also incorporates their interests into her lessons, for example”

[Y]ou have kids that never answer a math question. But golly, you start talking about Pokemon Go, and...all these kids [opened up]. I was like, “Seriously?” So we went out on the football field [turned it] into a giant grid and like you know you can only go get the last Pokemon...if you could tell me the ordered pair of where it was located, like, you know, just make a game out of it. But like more kids talked over that than they did any math conversation. So I think it's just putting your ego aside and letting them know that's okay, too.

Angela believes that relationship building with students involves setting aside content often, but believes that without the relationships, content is challenging to get to with

trauma-impacted students because of their behaviors. And Lindsay invests in the students' interests, too, making sure that her students know that she has read the things that they enter into their portfolio and showing them that their favorite methods of learning are important to her. Regardless of how they approach relationship-building, they all use relational strategies every day in their classrooms and believe that this is the foundation of helping trauma-impacted students.

#### 4.4.4.2 Positive Attachment

Alongside the need to build relationships with students as a way to get to know the student and how to best interact with them to help them through their trauma, the teachers also recognize the importance of teaching students how to have positive attachments with others. The main way that teachers do this is through giving students opportunities to build relationships with the teacher and their peers in class, helping them understand healthy relationship boundaries and appropriate interactions. There was some mention of emotional intelligence, but that was more often discussed within the context of helping students regulate their emotions (e.g., Corey teaching students about how anger manifests in the body and how they can respond to that without violence). There was some discussion of play and fun in the classroom (e.g., Angela's Pokemon Go example), but this was the least-discussed form of positive attachment interventions. It seems that this is because they find that the positive attachment hinges so much on students being able to have healthy relationships with those around them that this is seen as having greater importance. The teachers talked about recognizing the need for positive attachment development in their trauma-affected students. Corey sees the impact that trauma has on attachment, saying:

I have a hard time believing a student would be on that...one way track to prison if there wasn't some trauma because of the impact that it has...[I]t's hard to have a rational conversation with them and if they're incapable of having that rational conversation there's something, there's some connections that are not firing correctly and we all know, at this point when those moments, when those emotional connections aren't firing [it's] probably due to some hefty trauma.

In Corey's opinion, the students' inability to have conversations with others when they are upset leave them vulnerable to negative life outcomes, like prison. Developing those communication skills is a huge part of how teachers implement positive attachment interventions, with Angela noting that mathematics is a means of teaching those communication skills. Corey teaches his school's communication curriculum, which helps with transactional analysis, assertiveness, and conflict resolution. These are designed to aid in the development of positive attachment.

While most of the teachers noted an "every day is a new day" mentality when students present with challenging behaviors, Angela and Corey talked about intentionally showing students frustration following conflict between them because they note that students need to know how their behavior impacts other people in order to have healthy relationships in the future. In their experience, showing grace is important, but so is helping students to see how their behaviors impact the people around them.

#### 4.4.4.2.1 TEACHER-STUDENT RELATIONSHIP

Much of the positive attachment building in their classrooms is focused on the teacher-student relationship, as the teachers view this relationship as a healthy place for students to figure out how to interact with other people because the teachers can handle

the negative interactions that might take place since they do not take the interactions personally. Alice notes the impact of trauma on attachment and the importance of the teacher-student attachment:

[T]hey don't want people to love them...[or] they don't know how to accept love and care because they haven't been before. So whenever you show them that love, care, and support and restorative justice and bringing them back into your fold, that is in and of itself retraining their brain.

She uses helping them learn to accept love and care as a means of developing positive attachment styles for the students. Dan also has a similar approach, showing students that he is not the enemy and that they are safe in his classroom in an effort to help them move toward positive attachments with others. Dan also notes that the barrier for students who have experienced trauma is often that they “have a hard time trusting” and “it would take them a while to come around.” But he also has seen that when they are willing to buy into what he is doing relationally, it helps them buy into the mathematics.

#### 4.4.4.2.2 RELATIONSHIPS BETWEEN PEERS

While teachers viewed the teacher-student relationship as a good starting point for helping develop positive attachment styles, they also work to develop positive relationships between students and their peers. Often, the attachment interventions are rooted in mathematics being a collaborative subject, with their interventions being based in structured group work designed to encourage positive interactions between students. For example, Angela talked about using mathematics as a starting point for students who needed help interacting with others, saying, “I actually encourage them to sit with their friends because then I hope that they'll actually talk more and have like that math

discourse.” She believes in the power of students working together, saying, “I think you can learn a lot through working on mathematics with other people.” And Carrie has a similar belief, which is that “there’s a lot to be said for learning together...and working together.” She recognizes that it cannot only help students develop positive attachments, but also helps them to develop mathematical confidence while working with others so that they can go home and practice on their own with less worry about doing the mathematics incorrectly.

Angela also talked about how the positive attachment with her comes before mathematics for her, saying “I always get the complement of being good with the tough kids and I would say that's why, is because I'm not forcing math down their throat. I'm just having them be human with each other.” Additionally, Dan noted that you have to be careful, and cannot force relationships between students who do not want to work together. Instead, he encourages students to find someone that they can work with and will try again to introduce them to new people at a later time. He did note gender differences in the way students respond to being paired with someone they do not necessarily know, with female students being more likely to respond positively and open up with another female student and male students rejecting the opportunity to talk with people they do not know as well.

#### 4.4.4.2.3 INTERVENTIONS AND RESULTS

Some of the ways that they specifically help students with positive attachments and relationship-building were “pausing class to explain why certain derogatory insults shouldn’t [be] in the classroom” (Corey), “role play and gameplay” with team building and cooperation training (Debbie), and helping them understand when they have crossed

a line by having open conversations (Lindsay). Debbie talked about why her interventions make a difference, saying:

[I]t's not an island. It's not a one man society. It's one of these where the kids have to come apart from what they know...to actually work with, cooperate, and deal with respectfully in order to make things happen.

The teachers use these relational positive attachment interventions consistently in their classrooms, and they see some positive results. Corey noted that while some days trauma-affected students shut down completely and do not respond to interventions, some days “you can tell some of the interaction some of the relationship building pieces are what they needed that day, because you see them strive for it, you see them engage extra.” Alice also talked about how a former student does not necessarily come to her classroom anymore but that they know that she is a safe person to come to if they need someone to be in their corner. She said:

I think that's what, what makes the big difference is...when kids realize that you care, that you care about them enough to correct their behavior and establish boundaries for them in your classroom and in other environments to they realize that you're in their in their corner and that they want to, they want to do well for you.

For Alice, it all starts with developing the student’s ability to receive love and develop trust with others through positive attachment interventions. Debbie also noticed that students who do eventually trust her will “attach themselves” to her and will go from saying, “Forget you. I’m not doing that. There’s no way” to participating in class lessons and “reaching out tentatively.” And while Corey noted positive relationship



changes between students from his intentional interventions for positive attachment, he also noted that there were “minimal” impacts on negative behavior in the classroom due to these interventions.

#### 4.4.4.3 Psychological Resources

Teachers reported using a variety of interventions to bolster students’ psychological resources, including using growth mindset language, improving their confidence and self-esteem, using social-emotional learning (SEL) practices, gratitude activities, activities designed to help them see that they can accomplish goals they set, and strategies for retraining their brains to react differently in stressful situations. While not all teachers use every technique, every teacher has strategies for improving student psychological resources.

##### 4.4.4.3.1 GROWTH MINDSET

One of the most commonly-discussed and widely-used interventions for improving students’ psychological resources was growth mindset language, used by Alice, Corey, Angela, Carrie, and Dan. Alice has signs in the classroom that say things like “embrace the struggle,” and helps them learn how to change their language from “I’m not good at this” to “What am I missing?” and from “This is too hard” to “This might take some time and effort.” Angela also uses growth mindset language, helping students go from thinking and saying “I can’t do this” to “I can’t do this yet.” Corey and Angela both do not allow their students to say, “I don’t get it” and instead require them to give themselves credit for what they do understand and focus on asking for specific help with the mindset that they can grow and learn. And while the teachers often use growth mindset activities and language, their belief that these interventions work is somewhat

hampered when students have a deeply ingrained fixed mindset, which means the student believes that they cannot get better or change. Carrie notes that this is often students who have been impacted by trauma, saying:

I think if you have experienced trauma, you've been hurt so many times that I don't know that growth mindset is going to make sense to you....[Y]ou are getting kids that they've been told they're not good at [math], they've been told they're not good at other stuff at home. And so I don't know that just me talking...about growth mindset with kids is going to make that big of a difference...It doesn't work that way for them at their home and whatever else they've been through. So I think there needs to be other strategies in place too.

She believes that the impact of negative talk at home by parents, siblings, or others can impact student buy-in for growth mindset in the classroom. Dan has a slightly different perspective, believing that deeply-engrained fixed mindsets make it more challenging to get students to buy into what he is trying to teach them about growth mindset, but that mindsets can change over time. He notes that students with a fixed mindset are more likely to try to get kicked out of mathematics class when they do not believe they can be successful at it, but that after interventions, “Once you get them out of that mindset thing, they're much more likely to behave and do what they're supposed to do in class.”

Angela’s experiences have also shown that it is more challenging to help students who have such a deeply-ingrained fixed mindset and are missing foundational mathematical knowledge, but then she does see impact over time: “Sometimes it takes longer....By eighth grade you're battling...14 years of whatever the kid has been told.” She has seen

improvement by giving students manageable goals, helping them to achieve them, and then helping them to see that maybe the next step is achievable, too.

#### 4.4.4.3.2 CONFIDENCE AND IMPROVED MATH IDENTITY

Another way that the teachers help develop positive psychological resources is by helping them to gain confidence and self-esteem, particularly in mathematics. Angela, Carrie, and Dan all talked about building student confidence in mathematics. This helps them to develop a more positive math identity, something that all of the teachers talked about except Lindsay, who talked more generally about educational identity than mathematics-specific identity issues. This distinction might be due to the fact that Lindsay just switched from being a science teacher to a mathematics teacher and favors talking about science. Carrie talked about how she had a parent email her about how the student gets excited about hearing positive praise from her and it “helps to build his confidence in mathematics and where he thought he couldn't” do mathematics for years before, he now has confidence that he can do it. And Angela talked about how students will reach out years later to tell her that they were able to get into college or were accepted into a program, and she partially attributes them reaching out to helping them develop confidence. She said, “I think anytime someone can tell you that you can do something is great.” Alice talks about developing a more positive math identity by helping students gain confidence by talking openly about mistakes being part of learning mathematics and that “perseverance through problem solving” is the mathematical process. Dan, Debbie, and Angela discussed when a student talks about “not being a math person” and how frustrating this phrase is for them--and one of the ways they

counteract that is by giving students the confidence to approach mathematics and showing them that “math people” are people who work hard and persevere.

#### 4.4.4.3.3 OTHER INTERVENTIONS

In addition to growth mindset and confidence in mathematics identity, teachers also talked about several other interventions that help increase students’ psychological resources. Alice and Carrie used social-emotional learning (SEL) techniques (e.g., Alice has them put a dot on a coordinate plane on the board as part of their emotional check in for the day, Carrie’s school does SEL with their homerooms in the morning). Alice talked about helping retrain their brains by using calming techniques before a test to help reduce stress. She also teaches them ways to rethink when they have negative thoughts, telling them to “think their second thought” (e.g., “I’ll say like ‘My first thought is I can’t do this. What’s my second thought?’ Or ‘My first thought is...she’s talking about me, so I can’t focus on what I’m doing. Second thought, she’s not talking about me.’”) Carrie and Lindsay talked about gratitude activities that encourage students to consider how to cultivate thankfulness (e.g., Carrie’s class makes paper boxes to write thank you notes to former teachers and has them delivered; Lindsay encourages her class to have gratitude every day). Lindsay and Corey talked about recognizing student strengths and helping students to recognize their own strengths (e.g., Lindsay does a strengths assessment to help them recognize strengths; Corey’s entire school has a strengths-based approach, focusing on student strengths instead of deficits). Lindsay also helps her students set goals and helps them to see that they are capable of achieving them, having them write down two things they are grateful for and a personal goal and academic goal and they “wrote it as if it already happened.” She modeled this after an activity that she personally

does in an effort to encourage them to develop skills they need to have success in the future.

#### 4.4.4.3.4 IMPACT

As far as the impact of these interventions for psychological resources, the teachers were generally positive, and their continued use of these activities itself speaks to their thoughts on their effectiveness. Carrie talked about gratitude and growth mindset as being effective at making changes, not only for students but also for herself. Corey said that all of these techniques are focuses at his school, and that he has seen interventions for psychological resources “work wonders” for students’ comfort level in the classroom, seeing the class as a safe space to talk and find connection. For growth mindset, Dan talked about having “good success with it,” finding “when you do things where they feel like they're going to be successful, then they're, they're more likely to respond to you than if they think they have no chance.” And Debbie notes that these interventions do not necessarily produce immediate results, but that they impact the long-haul relationships.

#### 4.4.4.4 Regulation

Teachers view regulation techniques as central to a trauma-informed classroom, and discussed using meditation/mindfulness, de-escalation, sensory activities, physical movement, and scheduling consistency as means of teaching students how to regulate their bodies and emotions, particularly students who have been impacted by trauma.

As for it being central to trauma-informed classrooms, the teachers noted that students who have experienced trauma often have more trouble regulating themselves than other students and have more need for these interventions. For example, Alice said,

“When they've never been taught, [or] maybe they don't have self regulation skills, or they're not being reminded to use those self regulation skills in that classroom because that classroom is not a trauma informed instructional classroom,” that leads to more punitive discipline and less student self-sufficiency. She believes that teaching regulation techniques helps students, and knowing how to teach them helps teachers to help students.

#### 4.4.4.4.1 MEDIATION AND MINDFULNESS

One of the techniques they used to teach regulation was a combination of meditation and mindfulness in the classroom. Alice talked about helping students reduce test anxiety by having them watch a calming video and dimming the lights, teaching them to get into their “happy place” before taking the test. Corey’s school implemented “a five to ten minute mindfulness time immediately following” lunch because they noticed over 60 percent of their discipline referrals were happening right after lunch. They were able to reduce the referrals by doing a quiet time or guided reflection for students to help them regulate and get back into a classroom and working mindset. He did note that it is important to be cautious about how to implement these mindfulness activities, since some students who have been impacted by trauma have a hard time with the silence, since they get a “this really uneasy feeling of dread. When it was that quiet and there were so many people around, typically that proceeded something very bad happening.” They are careful to implement activities that give freedom for students to participate in a way that does not trigger traumatic memories, and he said, “[T]here's no cookie cutter stamp that will work for an entire classroom.” Lindsay notes that mindfulness makes a positive impact for about half of her students, with some of her students thinking that the activities are a

waste of time. She thinks that her students who have experienced trauma have a harder time with mindfulness, saying “I think their brain is just overactive. I feel like...and that kind of goes back to the sensory thing. Those kids need sensory techniques...more than anything.”

#### 4.4.4.4.2 SENSORY TECHNIQUES

Both Lindsay and Angela talked about meeting sensory needs to help not only trauma-impacted students, but also students who typically take medication intended to help with behavior who forget them sometimes. Lindsay has “a giant bowl of...fidgets” for any student, even when they are in another teacher’s classroom. She said that she sometimes has to teach her students sensory techniques when they forget their medication, teaching them “how to be self-aware that whether or not you have your medications, [it’s] not just an open excuse” to behave poorly. Angela also has a bucket of sensory items, calling them “medication for the moment” for her students who forget their medication or need additional support regulating their need for movement. Additionally, Lindsay talked about having a student who “just needed something to squeeze,” giving him something to grasp when he had “meltdowns.”

#### 4.4.4.4.3 DE-ESCALATION TECHNIQUES

All of the teachers discussed using de-escalation techniques with students in some way, mostly co-regulation (teacher-led regulation as opposed to student self-regulation) techniques. Alice talked about how her trauma-impacted students need to get “away from their lower brain where they’re really just wanting to flee from the situation” and to get “back to where they can cognitively process” and return to mathematical tasks within the classroom. She views her role as supporting them and teaching them how to calm

down when they are escalated. Sometimes it is as simple as reminding them to take a deep breath before having a conversation about what has been happening. Carrie and Dan also use breathing exercises, along with soothing talk and asking questions that help the student process their emotions. Angela talks about how de-escalation is important to help students learn that there is a time and place for their intense emotional reactions, but that sometimes they need to be able to “control” their emotions and actions (e.g., when interacting with authority figures, like police officers). Lindsay has a space in her classroom that she allows students to use as a “calm down corner,” noting that while she does not like the “fluffy” name, sometimes students just need space to “cool down.” She likes to clarify for students that it is not a punishment, saying to them “You’re not in trouble. I just want you to kind of remove yourself for a minute.” She wants them to know that it is not a consequence, but a strategy for regulation.

A common de-escalation technique Angela, Debbie, and Lindsay use is allowing students to take a walk, either on their own if they can be trusted with that or with a trusted adult (e.g., school resource officer, administrator, the teacher when they can find someone to cover their class). Debbie talked about the impact of taking a walk for students who otherwise might have an outburst of emotions in the classroom, saying

A lot of our kids are confrontational...[I]f they have a chance to get out and run off whatever energy's creating the issue...and it goes out into a productive activity, instead of beating someone, you know that is always helpful.

Angela and Corey believe so strongly in using de-escalation techniques that they think that all teachers should be taught these techniques. Angela said “I think you should be taught how to handle” simple situations when students are escalated. And about



escalating events, Corey “absolutely think[s] teachers should be taught how to deal with those situations in the moment.” They have seen these techniques help students regulate their emotions, and believe it can reduce discipline referrals and help keep students in class.

As far as impact, Debbie and Corey both talk about the ability of de-escalation techniques to prevent major behavioral incidents in the classroom. Debbie said, “[Y]ou can diffuse by taking [the] fire away from them, or taking the oxygen away from the fire.” She sees that when she is able to diffuse arguments or help a student regulate their emotions, she helps prevent administrative involvement. Corey said,

[A]nything that gives the student a moment to or a means to bring themselves back into that comfort zone...is majorly beneficial for our kids because, in my experience...they may get done cussing me out and then seeing the look on their face is like “That wasn't aimed at you, that wasn't because of you.” [A]nd a lot of their issues come from [they] don't have that quick regulation, that filter, that normalization of what interactions look like that people that haven't necessarily gone through certain traumatic events have.

The de-escalation techniques are helpful for preventing escalated students from escalating further, but there are other techniques the teachers use that help prevent the escalation from happening, including incorporating physical movement into the classroom. For example, Carrie gives opportunities for students to move their body, and wishes that they had a school-wide movement activity at the beginning of the day. And Lindsay has a co-worker who has used bands by the students' feet that they can kick, and she thinks those are helpful. And Debbie incorporates “sensory walks” into her classroom whenever she

feels like the students need a break. The teachers believe these techniques help students to regulate their bodies and emotions before they become escalated.

Both Carrie and Corey talked about teaching students how to respond differently by teaching regulation techniques at times when the student is not escalated. For example, Carrie would have conversations with students when she was an administrator that are similar to what she thinks teachers should have with their students at times when they have calmed down, which she calls a “re-teaching moment.” She gave an example of a conversation she had with a student following an escalated incident in the classroom:

“Okay, you called your teacher a bitch. Can you tell me what would have been a better way to talk through the situation with your teacher? What were you upset about in the first place? And why did you do that? And then, what could you have done?”

These conversations took place when the student was not escalated and could focus on processing what happened, and helped the student learn techniques to de-escalate themselves in a similar, future situation. Corey also teaches students at times when they are not escalated, helping them to understand their emotions, how they impact their actions, and how to de-escalate themselves in conflict or stressful situations. He did note that de-escalation techniques are difficult to implement when a student becomes escalated very fast and forgets everything because they become too overwhelmed by what happened to process anything rationally.

#### 4.4.4.4 CONSISTENCY

Another technique that teachers used was consistency, whether in scheduling or classroom routines. Corey has seen consistent schedules help “with some of that self-

efficacy, because if they know what's coming, they know where to go, and there is a bit of self-pride when they do what they're supposed to do without asking me or without me." Carrie notices that having a consistent classroom routine and consistency in how they use their mathematics journal in her class students to feel comfort in the regulation. Dan included another teacher in the plans to help a student in his class regulate and get on a schedule, noting that this student did not particularly like him and Dan was happy that the student found a teacher who could help the student get his work done by getting on a schedule. Lindsay uses consistency in routines, but does not regulate due dates to give students flexibility and freedom. She notes that the freedom and flexibility in her classroom can be a struggle sometimes for students who thrive on scheduling. Angela also talked about a combination of mixing things up (e.g., changing the arrangement of the desks in her room often) and routine (e.g., always incorporating movement breaks into the class) in order to help students feel a sense of safety within small amounts of situational change. She notes that sometimes, students look forward to the routine, saying,

[Students will say,] "Miss [Angela], it's Tuesday. Are we going to do this?" "Yes we are," you know, like and that was kind of when I became more of a schedule person is when I knew that kids were looking forward to things. And I was like, "Oh, you guys do pay attention." So I became more deliberate and how I structured my weeks.

Corey noted the importance of this, saying "One thing our kids absolutely crave is consistency. They need it because they don't get it anywhere." He also notes that students will ask for things like Angela's students, saying

[I]t's funny because if you veer off something or if you tell them some plan that you've got coming up for it and you happen to not reach it or whatever, they will call you out on it in a heartbeat. You know, "You said, we were going to get this today."

He also notes that consistency is especially important to help regulate students around long breaks or "awkward instructional settings" (e.g., hybrid or virtual learning), and that sometimes, students do not know how to handle the consistency in school, even though it is what they crave because it is so different from their typical experiences at home.

#### 4.4.5 Changes in Perceptions of Student Behavior Due to Trauma

Sometimes, the teachers do not view student behavior differently or treat it differently because of trauma status because they treat all students as if they have experienced something traumatic. Dan talked about this, saying that his class practices would not change if he could know which students are affected by trauma because he already assumes that a high percentage of them have experienced traumatic events. He structures his class with interventions that would help any student with challenging behavior. And Carrie also believes that "just being a kid is traumatic" and does not change her view of their behavior much based on whether she knows that a student has experienced trauma or not.

For the most part, however, the teachers do have changes in the way they view and understand student behavior when they understand how trauma impacts them. Alice talked about a student she had in class before she understood trauma and its impact on the brain. She said that she would have chosen to interact differently if she had known his trauma history when she had him in class. After Alice learned about trauma-informed

instruction, she saw a colleague interact with the same student when he was “going nuts in the hallway” and she stopped and said to the student, “Whoa...tell me what's happened today.” The student talked to her about the conflict with the other teacher and then Alice helped to restore the relationship between the other teacher and the student. Afterwards, she talked to the other teacher who said “I didn't even think to ask that,” and Alice said, “I know, because nobody tells us to.” For her, knowing that a student has been impacted by trauma changed the way she perceived her behavior, since she now knows “something has happened to the student...that has made them in the state of mind where they're easily going to be you know, going off the rails.”

Another common discussion point was that knowing that a student has experienced trauma helped the teachers to not take the behavior as personally and move from a teacher-centric classroom to a more student-centered approach to classroom discipline. Alice said,

[I]f you're a decent human being, I think it gives you more of a sensitivity to their behavior...[W]e should be taught to put on our trauma lens with those students and see them through the lens of their trauma. And again, it helps us not take their behavior so personally.

Dan talked about how understanding behaviors that are symptoms of trauma has changed his perspective of the behavior and how he responds, saying that early in his career, he was more worried about what administrators would think if they came into his classroom and saw students with challenging behavior. He said, “[N]ow I'm more worried about the kid in, you know, getting them the help they need, as opposed to trying to establish

myself as...the authority figure in the room.” Debbie also has changed her perspective of behavior based on trauma, saying that without understanding trauma symptoms,

there would be a lot more of a shock effect....like “Whoa, why are you doing this? What’s happening? What’s going on?...Why are you treating me this way? Or why are you treating the kids this way? Or why are you...not responding appropriately in this manner?”

Corey also talked about how understanding which behaviors are symptoms of trauma helped him to respond better to them, also noting that he has had a transformation over time in how he understands these behaviors. He said,

[M]y first year I would get very bothered. I'd be like “What am I doing to these kids to cause these issues? What am I, what am I, what am I, what am I...?” And it’s that egotism it's that, “I am directly influencing them.” And a lot of times...their blow ups have nothing to do with anything that I did personally.

Alice says it gives her “an entirely different perspective on the student” when she knows that they have a trauma history. She is more able to see their behavior as “not a personal attack” and is able to “empower [the student] to learn how to behave in a better way” since she understands the reasons behind their behavior.

Other differences in teacher responses to behavior when they know it is a symptom of trauma include being more likely to persist in interventions for the behavior because of the trauma history (Angela), keeping high expectations for behavior while providing some leniency due to their trauma history (Corey), having more of a focus on getting to the root of the behavior (Dan), and simply giving students the space to have a bad day (Lindsay). Angela believes that knowing that a student has been impacted by

trauma makes her less optimistic about their future when they exhibit persistent or incredibly challenging behavior because other teachers may not show the student the same grace. But Carrie has a different approach, treating every student as if they have experienced something she does not know about, saying, “And yes, sometimes they'll probably take advantage of it. But at the other point like who really cares, you know, what's the best, what's the best thing for them, and how can I help them through it?” Though, Carrie does admit that if she knows that a student has been through a traumatic event, she might be more likely to be lenient and allow them to turn in assignments at a later time. And Corey talked about the balance of not being too lenient, but wanting to make sure that student needs are met:

[T]he trauma impacts how they view situations and how they handle [them].

[B]ut not to let it kind of pigeonhole them in, so finding the balance of “You're still going to be held accountable for decisions and choices that you make. But we're still going to make sure that you are met where you need to be for whatever emotional state or triggering events put you in this position.”

#### 4.4.6 Discussion

The interview participants' definitions of trauma-informed classroom (TIC) are in line with much of what the literature states should be happening within trauma-informed classrooms. They believe that teachers should focus on “What has happened to [students]?” instead of “What is wrong with them?” (Brodovsky & Kiernan, 2017), and believe TIC involves recognizing and responding to trauma symptoms within the classroom culture and pedagogical choices (National Traumatic Stress Network, 2016). They believe that all of this is for the ultimate goal of safety (both perceived and physical

safety) within the classroom for students to allow room for students to grow and learn (Pickens & Tschopp, 2017). However, the teachers did not speak much about moving past what has happened to the students and into a more “healing centered engagement” approach, which requires thinking more about healing and resilience (Barnhill et al., 2019; Ginwright, 2018). This is likely because of the many obstacles they discussed as being in the way of learning for students who have experienced trauma. The teachers believe that TIC involves using relationships as the context for the collaborative mathematics approach that impacts student well-being (Schettino, 2016).

The teachers’ descriptions of TIPE practices are varied and include many informally-learned techniques that teachers learned simply by trial-and-error over time. They generally believe that these strategies show promise, but their hesitations might be because almost none of them received formal training in any of the TIPE practices they use. Most of the teachers interviewed expressed desiring to know more in order to better help students (Alisic, 2012). Several of the key assumptions of the TIPE framework were believed by the teachers who participated in the interviews, including that “trauma-informed teaching should provide students with access and opportunities that assist them to increase positive psychological resources,” “the classroom is sometimes the most stable and consistent location in a trauma-affected student’s life”, and “well-being should and can be taught in all school settings” (Brunzell et al., 2016b, p. 64). The skepticism that teachers had about the impact of some of the TIPE practices that they used in their classroom supports the assumption that

in order to successfully access many of these cognitive based positive psychology interventions (e.g., character development, resilient self-talk, hope, and goal



setting), students must be developmentally ready in a number of other affective, physiological, and interpersonal competencies that have been compromised by the effects of trauma. (Brunzell et al., 2016b, p. 64)

While the teachers were less direct about this, their belief that trauma impacts students' receptiveness and ability to participate in interventions is in line with this TIPE assumption, and this points to the need for training to help teachers who are helping students to develop the skills they need to be ready for these other interventions.

One of the TIPE assumptions that was not held by all teachers was "an education approach to trauma-informed learning should include high learning expectations and aspirations that are developmentally informed" (Brunzell et al., 2016b, p. 64). As seen in the findings of this study, sometimes teachers compromise their high expectations of student learning because of their trauma history and the symptoms of trauma they see present in the classroom. This decision might negatively impact student well-being long-term (Cole et al., 2005).

Brunzell et al. (2016b) said that "[m]anaging disruptive classroom behaviors in a safe and supportive manner is a hallmark of trauma-informed teaching." This was a consistent theme throughout their responses as they discussed TIPE practices and their interventions for trauma symptoms. And teachers talked about student success often as part of an interactive process of building on previous successes, very similar to the "upward spirals of well-being" that is part of TIPE. The most-often discussed TIPE intervention was growth mindset, which has the potential for increasing students' psychological resources (Froschl & Sprung, 2016). Growth mindset is also a key component of transformational learning as defined by Slavich and Zimbardo (2012), and

several other key components were commonly discussed, like directly opposing the “sage on the stage” teacher mentality (e.g., Carrie, Alice, Lindsay, Dan), intellectually challenging students (all teachers did this to some degree), and creating lessons that “transcend the boundaries of the class” (Slavich & Zimbardo, 2012, p. 585; e.g., Dan, Debbie). It seemed that the teachers had been exposed to these transformational learning techniques in some fashion, viewed them as helpful for students’ challenging behaviors, but did not necessarily view them as part of their trauma-informed approach to teaching and learning despite the evidence they gave of it helping trauma-impacted students.

Whether the teachers learned techniques formally or informally, the teachers believe they can impact student self-esteem, which is a need Maslow (1943) identified and a need that can be more difficult to fulfill for students who have been impacted by trauma, leading to negative mental health outcomes and a harder time forming attachments (Lim et al., 2012). It is promising that the teachers believe they can impact student self-esteem through trauma-informed mathematical practices, as well as increase a student’s ability to engage with others in a way that might lead to empathy and understanding (Brown-Jeffy & Cooper, 2011; Cuadra et al., 2014; Gay, 2002; Wachira & Mburu, 2019). The teachers’ experiences did show that fulfilling the self-esteem needs as described by Maslow (1943) apart from the cognitive needs he described (Maslow, 1943) within the mathematics context is challenging, as most of their interventions for self-esteem are rooted in mathematics and cognitive pursuits. But they also see that when esteem needs are fulfilled, students are more likely to desire the cognitive pursuits on their own, instead of it being simply something they do to appease the teacher. The teachers’ experiences have shown them that traditionally-held false beliefs about

mathematics (e.g., being fast at solving mathematics problems means you are “good at mathematics”) combined with outside factors like parental dissatisfaction or lack of parental approval impact student mathematics identity negatively, which they believe can be helped through these interventions for increasing self-esteem (Betty et al., 2011; Darragh, 2015; Froschl & Sprung, 2016; Nasir et al., 2008; Wilson, 2016). Their beliefs about the importance of student self-esteem, particularly relating to their mathematical identity, are bolstered by the way they discuss the lack of self-esteem in mathematics among students who have been impacted by trauma. Based on their experience, when students miss school or get behind academically as a result of their trauma symptoms (e.g., missing school due to bruises they cannot cover up, being suspended because of an outburst that was the result of exposure to trauma the day before), it is more challenging to build their mathematics identity and increase self-esteem. This points to the need for more research regarding how interventions for mathematics behavior and identity impact trauma-affected students, and a framework for trauma-informed interventions in these areas.

The TIPE practices teachers use were often developed from and rooted in their past experiences since they often have not been formally trained. For example, Angela is a special education teacher and Lindsay worked at a mental health facility, so they focused a lot on sensory integration and using items like fidget spinners to help students. Dan uses a lot of relational interventions because he learned over time that this was what was missing when he was trying to help students. And Carrie was an administrator before, so she believes that as much as can be handled in the classroom should be handled in the classroom. She uses interventions that are focused on helping all students

because she knows that most of them have things going on in their lives that impact their behavior, a belief she picked up over time and was bolstered by her desire to be a foster parent someday.

Training level was associated in the ARTIC survey analysis with differences in the Self-Efficacy, Personal Support, and System Support subcategories, as well as the overall ARTIC score, with teachers with higher levels of training indicating on average more personal and system support and having, on average, higher levels of positive attitudes overall toward trauma-informed care. Just as Baker et al. (2015) found that high scores for the System Support subscore correlated with feelings of being supported at work, the teachers who had the lowest scores in this subscale (Angela, 3.5; Carrie, 4.5; Lindsay, 1.5) more often said negative things about the outside help they received at their school and the level of buy-in from others. Lindsay's extremely low score in the System Support (more than three standard deviations from the mean of 5.39) makes sense given her responses in the interview that indicated the most frustration out of all of the participants regarding her school and district's TIPE practices, particularly with regard to restorative justice and discipline.

Additionally, Baker et al. (2015) found that the Personal Support subscore was "associated not only with personal familiarity with [trauma-informed care (TIC)], but also that the participant's job setting facilitates familiarity with TIC (e.g., TIC is well-implemented in the organization, the participant has received formal TIC training)" (Validity section, para. 2). Interestingly, of the teachers who participated in their interviews, Corey, Dan, and Debbie were the only ones who answered the questions in the Personal Support Category. This was particularly interesting, as Alice's interview

responses indicated that her school was implementing trauma-informed care practices, and answering N/A for these questions is for teachers whose schools do not have a trauma-informed care plan. It is also important to note that Corey and Debbie are in alternative school settings where trauma-informed practices are more embedded into the school's curriculum and disciplinary practices, so it is not surprising that they were two of the three who recognized this as part of their school's plan for students. The third, Dan, also indicated that his school was incredibly supportive of his trauma-informed practices and gave him a lot of leeway when working with trauma-impacted students.

The Personal Support subscore was also found to have statistically significant differences based on school district size, with teachers in larger districts more likely, on average, to express confidence in and support of the implementation of trauma-informed care practices. It is difficult to make comparisons based on interview responses, as Alice and Corey were the only two interview participants who were not in large school districts, with Alice in a mid-sized district (between 10,000 and 19,999 students) and Corey in a small district (less than 10,000 students). Corey's situation is incredibly unique, as he is in an alternative school with a supportive administration, board of education, and school district. Corey and Alice both showed less frustration with their schools and districts than the other teachers who were from larger school districts, maybe due to buy-in at their specific institutions. More study is needed to probe these differences.

While the teachers talked about some practices that any teacher can implement (e.g., building relationships with students, using breathing techniques, regulation strategies), there were several mentions of TIPE practices that were specifically in the

context of mathematics. These are in line with the practices from the literature that show the potential of mathematics to aid in healing from trauma, including communication in mathematics courses encouraging the development of positive relational communication (e.g., Cole et al., 2005), helping students to reason through their emotions in order to prevent further maladaptive behavior that could lead to prison (e.g., Cuadra et al., 2014), and helping students with learning and behavioral (dis)abilities gain access to quality mathematics as a means of helping trauma-impacted students (e.g., Gersten et al., 2009). Additionally, teachers talked about mathematics being a safe space for students to make mistakes and learn how to respond to those in a healthy and productive way (Boaler, 2013). They believe in using mathematics as a tool for helping students to learn educational resilience (making mistakes and persevering through them within the mathematical context), which in turn they believe helps students to learn how to be resilient in the other areas of their life. They believe this increases the student's own strengths-based view of themselves and gives the student the opportunity to succeed in the classroom and empowers them to grow and change in other areas of life (Brunzell et al., 2016b).

The teachers' discussions regarding helping students understand their own triggers and how to better respond to stressful situations through regulation strategies are in line with the literature that suggests that if students are taught about how their body responds to stress and intense emotions, they may be better equipped for handling those situations because of a deeper sense of safety due to strategies for deeper focus when their brains begin to be overwhelmed by outside stimuli (Brunzell et al., 2016a; Brunzell et al., 2016b; Chafouleas et al., 2016; Pickens & Tschopp, 2017; Stokes & Brunzell,

2019). The teachers believe in these regulation strategies and teaching students how to respond to their body's stress indicators because their experiences have shown them that they can improve student functioning in the classroom. However, they also note that sometimes students escalate too quickly for these strategies to be effective, and in this situation the teachers focus on restoration back into the classroom once the student has de-escalated. The teachers believe that academic and wellness learning are both important, and that without teaching students how to respond to difficult and emotional situations, the students will struggle to reach academic success (Brunzell et al., 2015).

It is also interesting to note that the teachers who participated in the interviews, regardless of their level of training in TIPE practices, struggled to talk about the strengths of their students, which is a central component of TIPE (Brunzell et al., 2016b). While the teachers would answer a direct question about the strengths of their students who had been impacted by trauma, even those responses were often hedged with comments about how the strength could also be a weakness. This warrants further investigation—can strengths-based trauma-informed training help teachers view their students from a strengths-based lens (as opposed to a deficit one)?

Lastly, the teachers' beliefs about TIC support the choice of Brunzell et al., (2016b) to include relationships twice in the TIPE framework. The teachers interviewed believe that relationships are the most important component of TIC, with the teacher-student relationship being the hinge upon which all other interventions rests—if they cannot reach students through relationship and establish trust, the teachers believe that no other intervention will work.

## 5 DISCUSSION

The purpose of this study was to learn about mathematics teacher perspectives regarding the potential of trauma-informed mathematical practices to assist in disrupting the preschool-to-prison pipeline. Teacher perspectives were sought regarding what they believe about responding to challenging behavior and how these behaviors impact their perception of future student success, since the pipeline is largely in place because of harsh disciplinary reactions to student behaviors that occur in the classroom. Teachers were asked about their perception of the power of mathematics to impact students who present with challenging behaviors, who have experienced trauma, or who are likely to end up incarcerated. These perspectives gave insight into both their thoughts on how mathematics makes a difference for these student populations and the connections they draw between the three groups. And teachers were asked about trauma-informed practices and how they apply in their mathematics classrooms, as their experiences are vital to understanding whether there is potential for these practices to disrupt the pipeline. The ARTIC survey data were used to better understand mathematics teacher perspectives on trauma-informed practices and to consider patterns that might inform future research in this area.

Teachers said trauma-informed practices help with behaviors they associate with office discipline referrals and traditional school discipline methods, but interestingly did not necessarily link those behaviors (e.g., fighting, outbursts toward a teacher) to an increased risk of incarceration. Teachers generally believed that they could make an impact on behaviors that are often symptoms of trauma when they were given the tools to help respond well to those behaviors (e.g., extreme emotional responses). But the trauma



symptoms that they did not know how to handle (e.g., withdrawing, truancy) were more likely to be on their list of behaviors that are linked to incarceration. They believed that relational interventions were the best way to help students who presented with challenging behavior, especially when it was a symptom of trauma (Brunzell et al., 2016b, Chafouleas et al., 2016; Crosby et al., 2017; Crosby et al., 2015), but stress of working with trauma-impacted students occasionally impacted their own behavior and caused them to behave differently with these students than they would have liked (Kokkinos et al., 2005; Robinson, 2002).

Teacher bias came up throughout the interviews—either the bias of the teacher themselves or of their colleagues toward students with (dis)abilities, students from low socioeconomic status families, and minority students, particularly Black students. There was also potential bias in the way they sometimes talked about gender and behavior, and discussion on how gender bias impacts students’ mathematics identity. These biases are connected to both how they viewed trauma and how they view incarceration, with their perception being that students from these groups (e.g., males, Black students, students from low socioeconomic status families, students with (dis)abilities) are less likely to be impacted by trauma-informed practices and more likely to end up incarcerated, though they usually attribute this to the bias of other teachers. More research is needed regarding whether teacher perceptions are based in actual student behavior and outcomes or in unintentional bias.

A significant finding was the teachers’ perceptions of what mathematics is compared to their beliefs about what they are actually teaching students. While teachers tended to think of mathematics as a way of thinking that involved problem solving,

critical thinking, logic, and making complicated things more simple, they did not describe what they taught in these terms when asked questions like “What impact, if any, do you think mathematics has for students who seem to be on their way to a life in the justice system?” When answering this question, they all reverted to the idea that mathematics is simply a set of standards (algebra, geometry, trig, etc.) and rarely talked about mathematics as a way of thinking. They believe that critical thinking was important for trauma-impacted students and students who they believe will end up in the justice system (Cole et al., 2005; Cuadra et al., 2014), but then struggle to make the connection between what they are teaching with their view of mathematics as a tool for problem solving and critical thinking. Future research is needed to understand their perceptions of mathematics and why this disconnect exists. Their perception of what mathematics is (e.g., problem solving) is in line with helpful interventions for impacting criminal thinking styles and a lack of interpersonal skills that may help prevent future incarceration (Brunzell et al., 2016b; Cole et al., 2005; Cuadra et al., 2014; Meece, 2003). The disconnect between their beliefs of what mathematics is and what it is they are teaching could also have further reaching implications beyond students impacted by trauma or students who are on the pipeline. This warrants further study, as well as how these disconnects impact a teacher’s ability to provide high-quality and rich mathematics opportunities for trauma-impacted students (Kokka, 2015).

The study also found that teachers are using TIPE practices in their classroom on a daily basis, but have not always been trained in these formally as trauma-informed practices. For example, they spoke consistently of growth mindset, which is a TIPE strategy (Brunzell et al., 2016b), but did not have formal training identifying this as

helpful for trauma-impacted students. It is as if they are accidentally using trauma-informed practices based on trial and error, or using strategies that have been presented as helpful to solve other “problems” that happen to be linked with trauma symptomology. The teachers expressed an earnest desire for further training in TIPE practices and for all teachers and administrators to learn more about these practices, which is in line with findings from other studies on trauma-informed educational practices (Alisic, 2012; Crosby et al., 2015). So while it is encouraging that they are using trauma-informed practices and believe they make an impact on student communication (e.g., Cole et al., 2005) and emotions (e.g., Cuadra et al., 2014), there is a need for more training in formal settings to explicitly share practical advice for teachers on how to work with trauma-impacted students, as the teachers craved more formal training.

One of the most interesting findings from this study was the idea of the student’s own perception of their risk of future incarceration and their attitudes making an impact on the teacher’s belief that they could help a student avoid that outcome. The discussion around the preschool-to-prison pipeline involves the role of teachers, the role of administrators, and even impacts of harsh disciplinary policies on students (e.g., Coalition for Juvenile Justice, 2001; Wald & Losen, 2003; Wald, 2012), but does not discuss this self-assessment on the part of the student about where they will end up in their future. This was a consistent theme throughout the interviews, with teachers unsure how to impact students with this mindset. Teachers linked this mindset with some traumatic event or a series of traumatic events in the student’s life (e.g., having to mule drugs because of financial difficulty in their family, wanting a roof over their head and meals provided to them because they do not currently have them). More research is

needed into how this mindset impacts future incarceration, as well as what classroom interventions help with this mindset. Unfortunately, the interventions the teachers tried with these students did not seem to produce results. As an example, Angela had a student who would openly discuss his future as a drug dealer. Her school had motivational videos they would watch school-wide, and this student was not impacted by them. She said,

[H]e even said he would get better meals in prison than he got at home, like that was his, his wording. And so motivational videos for him meant nothing, like that wasn't a future that you could understand. So we watched one about a former drug dealer who went to prison and cleaned up afterwards, was now running a leadership program, yada, yada. But still, for him, that was a rare case scenario that couldn't be him. And so in the beginning, I don't think they're able to understand that that can be their reality.

This type of struggle was a consistent theme throughout the interviews—wanting better for the students than they want for themselves. Further study could dive deeper into this topic, as it was on the teachers' minds a lot and a source of great struggle for them as they seek to impact students.

Another consistent theme in the interviews involved the ideas of power, control, authority, and boundaries. While suggestions from Gutiérrez (2018) for rehumanizing mathematics involves a shifting of “power” to the students in the classroom, there was a consistent theme that arose that was not necessarily in contradiction to this idea (most teachers allowed some student autonomy and power in the classroom), but instead adds another layer to the discussion. These teachers believe the need for trauma-impacted

students to feel safe is partially achieved through appropriate boundaries and a safe authority figure (e.g., teacher; NCTSN, n.d.). The teachers believe that since many trauma-impacted students (particularly ones who have been neglected and abused) can lack appropriate boundaries in their homes, they crave them at school. More research and discussion is needed regarding the idea of power and control vs. authority and boundaries and the place for each of these in the mathematics classroom, since this could impact trauma-affected student well-being if this balance is not achieved. As Lee and Hannifin (2016) found, sometimes students may feel a sense of autonomy even when taking on tasks imposed on others, which indicates that it may be possible for teachers to both give healthy boundaries and authority while also providing enriching opportunities for student autonomy. Frameworks for trauma-informed mathematics are needed to address this balance, particularly in light of the student-centered shift in mathematics that requires relinquishing power and rejecting traditional classroom hierarchies (Lee & Hannafin, 2016; McCombs & Whistler, 1997; Meece, 2003).

An additional theme that emerged throughout the interviews was the fragile mathematics identity of students who have been impacted by trauma. The teachers believe that the trauma-affected student's identity in general is fragile, so it makes sense to the teachers that their identity would be a struggle to make sense of in the context of mathematics. The teachers also see that there are outside factors that influence the students' identity, including their parents (e.g., Betty et al., 2011; Froschl & Sprung, 2016). Mathematics is so unique in that mistakes are so valuable, but the teachers noted that trauma-affected students viewed themselves as "bad" at mathematics and viewed mistakes as negative. And the teachers focused more on the identity outside of

mathematics than math identity, since they were less concerned about mastery of mathematics for their trauma-impacted students. This begs the question, what does the sociopolitical turn of mathematics (Gutiérrez, 2013; NCSM & TODOS, 2016) mean for students who have experienced trauma? Since the teachers question the importance of mathematics for these students, perhaps the question of access and opportunity is important to consider for these students in a unique way from other students—are mathematics teachers “shielding” students from mathematics, operating as an unintentional gatekeeper because they view mathematical content as unimportant to students who have experienced trauma, like what many of the teachers in this study described? Could this be the result of a failure on the part of teacher education programs to adequately define mathematics and the potential impact it makes for kids, or is this simply the result of empathy for the students’ situations leading to a lesser view of the importance of the content? It seems that in some ways, Maslow’s (1943, 1970, 1971) hierarchy in the minds of the teachers is exactly the pyramid that it is typically represented as—students are incapable of higher thinking because of not having their other needs met first. And while there might be some truth to this, there is also the point of Maslow’s (1943) insistence that a need does not have to be completely satisfied in order to seek out fulfillment in other areas, represented as the ebb and flow diagram by Guttmann (n.d.). It also brings up another question, which is whether it is possible to meet needs (e.g., safety needs) through mathematics and not in spite of it? Could mathematics learning be wellness learning (Brunzell et al., 2015)? Maslow (1943) even discussed the role of education to help fulfill the needs of children (e.g., esteem, safety)

by “neutralizing of apparent dangers through knowledge” (p. 377), so what is the role of mathematics in this? Or what should it be? Further research is needed on this topic.

Additionally, there was some bias in the responses of the teachers that warrants discussion. There was a common dichotomy presented by teachers: wealthy students vs. trauma-affected students. Often they discussed these two student groups as mutually exclusive (and Advanced Placement (AP) students and trauma-affected students, as well), but trauma impacts students from every socioeconomic class, despite higher levels of trauma in lower socioeconomic families (Goodman et al., 2012). Poverty alone can be traumatic for students, so this is not to discount the enormous challenges faced by populations the teachers perceive to be impacted by trauma at higher rates, but to say that sometimes teachers might overlook the importance of trauma-informed practices if they teach in an affluent area or teach AP classes. This distinction has important implications for future training and targeting of district plans—all schools, regardless of socioeconomic status of their students, should have a trauma-informed care plan. And all students, regardless of their academic prowess, should be treated with trauma-informed educational practices and interventions.

Overall, the findings of this study suggest that there is potential for TIPE in mathematics classrooms to help disrupt the preschool-to-prison pipeline based on the links drawn between challenging behavior, classroom discipline, trauma symptoms, TIPE, and risk of incarceration. The teachers believed that using relational, trauma-based approaches to discipline and preventative measures helps students. They believe that helping students with challenging behaviors means changing their futures, which they believe are grim if they cannot intervene and help the student mitigate the negative

behavior responses to trauma. And they believe that TIPE practices are generally effective, with some limitations. Even though they do not necessarily directly link trauma symptoms with incarceration risk in their answers, this finding is somewhat promising because it means that they generally find their trauma interventions can work to help students, since only behaviors they do not think they can help show up in their list of incarceration risk behaviors. However, much is still to be learned about this topic and many questions remain. Some additional questions are discussed next.

### 5.1 Limitations

The purpose of using the mixed methods phenomenological research (MMPR) Phen-Quan approach described by Mayoh and Onwuegbuzie (2014, 2015) was to deeply understand the lived experiences of the participants while providing some context for the discussion on teacher perceptions of trauma-informed education. This design was well-suited for this study, but there are limitations. The first is that there was no experiment or control group for the ARTIC survey data to provide a larger picture of the results. Since the study was interested in the perspectives of Kentucky secondary (8-12) mathematics teachers who taught in school districts with trauma-informed care plans (so that they would potentially have a reference for the questions being asked), the results of the survey and interview are limited to just those perspectives. Further studies could compare, for example, mathematics and English teachers' perceptions, or mathematics teacher perceptions before and after a training on TIPE, since Bryan et al. (2012) found differences between referral rates among mathematics and English teachers. Larger scale, longitudinal studies that involve time in the teachers' classrooms could give a larger picture that simply is not possible with a small-scale phenomenological study, as



this study's focus was on the perceptions and lived experiences of the teachers interviewed.

Another limitation with this study design is that there was a limited number of potential participants to solicit for participation, as the scope of the study was limited to teachers in the state of Kentucky who were teaching secondary mathematics classes in trauma-informed school districts. This study's purposeful sampling was appropriate for the intentions of this study, but future study could expand the scope, considering the perspectives of teachers in other states or teachers who, for example, do not work in a district with a trauma-informed care approach but who have experience with trauma-informed practices. Further study could also consider the differences in behaviors teachers find to be challenging between teachers who have never been exposed to trauma-informed care practices and teachers who have training in this area—do they feel similarly equipped to handle trauma symptoms? Are they more likely to view trauma symptoms as increasing the likelihood the student will end up incarcerated?

An additional limitation was the ARTIC survey design itself, as noted by Parker et al. (2019) and others—there are some questions on the dichotomous Likert scale that are not exactly opposites. For example, Debbie and other participants would likely believe that both of these statements presented as a dichotomous choice on the ARTIC are equally true, based on interview data: “Students need to experience real life consequences in order to function in the real world” and “Students need to experience healing relationships in order to function in the real world.” Though the overall reliability scores were high, it does warrant further discussion on whether the questions in this measure are appropriately written. The measure worked for the purposes of this study,

and had some correlation with interview data, but a confirmatory factor analysis could provide useful insight in further study.

Lastly, there were limitations based on timing of the study (e.g., Covid-19 impacts, most of the interviews took place over winter break, recent challenging racial situations in one of the school districts that make conversations like the ones in the interviews more emotional), lack of financial incentives to encourage increased participation rates, and the fact that since this is a dissertation, there was only one coder for the interview data, the sole researcher. Each of these is in line with appropriate limitations on any study design involving limited time and resources (e.g., Bogdan & Biklen, 1997; Seidman, 1991).

## 5.2 Implications and Next Steps

There are many implications of this study for teachers, administrators, researchers, and teacher educators. First, the study begins to fill the gap for content-specific trauma-informed education and the teachers' experiences highlight the need for a framework for secondary mathematics teachers (and likely all teachers within their content context) to consider how their content can assist trauma-impacted students and their content and pedagogical choices made more trauma-informed. This will have to be a collaborative effort between researchers, teachers, and teacher educators.

Second, frameworks for mathematics education are trending toward a lens for helping underserved and underrepresented groups (e.g., Gutiérrez, 2013), yet trauma-impacted students' needs are not clearly considered within these frameworks. The tension teachers saw between wanting to give their students autonomy and yet still seeing the need for a clear authority in the classroom to help trauma-impacted students can be

drawn out with further consideration of frameworks for mathematics teaching and learning following this study. The ideas of power and control in mathematics is a common theme in both social justice mathematics education frameworks, as well as student-centered mathematics frameworks (e.g., Lee & Hannafin, 2016; Panthi et al., 2018), and the discussion regarding what it means to have healthy boundaries and how to model appropriate authority is missing from the conversation. These dynamics showed up throughout the teachers' experiences in this study, clearly demonstrating the need for considering them in light of the current frameworks for mathematics education. There needs to be conversation regarding how to give collective responsibility for the production of knowledge (Kokka, 2015; NCTM & TODOS, 2016) while still providing structure and authority that students who have experienced trauma need.

Additionally, the need for training in trauma-informed educational practices is evident, as training levels impacted teacher Self-Efficacy, Personal Support, System-Wide Support, and Overall ARTIC scores. This was in line with the interview data as well, with Angela, Alice, Dan, and Debbie all desiring to know more about the results of the study—they crave more training and information regarding helping students with trauma-informed methods. The teachers also all discussed the training they had received as less than adequate, with Angela saying that the training they receive is “not the correct training that we maybe need.” Administrators who support trauma-informed classroom practices through helpful training and their own trauma-informed disciplinary and relational practices were spoken highly of, while administrators who do not care about trauma-informed practices were deemed as unhelpful, leading teachers like Angela and Carrie to not really send students to administrators even when they need help responding

to challenging student behavior. Angela mentioned training her school gave on the preschool-to-prison pipeline, which essentially told the teachers what it was but have no practical steps for how to disrupt it or help students who may be in the pipeline. This study gives one practical suggestion, TIPE, and shows the great need for training on these practices. The teachers also struggled to understand what trauma-informed mathematics should or could look like, and this points to the need for content-specific frameworks and training for teachers. These findings have implications for teacher preparation programs and administrators, showing the great need for better preparation for teachers in trauma-informed care practices.

This study started bridging the gap between trauma-informed educational theory (Cavanaugh, 2016; Cole et al., 2016; Crosby et al., 2018; NCTSN, 2017; ) and the correlation between trauma's impact on learning and adult maladaptive behavior (Cuadra et al., 2014; Fox et al., 2015; NSCH, 2018; Pickens & Tschopp, 2017), as the teachers' experiences lead them to believe that trauma is at the root of many of the maladaptive behaviors that lead to delinquency and ultimately incarceration. They also draw on ideas of social justice and culturally relevant mathematics as having the power to impact students who might be on their way to a life in the justice system (e.g., Crosby et al., 2018). The study draws links between the teachers' experiences with mathematics-specific interventions for behavior and identity (e.g., Alter et al., 2008; Hodge et al., 2006; Nasir & Hand, 2008; Partin et al., 2009) and the responses of students who have experienced trauma to these interventions. While teachers tend to believe that these types of interventions work, they are also more hesitant when talking about how they impact trauma-affected students, and further research is needed to continue exploring the

relationship between these interventions for identity and behavior and trauma-informed practices. This study found limited potential bias among participants when discussing trauma-impacted students and those they believe are likely to be incarcerated, and there is further study needed to identify whether these biases impact the discipline gaps identified in the literature (e.g., Zimmerman, 2018). This study also added to the limited research on teacher perspectives regarding trauma and its impact on students (Alisic, 2012).

Lastly, there are important next steps to take for researchers considering frameworks for trauma-informed education, namely that more research needs to be done on the efficacy of TIC interventions in mathematics classrooms, as well as how these practices impact students who are on the preschool-to-prison pipeline. Further consideration and study is needed in these areas, as this study shows that there is potential for trauma-informed mathematics education to assist in the disruption of the pipeline.

## APPENDIX

### APPENDIX A. INTERVIEW PROTOCOL

#### Interview 1: Context and Background

The purpose of this part of the interview is to get to know you and to understand your background. You should feel free to speak your mind, there are no right or wrong answers to these questions. At any point, if you feel uncomfortable and wish to skip a question or end the interview, just let me know and there will be no consequences for your choice. Do I have your permission to record this interview?

- 1) (Demographic questions)
  - a) State your name and where you are teaching.
  - b) How long have you been teaching?
  - c) Have you worked in schools other than where you are working now? Which ones?
  - d) Describe the school community within which you work (rural, suburban, urban; school size; student characteristics).
  - e) Does your school have a school resource officer?
  - f) Briefly describe the students you work with.
  - g) How often do you work with students from racial/ethnic minority groups? Students with learning or behavioral (dis)abilities? Trauma-affected students?
- 2) Describe your schooling experience as a child growing up.
- 3) Describe your feelings when you think about administrators at a school you attended growing up.
- 4) How did you end up teaching?
- 5) How would you define mathematics?
- 6) How do you define “trauma”?
- 7) What is your definition of “trauma-informed classroom”?
  - a) What does this mean to you in the context of a mathematics class?
- 8) Have you received formal training in TIE? If so, describe that experience.
- 9) Describe a typical school day for you.
- 10) Describe your classroom environment.
- 11) Do you have any experience with any techniques for teaching students how to develop positive attachment styles (like play and fun, emotional intelligence, co-regulation, other relationship-building activities)?
  - a) If yes:
    - i) Describe your experiences.
    - ii) Do you think they work? How have your experiences shaped your opinion about this?
    - iii) Have you seen them help with challenging classroom behaviors?
  - b) If no, why not?
  - c) Think of a student you know who has experienced trauma (or one you suspect has). How might this student respond to these activities?

- 12) Do you have any experience with any techniques for teaching students regulation strategies (like consistent scheduling, mindfulness, self-regulation techniques, sensory integration, etc.)? Describe them.
  - a) If yes:
    - i) Describe your experiences.
    - ii) Do you think they work? How have your experiences shaped your opinion about this?
    - iii) Have you seen them help with challenging classroom behaviors?
  - b) If no, why not?
  - c) Think of a student you know who has experienced trauma (or one you suspect has). How might this student respond to these activities?
- 13) Do you have any experience with any techniques for increasing students' psychological resources (like gratitude, character strengths assessments, resilience, hope, growth mindset, etc.)?
  - a) If yes:
    - i) Describe your experiences.
    - ii) Do you think they work? How have your experiences shaped your opinion about this?
    - iii) Have you seen them help with challenging classroom behaviors?
  - b) If no, why not?
  - c) Think of a student you know who has experienced trauma (or one you suspect has). How might this student respond to these activities?
- 14) When you hear the word "prison," what images come to mind? What feelings? What ideas?

## Interview 2: Experiences Relating to and Connecting TIPE and the Pipeline

The purpose of this interview is to learn more about your perspective regarding both trauma-informed classroom practices and the preschool-to-prison pipeline. As a reminder, you should feel free to speak your mind, there are no right or wrong answers to these questions. At any point, if you feel uncomfortable and wish to skip a question or end the interview, just let me know and there will be no consequences for your choice. Do I have your permission to record this interview?

- 1) Describe a student you know or suspect has experienced trauma and your interactions with this student in your classroom.
  - a) How do you know or why do you suspect this child has experienced trauma?
  - b) What is your relationship like with this student?
- 2) How do you make sense of your role in the lives of trauma-affected students in your math class?
- 3) What are some of the strengths of your students who have experienced trauma?
  - a) How do you see this manifest in your mathematics classroom?
- 4) Describe behaviors you have seen in your classroom that you have found to be challenging.
  - a) Talk more about your feelings when these behaviors occur.
  - b) How do these behaviors impact your relationships with your students?

- c) Would you say that students who exhibit these challenging behaviors like and respect you? Why or why not?
  - d) What behaviors do you think should automatically be referred to an administrator?
    - i) Why should administrators be the ones to respond to these behaviors?
    - ii) Do you believe teachers could be taught to respond to these behaviors in the classroom? Explain more about why you feel that way.
    - iii) Do you believe teachers should be taught how to respond to these behaviors within the classroom? Explain more about why you feel that way.
  - e) What typically happens when you refer a student to the office?
  - f) Are you satisfied with how administrators respond to these behaviors?
  - g) Why do you think your students engage in these behaviors?
  - h) How might you respond differently if you knew these behaviors were symptoms of trauma?
- 5) Describe a student you have in class who exhibits challenging behaviors. What is your relationship with this student like?
  - 6) How important do you think mathematics is for these students we just discussed?
    - a) What about for your other students?
    - b) What experiences have you had that have led you to these conclusions?
  - 7) Describe behaviors that you associate with trauma.
    - a) How do these behaviors affect your classroom environment?
    - b) What do you think discipline should look like for these behaviors when they occur in your classroom?
  - 8) What impact do you see learning mathematics has on trauma-affected students, if any?
  - 9) I am going to give you a behavior, and I want you to describe for me how you have responded to this behavior in your classroom.
    - a) Withdrawing/Social Isolation
    - b) Outbursts of anger or other extreme emotional responses
    - c) General disruptive behavior, like talking during lecture
    - d) Perfectionism
    - e) Do you believe your responses have been effective?
    - f) How do these behaviors (or other challenging behaviors) impact student success in your class?
    - g) How do these behaviors (or other challenging behaviors) impact their future success?
  - 10) Are there any students you have had that you believed, no matter what you do, they would end up in prison?
    - a) If so:
      - i) Describe the student(s). What led you to that conclusion?
      - ii) Are there certain behaviors you associate with a higher chance they will end up incarcerated?
      - iii) What impact, if any, do you think you have had on these kids in your capacity as their math teacher?
      - iv) Is there a point at which you think someone could have intervened and changed this trajectory?



- v) How would your perspective change if you knew one of these students had been impacted by trauma?
  - b) If not:
    - i) Why not?
  - c) Either way:
    - i) What do you think mathematics has to offer, if anything, to students who seem to be on their way to a life in the justice system?
  - d) Do you think there any predictive factors that lead to someone ending up in prison?
- 11) What do you think is at the root of the behaviors you have seen in your classroom?
    - a) Do you believe that trauma has played a role in the challenging behaviors for any of the students you have taught?
  - 12) Walk me through a time that you wrote an office referral for a student who was behaving in a challenging way for you.
    - a) What happened? (Describe the incident)
    - b) How did the student respond to the referral?
    - c) How did you feel during the incident? After?
    - d) How did it affect your relationship?
    - e) What are some possible reasons for their behavior?
    - f) What happened with the administrators?
  - 13) What do you believe is the purpose of discipline in the school setting?

### Interview 3: Visualizing and Extending

The purpose of this interview is to consider how the things we have previously discussed might impact your decisions in hypothetical situations. We will also explore how your experiences bring meaning to your perspectives. As a reminder, you should feel free to speak your mind, there are no right or wrong answers to these questions. At any point, if you feel uncomfortable and wish to skip a question or end the interview, just let me know and there will be no consequences for your choice. Do I have your permission to record this interview?

- 1) Picture yourself as a teacher who had never heard about trauma-informed education. What would be different about your classroom, if anything?
- 2) Given what we have talked about and your experiences with trauma-affected students, what does it mean to you to be their mathematics teacher?
- 3) What is your role in the lives of trauma-affected students in your math class?
  - a) Are there differences in your role with these students and your role with students who are not trauma-affected?
- 4) If you had a student who you knew would end up in the criminal justice system, what advice would you give to them about mathematics?
- 5) Pretend like you could see the future and know which of your students would end up in prison.
  - a) Would that change the way you teach them mathematics?
    - i) If yes, how? If no, why not?
  - b) Would that change your perceptions of their behavior?

- i) If yes, how? If no, why not?
- 6) How might your classroom practices change if you knew which of your students were trauma-affected?
- 7) If you were an administrator, what factors would you consider when a student was referred to you for challenging behavior?
  - a) Would it be helpful if you knew whether the child was trauma-affected or not?

APPENDIX B. SCHOOL DISTRICT DESCRIPTIONS

Table B1—School District Size and Demographic Category Descriptions

	Size Category (Number of Students)	Demographics Category (Percentage Minority Student Enrollment)
District 1	<10,000	≥40%
District 2	20,000+	≥40%
District 3	20,000+	≥40%
District 4	<10,000	20-39%
District 5	<10,000	20-39%
District 6	10,000-19,999	<20%
District 7	10,000-19,999	<20%
District 8	<10,000	<20%
District 9	10,000-19,999	20-39%
District 10	10,000-19,999	20-39%
District 11	<10,000	20-39%
District 12	<10,000	≥40%
District 13	<10,000	20-39%
District 14	<10,000	<20%
District 15	<10,000	<20%

Source: [www.kentuckyschoolreportcard.com](http://www.kentuckyschoolreportcard.com)

The school districts were chosen for inclusion because of their public commitment to trauma-informed educational approaches. District 1 is participating in a program with District 11 that is focused on reducing the impacts of violence within their school district. The student handbook in both districts have specific reference to trauma-

informed practices. District 2 has participated in a long-term grant program with trauma-informed efforts to raise awareness, enhance skills, expand the district's capacity for services for trauma-affected youth, and improve student outcomes. District 3 has several long-term initiatives to implement trauma-informed practices, including a district-wide commitment stated in their student handbook regarding improving school climate and increasing student social and emotional skills to improve student outcomes.

Districts 4, 7, and 8 are part of a program through an educational cooperative designed to ensure that all students are cared for in a trauma-informed way. This program is dedicated to mental health programs that are sustainable. The program's goals include reducing violence through mental health support services and social-emotional learning. Their programs include training in Youth Mental Health First Aid (YMHFA) and Trauma Informed Care (TIC).

District 6 received a grant to focus on trauma-informed practices as a means of aiding in creating a safe environment for all students where their mental health needs are met. This includes the use of social-emotional learning, mental health coaches, and using a social-emotional screener to identify students who may need services due to trauma. This district also uses PBIS, Multi-Tiered Systems of Support (MTSS), and a trauma-informed safe schools training.

Several of the districts have PBIS as their primary intervention (Districts 9, 10, 12, 14). District 15 has behavioral Response to Intervention (RTI) plans and counseling care plans that are trauma-informed. District 13 utilizes RTI, PBIS, TIC, YMHFA, and crisis counseling plans for trauma-impacted students. Finally, District 5 utilizes

mindfulness and meditation resources for healthy bodies and minds, in addition to trauma-informed resources for students, staff, and parents.

APPENDIX C. STATISTICAL DATA

Table C1—Survey Participant School Size Demographic

School Size by Student Population	Frequency	Percent
20,000+	41	60.3
10,000-19,999	14	20.6
<10,000	13	19.1

Table C2—Survey Participant School Population by Percentage Minority Population

District Demographics By Percentage Minority Population	Frequency	Percent
40%+	46	67.6
20-39%	12	17.6
<20%	10	14.7

Table C3—Survey Participants by Age

District Demographics By Percentage Minority Population	Frequency	Percent
18-24 years old	8	11.8
25-34 years old	20	29.4
35-44 years old	19	27.9
45-54 years old	13	19.1
55+ years old	7	10.3
No Answer	1	1.5

Table C4—Survey Participant by Race/Ethnicity

Race/Ethnicity	Frequency	Percent
Asian	1	1.5
Asian, White or Caucasian	1	1.5
White or Caucasian	64	94.1
No Answer	2	2.9

Table C5—Survey Participants by Gender

Gender	Frequency	Percent
Female	41	60.3
Male	24	35.3
Prefer not to answer	3	4.4

Table C6—Survey Participants by Training Level

Training Level	Frequency	Percent
None at all	7	10.3
A little	25	36.8
A moderate amount	23	33.8
A lot	4	5.9
A great deal	9	13.2

Table C7—Survey Participant by Years of Teaching Experience

Years of Teaching Experience	Frequency	Percent
0-5 years	18	25.4
6-10 years	15	21.1
11-15 years	10	14.1
16-20 years	10	14.1
20+ years	14	19.7

Table C8—Descriptive Statistics for ARTIC Score and Subscores

	Overall ARTIC	Underlying Causes	Responses	On the Job Behavior	Self-Efficacy
Valid	68	68	68	68	68
Missing	0	0	0	0	0
Mean	5.4233	5.1162	5.6261	5.5768	5.6029
Median	5.4384	5.0714	5.7143	5.5714	5.7143
Std. Deviation	.59906	.84655	.79060	.77312	.85031
Minimum	3.07	3.00	3.43	2.14	2.71
Maximum	6.67	7.00	7.00	7.00	6.86
	Personal Support	System Support	Reactions		
Valid	45	57	68		
Missing	23	11	0		
Mean	5.4583	5.3889	4.9901		
Median	5.5714	5.6000	5.0000		
Std. Deviation	.77275	1.13367	1.42786		
Minimum	3.00	1.00	1.00		
Maximum	6.86	7.00	7.00		

Table C9—Ranks and Test Statistics for Kruskal-Wallis H Test Comparing Scores Based on School District Size

	School Size	N	Mean Rank	Kruskal-Wallis H	p
Overall ARTIC45	20,000+	41	38.55	5.625	.060
	10,000-19,999	14	24.18		
	<10,000	13	32.85		
	Total	68			
Underlying Causes	20,000+	41	37.01	1.912	.384
	10,000-19,999	14	28.89		
	<10,000	13	32.62		
	Total	68			
Responses	20,000+	41	36.70	1.617	.446
	10,000-19,999	14	33.29		
	<10,000	13	28.88		
	Total	68			
On the Job Behavior	20,000+	41	37.74	2.939	.230
	10,000-19,999	14	30.93		
	<10,000	13	28.12		
	Total	68			
Self-Efficacy	20,000+	41	35.13	.535	.765
	10,000-19,999	14	31.14		
	<10,000	13	36.12		
	Total	68			
Reactions	20,000+	41	36.62	1.200	.549
	10,000-19,999	14	31.07		
	<10,000	13	31.50		
	Total	68			
Personal Support	20,000+	29	25.40	6.083	.048
	10,000-19,999	6	10.92		
	<10,000	10	23.30		
	Total	45			
System Support	20,000+	37	30.04	3.019	.221
	10,000-19,999	8	19.75		
	<10,000	12	31.96		
	Total	57			

Table C10—Dunn Test for Post Hoc Analysis to Determine Differences Based on School District Size in the Personal Support Category

(Sample 1)-(Sample 2)	Test Statistic	Std. Error	Std. Test Statistic	p
(10,000-19,999)-(<10,000)	-12.383	6.763	-1.831	.067



(10,000-19,999)-(20,000+)	14.480	5.874	2.465	.014
(<10,000)-(20,000+)	2.097	4.803	.437	.662

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed

Table C11—Ranks and Test Statistics for Kruskal-Wallis H Test Comparing Scores Based on School District Demographics

	District Demographics	N	Mean Rank	Kruskal-Wallis H	p
Overall ARTIC45	40%+	46	38.24	5.112	.078
	20-39%	12	26.04		
	<20%	10	27.45		
	Total	68			
Underlying Causes	40%+	46	37.64	3.876	.144
	20-39%	12	25.92		
	<20%	10	30.35		
	Total	68			
Responses	40%+	46	35.85	2.374	.305
	20-39%	12	26.67		
	<20%	10	37.70		
	Total	68			
On the Job Behavior	40%+	46	37.67	4.462	.107
	20-39%	12	24.50		
	<20%	10	31.90		
	Total	68			
Self-Efficacy	40%+	46	34.37	.008	.996
	20-39%	12	34.92		
	<20%	10	34.60		
	Total	68			
Reactions	40%+	46	37.26	5.321	.070
	20-39%	12	22.63		
	<20%	10	36.05		
	Total	68			
Personal Support	40%+	32	25.52	4.773	.092
	20-39%	8	19.19		
	<20%	5	13.00		
	Total	45			
System Support	40%+	42	29.65	2.827	.243
	20-39%	9	32.78		
	<20%	6	18.75		
	Total	57			

Table C12—Ranks and Test Statistics for Kruskal-Wallis H Test Comparing Scores Based on Years of Teaching Experience

	Teaching Experience	N	Mean Rank	Kruskal-Wallis H	p
Overall ARTIC45	0-5 years	18	31.36	1.024	.906
	6-10 years	15	38.10		
	11-15 years	10	33.20		
	16-20 years	10	34.20		
	more than 20 years	14	33.43		
	Total	67			
Underlying Causes	0-5 years	18	40.56	3.188	.527
	6-10 years	15	34.10		
	11-15 years	10	30.65		
	16-20 years	10	31.25		
	more than 20 years	14	29.82		
	Total	67			
Responses	0-5 years	18	33.86	2.195	.700
	6-10 years	15	39.50		
	11-15 years	10	29.45		
	16-20 years	10	29.95		
	more than 20 years	14	34.43		
	Total	67			
On the Job Behavior	0-5 years	18	35.31	4.699	.320
	6-10 years	15	41.60		
	11-15 years	10	25.50		
	16-20 years	10	33.25		
	more than 20 years	14	30.79		
	Total	67			
Self-Efficacy	0-5 years	18	24.72	8.516	.074
	6-10 years	15	43.40		
	11-15 years	10	39.05		
	16-20 years	10	31.05		
	more than 20 years	14	34.36		
	Total	67			
Reactions	0-5 years	18	32.94	.863	.930
	6-10 years	15	34.80		
	11-15 years	10	37.50		
	16-20 years	10	35.70		
	more than 20 years	14	30.79		
	Total	67			
Personal Support	0-5 years	10	20.60	3.500	.478
	6-10 years	13	23.77		
	11-15 years	7	24.14		
	16-20 years	3	10.50		
	more than 20 years	11	24.95		
	Total	44			

System Support	0-5 years	14	21.93	5.297	.258
	6-10 years	13	32.73		
	11-15 years	9	28.06		
	16-20 years	7	23.86		
	more than 20 years	13	34.15		
Total		56			

Table C13—Ranks and Test Statistics for Kruskal-Wallis H Test Comparing Scores Based on Teacher Age

	Age	N	Mean Rank	Kruskal-Wallis H	p
Overall ARTIC45	18-24 years old	8	32.94	1.230	.873
	25-34 years old	20	32.63		
	35-44 years old	19	37.39		
	45-54 years old	13	34.65		
	55+ years old	7	28.71		
	Total	67			
Underlying Causes	18-24 years old	8	45.63	5.676	.225
	25-34 years old	20	34.65		
	35-44 years old	19	33.29		
	45-54 years old	13	33.46		
	55+ years old	7	21.79		
	Total	67			
Responses	18-24 years old	8	35.81	.640	.958
	25-34 years old	20	35.05		
	35-44 years old	19	32.89		
	45-54 years old	13	35.35		
	55+ years old	7	29.43		
	Total	67			
On the Job Behavior	18-24 years old	8	32.00	4.499	.343
	25-34 years old	20	40.42		
	35-44 years old	19	34.13		
	45-54 years old	13	30.42		
	55+ years old	7	24.21		
	Total	67			
Self-Efficacy	18-24 years old	8	23.94	4.195	.380
	25-34 years old	20	34.25		
	35-44 years old	19	40.00		
	45-54 years old	13	32.73		
	55+ years old	7	30.86		
	Total	67			
Reactions	18-24 years old	8	31.31	1.768	.778
	25-34 years old	20	33.55		
	35-44 years old	19	38.74		
	45-54 years old	13	30.81		
	Total	67			

	55+ years old	7	31.43		
	Total	67			
Personal Support	18-24 years old	5	24.00		
	25-34 years old	14	20.21		
	35-44 years old	12	22.33	.929	.920
	45-54 years old	9	25.22		
	55+ years old	4	23.00		
	Total	44			
System Support	18-24 years old	7	31.86		
	25-34 years old	16	21.81		
	35-44 years old	16	29.19	6.473	.167
	45-54 years old	10	37.75		
	55+ years old	7	25.64		
	Total	56			

Table C14—Ranks and Test Statistics for Kruskal-Wallis H Test Comparing Scores Based on Training Level

	Trauma-Informed Training Level	N	Mean Rank	Kruskal-Wallis H	P
Underlying Causes	Little-to-no training	32	32.22		
	Some training	23	31.72	4.590	.101
	A lot of training	13	45.04		
	Total	68			
Responses	Little-to-no training	32	31.77		
	Some training	23	36.57	1.185	.553
	A lot of training	13	37.58		
	Total	68			
On the Job Behavior	Little-to-no training	32	32.47		
	Some training	23	34.00	1.516	.469
	A lot of training	13	40.38		
	Total	68			
Self-Efficacy	Little-to-no training	32	28.69		
	Some training	23	33.30	11.872	.003
	A lot of training	13	50.92		
	Total	68			
Reactions	Little-to-no training	32	33.63		
	Some training	23	32.93	1.109	.601
	A lot of training	13	39.42		
	Total	68			
Personal Support	Little-to-no training	11	16.50		
	Some training	21	19.93	12.159	.002
	A lot of training	13	33.46		
	Total	45			
System Support	Little-to-no training	23	26.74		
	Some training	21	25.07	6.671	.036

	A lot of training	13	39.35		
	Total	57			
Overall ARTIC45	Little-to-no training	32	30.92		
	Some training	23	32.28	6.276	.035
	A lot of training	13	47.23		
	Total	68			

Table C15—Dunn Test for Post Hoc Analysis to Determine Differences Based on Training Levels for Overall ARTIC Score

(Sample 1)-(Sample 2)	Test Statistic	Std. Error	Std. Test Statistic	p
(Little-to-no)-(Some)	-1.361	5.405	-.252	.801
(Little-to-no)-(Significant)	-16.309	6.503	-2.508	.012
(Some)-(Significant)	-14.948	6.861	-2.179	.029

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Table C16—Dunn Test for Post Hoc Analysis to Determine Differences Based on Training Levels in the Self-Efficacy Category

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	p
(Little-to-no)-(Some)	-4.617	5.393	-.856	.392
(Little-to-no)-(Significant)	-22.236	6.488	-3.427	.001
(Some)-(Significant)	-17.619	6.845	-2.574	.010

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Table C17—Dunn Test for Post Hoc Analysis to Determine Differences Based on Training Levels in the Personal Support Category

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	p
(Little-to-no)-(Some)	-3.429	4.875	-.703	.482
(Little-to-no)-(Significant)	-16.962	5.366	-3.161	.002
(Some)-(Significant)	-13.533	4.622	-2.928	.003

Table C18—Dunn Test for Post Hoc Analysis to Determine Differences Based on Training Levels in the System Support Category

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	p
(Little-to-no)-(Some)	1.668	5.004	.333	.739
(Little-to-no)-(Significant)	-14.275	5.850	-2.440	.015
(Some)-(Significant)	-12.607	5.752	-2.192	.028

Table C19—Ranks and Test Statistics for Mann-Whitney U Test for Comparing Scores Based on Whether the Teacher Participated in the Interviews

	Interview Participant	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p
Underlying Causes	No	61	33.03	2015.00	124.000	.070
	Yes	7	47.29	331.00		
	Total	68				
Responses	No	61	33.87	2066.00	175.000	.436
	Yes	7	40.00	280.00		
	Total	68				
On the Job Behavior	No	61	33.38	2036.00	145.000	.165
	Yes	7	44.29	310.00		
	Total	68				
Self-Efficacy	No	61	34.07	2078.00	187.000	.592
	Yes	7	38.29	268.00		
	Total	68				
Reactions	No	61	33.43	2039.50	148.500	.188
	Yes	7	43.79	306.50		
	Total	68				
Personal Support	No	41	22.34	916.00	55.000	.303
	Yes	4	29.75	119.00		
	Total	45				
System Support	No	51	29.72	1515.50	116.500	.352
	Yes	6	22.92	137.50		
	Total	57				
Overall ARTIC45	No	61	33.29	2030.50	139.500	.135
	Yes	7	45.07	315.50		
	Total	68				

Table C20—Ranks and Test Statistics for Mann-Whitney U Test for Comparing Scores Based on Whether the Teacher Indicated Their School Has a Trauma-Informed Care Plan

	Indicated Plan	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p
Underlying Causes	No	26	35.48	922.50	520.000	.747
	Yes	42	33.89	1423.50		
	Total	68				
Responses	No	26	34.42	895.00	544.000	.970
	Yes	42	34.55	1451.00		
	Total	68				
On the Job Behavior	No	26	38.58	1003.00	440.000	.179
	Yes	42	31.98	1343.00		
	Total	68				
Self-Efficacy	No	26	30.17	784.50	433.500	.155
	Yes	42	37.18	1561.50		
	Total	68				
Reactions	No	26	35.73	929.00	514.000	.685
	Yes	42	33.74	1417.00		
	Total	68				
Personal Support	No	6	25.83	155.00	100.000	.569
	Yes	39	22.56	880.00		
	Total	45				
System Support	No	16	24.00	384.00	248.000	.155
	Yes	41	30.95	1269.00		
	Total	57				
Overall ARTIC45	No	26	33.96	883.00	532.000	.860
	Yes	42	34.83	1463.00		
	Total	68				

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  - Graduate Teaching Assistant | University of Kentucky | 2016-2019
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  - Recipient of the Sallie E. Pence award (2011-2012)
  - Recipient of the J.C. Eaves award (2011-2012)
  - Recipient of the UK Women & Philanthropy Scholarship for the College of Education in STEM Education (2011-2013)
  - Recipient of the John Edwin Partington and Gwendolyn Gray Partington Scholarship (2020-2021)
- Professional publications
  - Braun, B., Davis, R., Doering, J., Harrison, A., Noll, J., & Taylor, C. (2013). Compositions Constrained by Graph Laplacian Minors. *Annual Volume 2013, 13*, 571.
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