Original Article

Science, Technology, & Human Values
1-31

DOI: 10.1177/0162243920974095
journals.sagepub.com/home/sth


A Science of Hope? Tracing Emergent Entanglements between the Biology of Early Life Adversity, Trauma-informed Care, and Restorative Justice

Ruth Müller[1,2,3] and Martha Kenney[4]

Abstract

The biology of early life adversity explores how social experiences early in life affect physical and psychological health and well-being throughout the life course. In our previous work, we argued that narratives emerging from and about this research field tend to focus on harm and lasting damage with little discussion of reversibility and resilience. However, as the Science and Technology Studies literature has demonstrated, scientific research can be

[1]Munich Center for Technology in Society, Technical University of Munich, Germany
[2]School of Management, Technical University of Munich, Germany
[3]School of Life Sciences, Technical University of Munich, Germany
[4]Departmemt of Women and Gender Studies, San Francisco State University, CA, USA

Corresponding Author:
Ruth Müller, Munich Center for Technology in Society, Technical University of Munich, Augustenstr. 46, 80333 Munich, Germany.
Email: ruth.mueller@tum.de

actively taken up and transformed as it moves through social worlds. Drawing on fieldwork with actors in education and juvenile corrections in the US Pacific Northwest, we found that they employed the biology of early life adversity not only to promote prevention but also to argue for changes within their own institutions that would allow them to better serve children and youth who have experienced adversity and trauma. Our study shows that biosocial narratives are neither inherently liberatory nor inherently oppressive but that the situated narrative choreographies in which they are enrolled are essential for their political effects. In our case, we show how these biosocial narratives have been articulated with knowledge and practices from restorative justice and trauma-informed care to reimagine the social meaning of the biology of early life adversity.

Keywords
early life adversity, biosocial knowledge, resilience, responsibility, education, criminal justice

Introduction

> We just saw more kindergarteners coming in with real challenges as far as regulating their emotions, connecting socially, and being able to be in a classroom environment, ready to learn. We saw much more runners who were just running out of classrooms, running out of the school. [. . .] You know, throwing chairs, throwing books, that sort of stuff. And to tell you the truth we just didn't feel we were meeting their need, like something is wrong. [. . .] 'Cause we're not cracking the code. We don't know what it is that is setting the student off [. . .] So we took that on as kind of a personal journey and a personal commitment, and community commitment to say "how can we serve these students?" (Elementary School Principal)

In this article, we explore what might seem like an unlikely association: we investigate how research from the biology of early life adversity has been enrolled to argue for systemic change in institutions that work with children and youth in the Pacific Northwest of the United States. Seeking new ways to respond to challenges within their institutions, such as rising rates of student suspensions, expulsions, incarcerations, and suicides, educators, nonprofit organizations, and employees in the juvenile corrections system engaged with research about the biological effects of early life adversity and

its long-term effects on children and youth to develop new approaches for responding to these challenges. We detail how these actors enrolled biological knowledge claims and how they interwove them with other knowledges and practices such as restorative justice. We highlight the explicit narrative choreography they performed that draws on the epistemic authority of science as a means to affect institutional change, while simultaneously resisting the deterministic tendencies of recent research in the biology of early life adversity.

The biology of early life adversity, a research field that has been growing due to recent advances in environmental epigenetics, proposes that experiences of social adversity in early life can impact brain development. Drawing mostly on rodent experiments, researchers suggest that social stress, traumatic experiences, and neglect in early life can lead to epigenetic changes in the human brain that alter the body's response to stress, influence behavior, and increase the risk of mood and anxiety disorders in later life (McGowan and Szyf 2010; Ptak and Petronis 2010; Klengel and Binder 2015). Beyond these effects on psychosocial health, studies contend that experiences of social adversity and the consequent epigenetic changes can lead to a higher-than-average risk of metabolic and cardiovascular disease (Gilbert et al. 2015). Researchers thus increasingly consider early life adversity a risk factor for illness across the life course and an important issue for public health policy (Larkin, Felitti, and Anda 2014).

Scholars in Science and Technology Studies (STS) have approached the field with both interest and concern (Pickersgill et al. 2013; Meloni, Williams, and Martin 2016; Lloyd and Müller 2018). On the one hand, STS scholars have expressed hope that biological research on early life adversity could be used to promote health equity policies that support parents, children, and communities by establishing greater social and economic equality. On the other hand, STS researchers have voiced concern that this research might just as easily stigmatize those who have experienced hardship during their childhood and youth (Mansfield and Guthman 2015; Kenney and Müller 2017; Pitts-Taylor 2019; Tolwinski 2019). In particular, they have drawn attention to the biological determinism implicit in the dominant narratives emerging in the peer-reviewed literature and in media representations of this research (Waggoner and Uller 2015; Lappé 2016). Often, these narratives depict negative experiences in early life as creating epigenetic wounds that will leave scars for life, altering biological processes and, by extension, social behavior in potentially irreversible ways. In these accounts, those who have experienced early life adversity such as high levels of stress, neglect, or abuse are unable to achieve the implicit ideal

of "normal" psychosocial development because they have been irrevocably damaged by their experiences (Mansfield and Guthman 2015). These accounts often advocate for prevention as the only way to address the public health implications of early life adversity, leaving questions of how to live well once adversity has occurred unasked and unanswered (Müller et al. 2017).

Most popular and scientific narratives place the responsibility for enacting prevention squarely on the shoulders of parents—especially mothers—while systemic factors contributing to adversity such as social inequality routinely receive less attention (Richardson et al. 2014; Kenney and Müller 2017; Mansfield 2012). Lappé (2016), for example, argues: "coverage of [epigenetic] findings often reinforces the biological importance of parents' experiences and actions [. . .] emphasizing individual behaviors and exposures over the social and political conditions that often influence such experiences" (p. 93). These narratives are readily compatible with tendencies in neoliberal governance that place responsibility on individuals rather than advocate for structural change (Pentecost 2018; White and Wastell 2017).

It is thus surprising to see that in our study, we find knowledge claims from the biology of early life adversity employed not to promote individual responsibility, parental action, and prevention but as essential components in a biosocial narrative that argues for collective responsibility, institutional changes, and the creation of social conditions that allow those who have experienced early life adversity to thrive. By investigating the specific epistemic and narrative choreographies that the actors at our fieldsite employ to construct this account and effect change, we contribute to an emergent discussion on situated interpretations and applications of the biology of early life adversity. As Pickersgill (2018) reminds us, biosocial narratives—both contemporary and historical—have been employed to support a range of different social and political positions, often at the same time (cf. Meloni and Müller 2018). We consider it therefore vital to empirically investigate how biosocial research is adopted and adapted by different actors in situated contexts rather than assume that the uptake will be uniform and prescripted. Warin, Kowal, and Meloni (2020), for example, recently found that Australian researchers use epigenetic research about the effects of early life adversity to strengthen Aboriginal accounts of the intergenerational effects of historical trauma caused by settler colonialism. In this context, research about the biology of early life adversity is articulated with Indigenous knowledge to support political struggles for reparation and health equity and to attribute responsibility for intergenerational

harm to the Australian government. In this vein, our research seeks to acknowledge and draw attention to novel articulations of the biology of early life adversity and asks what we can learn from these situated interpretations and applications as we search for biosocial narratives that support social justice.

Introducing the Actor Landscape

In this section, we will introduce the landscape of actors at our fieldsite—a region in the US Pacific Northwest—and the knowledge and resources they use to advocate for change. We start by introducing the CDC–Kaiser ACE Study, a landmark study on how Adverse Childhood Experiences (ACEs) affect health across the life course; second, we introduce NEAR-org, a local nonprofit organization that disseminates information about ACEs in the region; and third, RJ-org, a restorative justice organization that draws on the knowledge disseminated by NEAR-org to partner with local schools and juvenile correctional facilities to implement restorative justice and trauma-informed practices in their institutions.

Foundations: The CDC–Kaiser ACE Study

At the center of the biosocial approaches to early life adversity promoted by NEAR-org is the CDC–Kaiser ACE Study (1995-1997). In this large-scale epidemiological study, over 17,000 participants were asked whether they had experienced different types of abuse, neglect, and household dysfunction in early life. These ACEs were then correlated with their physical and mental health histories. The first significant finding of the study was that ACEs are common—63.9 percent of participants reported they had experienced at least one type of ACE; 12.5 percent had experienced four or more out of a total ACE score of ten.[1] Second, the data revealed a strong correlation between ACEs and health outcomes. The researchers described this correlation as "a graded dose-response relationship between ACEs and negative health and well-being outcomes across the life course" (CDC n.d.). In other words, those participants with higher self-reported ACE scores were more likely to have physical and mental health conditions such as depression, addiction, diabetes, heart disease, and cancer. Since the completion of the study, principal investigators Vincent Felitti (Kaiser) and Robert Anda (CDC) have argued that ACEs are strong predictors of later life health and constitute an important and previously unrecognized target for public health intervention.

As an epidemiological study, the ACE Study did not offer any mechanistic explanations for the correlations it reported. However, over time, Felitti, Anda, and other ACEs researchers have increasingly pointed to neurobiological and epigenetic processes as likely mechanisms that explain the study's findings (e.g., Anda et al. 2006; Shonkoff et al. 2012; Yang et al. 2013). This novel molecular framing of ACEs runs parallel with a marked increase in scientific and public attention to the ACE Study. Citations of Felitti et al. (1998)—the first paper to publish the results of the study—have risen sharply since 2013, indicating an increasing number of researchers incorporating the concept of ACEs into their research. The ACE Study has also informed diverse social initiatives across the United States, including trainings conducted by nonprofits that are intended to publicize the study findings as a means to address ACEs and their consequences.

The NEAR Science Trainings

Robert Anda has become a central figure in translating the findings of the ACE Study for public audiences. In 2014, Anda co-founded ACE Interface, an organization dedicated to disseminating the science of ACEs to encourage communities to make "intergenerational changes that will improve health and quality of life." ACE Interface offers a "Train the Master Trainer Program," a two-day workshop where participants learn about the ACE Study, strategies to support people with ACEs and to build resilience, and how to present this information to others. Those who attend the trainings, often community leaders and nonprofit professionals, return to their regions equipped with training materials and are able to conduct their own trainings for local schools, agencies, businesses, and communities or anyone else who might be interested.

ACE Interface uses the acronym NEAR Sciences to refer to the research areas that inform their trainings: Neuroscience, Epigenetics, ACEs and Resilience. The NEAR Science trainings offer a specific and well-rehearsed narrative about how early life adversity affects the brain and body and by extension, behavior. Below we have reconstructed this narrative based on field notes taken at such trainings:

> Experiences of trauma in early life affect neurobiology and create a heightened stress response. When a person feels threatened their heart races, cortisol floods their body, and the "fight, flight, or freeze" reflex is triggered. If this response is triggered often, the brain begins to expect stress everywhere. Individuals who have experienced trauma or toxic stress can become

> hypervigilant, perpetually scanning the environment for potential danger. They can sometimes respond to neutral stimuli as if to a threat. Kids with ACEs, for example, may exhibit disruptive or even violent behaviors when experiencing stress. These kids might not have much control over these behaviors, because they are in "fight or flight" mode and might not have access to the decision-making part of the brain (prefrontal cortex). This heightened stress response not only influences behavior but, as the ACE Study suggests, also increases the risk of disease (e.g., metabolic, cardiovascular, psychological) in later life.

While this narrative might at first seem pessimistic, trainers state and restate throughout the trainings that recovery and healing are possible—actively reframing the biology of early life adversity as a "science of hope." The second half of the NEAR Science trainings thus focuses exclusively on how to repair harm and build resilience through developing positive relationships with children and youth, creating supportive environments, and teaching the skills to recognize and regulate stress responses. Although resilience is not well-defined in the trainings, one adage that is often repeated is that a relationship with one caring adult can foster resilience in a child and buffer against toxic stress. The concept of resilience is often framed in relational rather than individual terms—that is, to speak of resilient communities rather than a resilient person.

The NEAR Science trainings are part of a larger trend toward "trauma-informed care" in US healthcare, education, and other human services. Trauma-informed care is defined as applying an understanding of how "violence, victimization, and other traumatic experiences may have impacted the lives of the individuals involved [. . .] to the design of system and provision of services so they accommodate trauma survivors' needs and are consonant with healing and recovery" (Carello and Butler 2015: 264). The Community Resilience Initiative (CRI) in Walla Walla, Washington, has been an important organization in establishing this framework, with the aim of creating a fully trauma-informed community, from schools to corrections, to foster care, and even to public libraries. The documentary film *Paper Tigers* (2015) features Lincoln Alternative High School in Walla Walla and their journey to create a trauma-informed school grounded in the findings of the ACE Study. Each year CRI, in partnership with other nonprofits, hosts the *Beyond Paper Tigers* conference dedicated to "mobilizing the community through dialogue to radically reduce the number of adverse childhood experiences while building resilience and a more effective service delivery system" (Community Resilience Initiative, n.d.).

The *Paper Tigers* film is regularly screened at our fieldsite and referenced in the trainings. In the US Pacific Northwest and beyond, Walla Walla has come to serve as a role model for how a county can successfully implement trauma-informed practices across multiple sectors and human service agencies.

Restorative Justice

At our fieldsite, the concepts from the NEAR Science trainings became central to the ongoing efforts of RJ-org, a restorative justice (RJ) nonprofit organization. RJ proponents advocate for moving away from a punishment-based system of justice to a system that focuses on accountability within communities and on repairing harm and relationships. Punitive justice tends to ask questions such as "Which law or rule was broken?" "Who broke it?" "What punishment is deserved?" Restorative justice asks "What harm was caused?" "What are the needs and responsibilities of everyone impacted?" "How can the harm be addressed and healed as much as possible?" (Zehr 2015). RJ practitioners facilitate dialogues between victims, other affected parties, and offenders to answer these questions and achieve agreements between all parties in order to restore relations, make amends, and heal harm. RJ advocates for strong community relationships as the most effective measure to prevent harm and encourage compassion and mutual support (e.g., Zehr 2015; Morrison, Blood, and Thorsborne 2005; González 2012). To this end, RJ uses methods such as talking circles[2] to create opportunities for people to get to know each other and build relationships, a practice that can also be adapted for addressing harm when it has occurred and to mend relationships that have been damaged. While many different organizations promote RJ across the United States and internationally, an important center of RJ thought and action is Oakland, California, where prominent community leaders emphasize the importance of RJ for achieving justice and equity for communities of color (Davis 2019).

When we arrived at our fieldsite, RJ-org had been partnering with juvenile corrections in the region for about twenty years. This partnership allowed for the courts to offer youth offenders the possibility to choose a restorative justice process over incarceration or probation. The program enacts restorative justice by facilitating victim–offender dialogues, setting up agreements between victims and offenders on how the offending youth will repair the harm they have caused, and by ensuring that all parties keep to these agreements. Should the agreements be broken or the process fail in any other way, the youth will enter into traditional juvenile justice

procedures. The goal of the RJ process is to avoid incarcerations, turn the harmful incident into an opportunity for social–emotional learning for the offender, offer resolution for the victim, and build relationships that will lower the chances of the youth engaging in harmful behavior again.

The long history of collaboration between RJ-org and juvenile justice in the region is a success story in itself. However, after twenty years of working with the juvenile justice system, RJ-org felt the need to engage with youth before they have entered the system and conduct preventive work in schools. By introducing restorative processes into schools, they believed they could lower the number of detentions, expulsions, and incidents with police involvement—all of which are prominent risk factors for a youth being incarcerated later in life, a phenomenon known as the school-to-prison pipeline (e.g., González 2012). With Black children and youth being at a significantly higher risk of receiving suspensions and expulsions for the same offenses compared to white children, the school-to-prison pipeline contributes to disproportionate incarceration rates in the United States by race (NAACP 2009; Skiba et al. 2011; US Department of Education 2016).

At the time of our fieldwork, RJ-org was actively working to increase their presence in schools in the region and also extend their partnership to include juvenile correctional facilities, where RJ processes were implemented to resolve conflicts and avoid incidents that might lead to extended sentences. We will show how their efforts to introduce restorative justice practices into the education and juvenile corrections system were significantly strengthened by NEAR-org's promotion of the NEAR Sciences and the novel social and epistemic networks between nonprofits, local schools, and other community actors that emerged in the region.

Materials and Methods

Our analysis builds on fieldwork conducted in two neighboring counties in the US Pacific Northwest in fall 2017. Fieldwork included semi-structured interviews with professionals in schools (4) and in juvenile correctional facilities (5), with restorative justice facilitators at RJ-org, who work with these schools and correctional facilities (4), and key leading figures at NEAR-org, the non-profit that offers the NEAR Science trainings (2). Interviews lasted between 60 and 120 minutes; they were recorded and transcribed, and informed consent was obtained before each interview. Fieldwork further included participant observations at a NEAR Science training offered by NEAR-org; a four-day training in restorative justice offered by RJ-org; a regional interagency meeting that focused on

improving public services for children and youth, in which representatives of both NEAR-org and RJ-org participated; and a three-day conference on restorative justice and trauma-informed care hosted by RJ-org in spring 2018. Fieldwork in the region was preceded by participant observation at the *Beyond Paper Tigers* conference in Walla Walla, Washington, in June 2017. During and after participant observation, we wrote field notes and obtained additional materials such as PowerPoint presentations and scripts used during the events.

We incorporated and analyzed all materials following a grounded theory approach based on consecutive rounds of open and focused coding. Questions about the role of biology-based knowledge claims within the institutional transformations in the region served as a sensitizing concept that guided our analysis (Blumer 1954; Bowen 2006).

Findings

Below, we outline four ways in which knowledge claims about the biology of early life adversity as presented in the NEAR Science trainings came to support institutional change in education and juvenile corrections at our fieldsite. We argue that the specific narrative choreography of the trainings, which interweaves knowledge claims about the biological effects of adversity with propositions for how to achieve healing and change through social action, supported transformations by (1) offering a common language for how to talk about the everyday challenges of working with children and youth, (2) reframing disruptive behavior as rooted in biosocial experiences of adversity, (3) shifting the responsibility for effecting change to institutions, and (4) inspiring new institutional practices aimed at biosocial healing.

Offering a Common Language

What motivates a school community to question the basic principles of how they relate to their students and, in particular, how they respond to difficult behaviors? In our fieldwork, we spoke to a number of professionals working with children and youth who advocated for and implemented significant changes in their institutions. When we asked what motivated them to engage in this work and how they came to draw on biological knowledge claims to effect change, each of them told a version of the same story. This story centers on the perception that disruptive, harmful, and self-harming

behavior in children and youth had increased in recent years. This is how a member of NEAR-org described this situation:

> We have a very high teen suicide rate here. The school district, the reason that they became motivated for trauma-informed practices [was that] they had two high school students the same year commit suicide. It's a small school, right? The then-superintendent was just devastated. And she goes to her school board and says, "We had two kids kill themselves. We got to do things differently." They didn't know what to do differently, but she and her district became kind of like this learning community. (NEAR-org 2)

This perceived crisis motivated a few members of the community to contact ACE Interface and complete the "Train the Master Trainer" program. Afterwards, they established NEAR-org and began to offer free trainings in the region. Educators who were looking for new approaches to behavior and mental health began to attend these trainings and adapted them for their own school communities.

To virtually all of our informants, the information conveyed in the NEAR Science trainings was new and inspiring. The trainings follow a specific narrative choreography that—despite emphasizing the significant impact early life adversity can have on development and health—centers hope and healing.[3] The narrative frames many of the difficult behaviors that teachers and others working with children and youth experience as a consequence of biology; that biology, however, is always presented as malleable and responsive to environmental, social, and individual action. This malleability, this possibility of effecting change, is at the center of the narrative choreography of the trainings. The trainings combine biological findings about the effects of adversity with research from psychology, behavioral health, child development, and education in eclectic, but strategic ways.[4] They create a sense of novelty and facticity, conveying that "we now know things we did not know before" (NEAR Science training field notes) as well as a sense of possibility for action. They frame the information they offer as knowledge in Stehr's (2005) sense: as information that conveys a "capacity to act."

In the specific setting of our fieldsite, this approach turned out to be highly successful in terms of delivering a message of possibility to motivated but struggling professionals working with children and youth across multiple agencies in the county. Since the trainings were free of charge and NEAR-org offered to train any group of people who were interested, the barrier to organizing and accessing trainings was very low. NEAR-org was

able to train over 7,000 people in the region between May 2016 and September 2017 in a deliberate effort to "[get] the information out across all sectors to as many people as possible" in order to develop a "common vocabulary, a common understanding" of ACEs and their impact on development, health, and behavior (NEAR-org 2).

Their efforts yielded a significant response in the community. A number of school principals as well as institutional leaders from juvenile corrections attended trainings and decided that this was essential information for their staff. They organized trainings for their institutions that ranged from half-day events to a nine-module curriculum that one of the school districts developed together with NEAR-org. All school staff members were asked to participate in the curriculum because the trauma-informed care practices that NEAR-org promotes hinge on a consistent and predictable response to behavior across the entire institution (e.g., Brunzell, Stokes, and Waters 2016). This is a elementary school principal describing this comprehensive training effort:

> [It] was all our staff, bus drivers, staff, teachers, doesn't matter. We've presented nine modules on trauma and ACEs and went through the science and the impact and things of that nature. (ESP)

The trainings created a collective environment where *all* school employees came together, were given the same information, and were encouraged to work together as a community to improve their services for their students. Our informants in juvenile corrections attributed much of the success of the training to this collective approach. One interviewee, for example, emphasized that the trainings were particularly valuable to him because they brought management, mental health counselors, and the floor staff together around a common goal, which he characterized as moving toward a less "correctional" (i.e., punitive) and more trauma-informed approach. He explained that in his role as a mental health professional, he often found himself at odds with the floor staff who wanted to maintain control over the youth by asserting their authority and implementing punishments. The trainings provided the opportunity to discuss the role of trauma in behavior and to better align the work of the counselors and the floor staff: "We were there all together, so that made a difference" (QMHP1).

The trainings also strengthened communications between organizations. For example, since the NEAR Science trainings emphasized the importance of positive relationships for addressing trauma, RJ practitioners noted that their focus on building community and mending relations was now

perceived in a different light. As one RJ facilitator phrased it, "Because of ACEs, it doesn't take a whole additional training now, to say this is why we do community building circles. [. . .] It really has given us the 'why?' behind doing restorative justice work" (RJ-org 1). Through the widespread training efforts described above, RJ professionals found that they could frame talking circles not only as building stronger social ties but also as effecting biological change through their ability to create and repair relationships. This new biosocial understanding of RJ practices created inroads for RJ-org to develop collaborations with schools and juvenile corrections facilities: "All I have to say to the Juvenile [Corrections] Department is, 'Restorative Justice helps support our ACEs kids.' And now they're more interested in it" (RJ-org 4). Overall, the professionals with whom we spoke expressed that the NEAR Science trainings offered a common language that has productively facilitated interagency communication and the alignment of goals in the region. In the next section, we will discuss what they perceived as the crucial, game-changing aspects of the NEAR Science trainings that facilitate this change.

Reframing Disruptive Behavior

Although NEAR-org deliberately set out to create a common language for institutions working with children and youth, the NEAR Science trainings would not have been successful had they not spoken to the everyday experience of those who attended the trainings. Speaking to practitioners in education and juvenile justice, we found that one of the most relevant aspects of the trainings was how they reframed difficult behaviors—such as swearing, yelling, fighting, breaking classroom rules, etc.—using the NEAR Science model. For these practitioners, difficult behaviors often felt like a personal attack; the trainings use biological claims about ACEs, neuroscience, and epigenetics to promote an understanding of behaviors as caused, instead, by the biological effects of trauma rather than willful disrespect of authority figures on the part of youth. This biosocial understanding encouraged new forms of attention and response to familiar and challenging behaviors. Here, a middle school assistant principal explains how the biological explanations she learned in the NEAR Science training informed her understanding of what was happening in the body and brain of a student who was sent to her office for disruptive behavior:

> I've always been an empathetic person but now I'm thinking about how [ACEs have] impacted the executive functions [of the brain]. [. . .] Like the

> kid this morning that's worried about his incarcerated mother, you know he's having anxiety attacks, he's showing all the signs of that. Kind of a fight or flight moment, 'cause he's had to flight a lot in [his life]. Yeah, I guess that's how I have integrated the understanding of the brain development [and] the executive function with what's actually happening with the kids. (MSAP)

In this quote, we see the middle school assistant principal make a causal connection between ACEs, in this case an incarcerated family member, and the behavior that brought this student to her office. In this narrative, a classroom incident upset the student, causing a "fight or flight" response. In this state, the student no longer had access to the "executive function" of his brain and was therefore unable to make good decisions. Drawing on the biological knowledge claims from the trainings, the assistant principal reframed the student's behavior. Rather than interpreting the student's actions as intentionally disruptive and in need of discipline, she proposed that the student had not been able to act appropriately in the classroom setting because he had not yet developed the skills to self-regulate in stressful situations.

In the juvenile corrections facility, we also found that the biological knowledge claims the staff encountered at the NEAR Science trainings helped them to frame behaviors they previously believed to be disruptive or dangerous as related to the biology of trauma and stress. One juvenile corrections officer explained to us that when a fight breaks out in the yard, the rest of the youths are required to lie on the ground with their heads down to avoid "creating an audience" for the fight. However, often some youths would refuse to lie down immediately when instructed, which historically had been understood as willful disobedience of facility rules. Here, the director of youth programs at corrections facility reframes this behavior as rooted in the biological effects of trauma: "You have kids with trauma issues, that's going to be a problem for them, to go ahead and put their heads down or something like that because they're going to be leery of what's going on around them" (JC2). Like the "fight or flight" response in the previous example, scanning the environment for danger is understood as one way our brains respond to stress to keep us safe—a response more prevalent in people who have been exposed to stress from an early age. Being asked to put one's head down while a fight is taking place therefore might be too much to ask from some people in this circumstance. Applying the biological narrative from the trainings to this common behavior, the juvenile corrections facility is working to create different procedures when a fight breaks out rather than "assuming it's opposition and providing a consequence [i.e., punishment]" (JC2).

In our fieldwork, we found that reframing disruptive behaviors as rooted in biosocial experiences of adversity encouraged actors to approach children and youth with curiosity and compassion rather than immediate judgment. In the NEAR Science trainings and at conferences, the speakers encourage adults to reframe the questions they ask themselves when they see "bad" behavior. Instead of asking "what is wrong with you?" they suggest asking "what happened to you?" In other words, they ask adults to move beyond their knee-jerk reactions (e.g., frustration, anger, fear) to consider how ACEs have shaped the behaviors they are encountering.

However, all actors we encountered in our fieldwork stressed that compassionate curiosity is not the same as allowing disruptive behavior, especially when it might harm other children. Instead, they emphasized that all students, regardless of their ACE score, should be able to learn how to regulate their emotions in a supportive environment. Control over behavior is framed in the trainings as a matter of "skill not will." In the words of one of the NEAR-org trainers: "If a child's acting out, it's because they don't have the skills not to" (NEAR-org 2). He hoped that the NEAR Science narrative offered participants a new approach to familiar behaviors: "I hope they take away the fact that that kid who's swearing at them, something happened to that kid. It's not you; it's what happened to that kid" (NEAR-org 2). As we will discuss later, this way of reframing behavior often made actors more likely to question the efficacy and ethics of the punitive forms of discipline that are being used in their institutions, such as suspensions and expulsions in schools, and restraints and solitary confinement in juvenile corrections facilities.

For practitioners in education and restorative justice who were already critical of punitive approaches to discipline, the value of the NEAR Science framework has been in convincing others—framed variously as conservative, old school, cynical, Republican, or corrections-oriented—to change their approach to behavior:

> My gut feeling when I went into [the NEAR Science training] was, "Really? Like, OK, if kids are experiencing high levels of abuse and trauma and [that] makes them less effective learners, that is news to no one." It seems like common sense; so having some of the science now to back up what I think most educators and people in behavioral health already knew, is what was most valuable for me and being able to take that information, disseminate it to some of the teachers we have that are old school, you know, that are of the very old guard. (RJ-org 3)

For this RJ practitioner, causal biological explanations, particularly those that link disruptive behaviors to specific molecular changes in the brain, have proved to be more persuasive than "feel-good stories" of RJ successes (RJ-org 3). His perspective was supported by accounts from others, including this elementary school principal:

> I think what was relevant and important [in the NEAR Science training] was there was science behind it. [. . .] There is a reason why this student is acting out. There is a reason why this part of the brain has not been fully developed in that child. (ESP)

The biological explanations of the NEAR Science trainings encouraged a more empathetic approach to youth who are difficult to work with and led to a new understanding of what constitutes an appropriate institutional response to disruptive behaviors. A prominent community leader we interviewed summarized this position powerfully when he told us: "the inevitable conclusion of this science is compassion" (NEAR-org 2). We argue that this "inevitability" is not a product of the science itself but rather a product of the specific narrative choreography of the NEAR Science trainings that emphasizes the possibility of biosocial change and resilience.

Institutional Responsibility

Based on their new understanding of behavioral problems as a "difficulty in a skillset as opposed to a disrespect thing" (MSAP), the professionals at our fieldsite began to consider how their institutions could implement this new knowledge. As we mentioned above, many of our informants perceived a crisis in the community that their institutions were ill-equipped to address. In the quote that began this article, an elementary school principal describes some of the behaviors his teachers were seeing increasingly often in the classroom:

> We just saw more kindergarteners coming in with real challenges as far as regulating their emotions, connecting socially, and being able to be in a classroom environment, ready to learn. We saw much more runners who were just running out of classrooms, running out of the school. [. . .] You know, throwing chairs, throwing books, that sort of stuff. And to tell you the truth we just didn't feel we were meeting their need, like something is wrong. [. . .] 'Cause we're not cracking the code. We don't know what it is that is setting the student off [. . .] So we took that on as kind of a personal journey and a personal commitment, and community commitment to say "how can we serve these students?" (ESP)

What is striking about this quote is that the principal frames the problem not as a problem with the children but as a problem with the institution. As a school, they were failing to meet the needs of children.

When the professionals at our fieldsite reframed disruptive behaviors as resulting from experiences of adversity rather than disrespect, punitive discipline no longer seemed appropriate or effective. From a NEAR Science perspective, common practices such as suspension and expulsion do not create the potential for change and add more stress and trauma to the lives of kids who may have already experienced adversity. Instead, our informants concluded that their institutions must change their response to behavior and adopt new practices that explicitly address the biosocial effects of adversity and offer opportunities for change and growth. This is how an RJ specialist described this shift:

> When these kids are acting out, we think they're wanting to do that [. . .] but if we change the paradigm to "this is actually all they can do," it puts the responsibility back on us. We have a responsibility to help develop social-emotional competencies. (RJ-org 4)

Many of the actors we spoke to articulated this responsibility as the importance of teaching kids the skills they need to behave appropriately under stress. The elementary school principal struggling with students running out of the classrooms and throwing things argued that the school should respond to these behaviors by teaching students "the skills of resiliency and regulating their emotions." A juvenile corrections officer explained that he felt the responsibility to teach incarcerated youth "the skills that they need to be able to manage the environments that they're in without hurting other people" (JC2). For the majority of actors we spoke to, teaching skills was imagined as part of a larger institutional change that gives young people opportunities to develop skills in a supportive environment where they wouldn't fear being punished if they made a mistake. A high school principal described this shift in terms of "providing situations where kids can practice better behavior, rather than just always hammering them for the behavior that they may not have a whole lot of control over." (HSP).

Similar to NEAR-org 2's statement that the "inevitable conclusion of this science is compassion," many of our informants argued that the information from the NEAR Science trainings came not only with an opportunity but with an ethical *obligation* to act. This is how one of the RJ practitioners framed this momentum: "It's almost like an ethical issue, like if we know

this, how do we actually create the best possible environments to support resiliency?" (RJ-org 1). For these actors, the science presented in the NEAR Science trainings took compassionate responses to behavior beyond the realm of the "feel good" and into the realm of practical and necessary solutions—solutions that needed to be addressed at the level of the institution and its practices.

New Institutional Practices

The most common trend we found in educational and juvenile correctional institutions that adopted the NEAR Science framework was a reduction in punitive discipline. In schools across the United States, suspensions and expulsions are common tools for administrators to punish disruptive, harmful, and illegal behavior and to protect other students from further harm. However, as many informants pointed out, these punishments rarely lead to a reduction in those behaviors and fail to keep other students safe. Juvenile correctional institutions are inherently punitive, however, the staff has degree of discretion about additional punitive measures that might be applied in response to difficult behavior during incarceration. By reframing behavior as resulting from the biological effects of adversity, the NEAR Science trainings encouraged actors at these institutions to adopt different approaches to prevent and address disruptive behaviors, particularly approaches grounded in the principles of trauma-informed care and restorative justice.

Trauma-informed Care

New practices under the umbrella of "trauma-informed care" encourage institutions to consider how environmental stimuli and everyday procedures might affect kids and adults who have experienced trauma. Many of the principles of trauma-informed care are based on the biological model of stress presented in the NEAR Science trainings. For example, elementary schools and middle schools have created quiet rooms where kids can go when they are upset and need some time to calm down. Different schools have different names for this room: the safe room, the calm room, the chill room, the twenty-minute room, and the student success room. Different than a "time out" or a referral to the principal's office, going to this room is not framed as a punishment; students are encouraged to ask to access the room anytime when they feel upset or overwhelmed so that they are able to self-regulate and talk to an adult about how they are feeling. At the *Beyond*

Paper Tigers conference, an elementary school principal in Walla Walla, Washington, described her school's student success room as a quiet room with low lighting that is stocked with "brain-friendly" sensory activities such as playdoh, coloring books, and puppets. She found that the student success room allows kids to separate being upset from being in trouble and acts as a space where adults can help kids solve problems constructively (e.g., asking them what happened, leading them through breathing exercises, playing together). In another elementary school in Walla Walla, students created their own "calm kits" with a favorite book or stuffed animal, which are stored in the calm room for them to use when needed (*Beyond Paper Tigers* conference field notes).

The calm room is one of the many practices premised on the concept that when children (and adults) are upset, stress hormones flood their bodies, making it difficult to use the prefrontal cortex. This process is referred to as "flipping your lid." This metaphor is based on a simplified three-part model of the brain called the "hand-brain model," developed by popular psychiatrist Dan Siegel. This model is an essential part of the NEAR Science trainings. It depicts the brain in a resting state as a closed fist with the thumb tucked in. The palm is framed as the "reptile brain," where instincts and the fight-or-flight response are located. The thumb is referred to as the "mammalian brain," where emotions are located. The fingers that cover the other parts when the fist is closed symbolize the prefrontal cortex, which permits executive function and reasoned decision-making. When a person encounters a stressful circumstance, this "lid" is "flipped"—represented by an open palm; the mammalian brain (emotions) and the reptile brain (instincts) take over. In this state, people are understood to have poor decision-making skills; they need time to calm down and regain the executive function. Twenty minutes is often cited as the minimum amount of time it takes to regain the executive function, though it might be shorter or longer. Some teachers and administrators use a target, with rings ranging from red to green that children can point to in order to indicate whether they feel ready for a conversation about their behavior. Red indicates that they should return to the issue again the next day; yellow indicates that they might be able to talk today, after a short period of calming down; and green indicates that they are ready to talk now. The goal of the target is to enable more constructive conversations about behavior, avoid unnecessary escalation, and promote self-awareness in students.

The professionals we spoke to explained that they appreciate models such as the hand-brain because they are easy to understand and use in their everyday work life. One of our interview partners in juvenile corrections

reported that the hand-brain model was useful for him when communicating with the staff he supervises since "you always have [your hand] with you" (JC1). Our interview partners frequently made the "flipping your lid" gesture when they talked about situations where youth—or they themselves—had been triggered and had made decisions that escalated a situation. This is a typical account of how a teacher might use the hand-brain model and other information from the NEAR Science trainings when interacting with a child who is upset:

> I do the "flip the lid" talk with kids. And I'm like, "So you know, I can see that you're not ready to have this conversation, do you need some time, need some space? Yeah?" [. . .] And they'll be able to kind of self-regulate, and come back down and notice when they're not so emotional. [. . .] You're asking them to think about it and reflect, "Oh what are the biological signs that I was escalating, [. . .] my heart rate was really high, you know, I was red, or I was feeling nervous, I was twitching a lot." So you're kind of slowing down the process and helping them to see what's going on with their own bodies. [. . .] Like, "Oh yeah, what's your heart doing?" You know. "Oh yeah, it's beating pretty fast." "I think you're probably upset, and you know what, I can't make any decisions when I'm upset or hungry or tired." (MSAP)

This quote not only illustrates the concepts of the biological signs of stress and the need for time and space to self-regulate but also how adults connect to their own experience of being upset rather than pathologizing the behavior of children. Here, biological explanations for behavior have the possibility to facilitate compassion, empathy, and connection; we can all recall a time when we were not in any serious danger, but our hearts were racing and palms were sweating, where it would have been beneficial to have had the time, space, and support to calm down before we acted. The professionals we talked to regularly mentioned that the NEAR Sciences framework made them think about their own behavior in new ways. The trainings inspired them to consider when they might be "flipping their lids" and what might be signs that "we're starting to lose it and [might] not [be] making the best decisions in our practice, because we've been triggered" (HSP).

Creating a trauma-informed institution can also include practices of rearranging or redesigning the environment in order to reduce factors that may trigger a stress response in kids with ACEs, such as the sound of a loud bell or turning off the lights without warning. The NEAR Science trainers encourage professionals to see their workplace through a "trauma lens" and learn to spot environmental triggers. We found that this practice

of scanning the physical environment was particularly relevant to juvenile corrections. This quote, from a mental health practitioner, illustrates how his institution has been using the trauma lens to identity stressful environmental stimuli:

> When [the kids are] in the crisis intervention unit, they're in a cell. [Next to that cell is a] door that opens and closes constantly, because all the meetings are in the large conference room [. . .]. Well that door is a very heavy metal door, and so day and night, the youth are in that cell, and there's this loud "Bang! Bang!" that can be a trigger for some of them. (QMHP1)

Despite the fact that being incarcerated in a juvenile corrections facility is inherently punitive and traumatizing, we can see how this facility is changing the physical environment and everyday practices to address the effects of early life adversity and to create better relationships between the staff and youth. Here, a mental health professional describes a newly instituted program for youth who are disruptive at bedtime:

> There are youth that escalate at night, when it's close to bedtime, they get anxious [. . .] and that has some kind of connection to trauma they've experienced before. And staff then get really overwhelmed [. . .] wanting to get everybody to bed. And so we've talked about [it and] in some cases we have established special programs for some of those youth. [. . .] Rather than putting them all in a dorm [with everybody else], we let some of those youth that struggle at night go in a room by themselves, kind of decompress, relax, read, calm down, wait 'til everybody else is calm, quiet, and hopefully asleep and then they move into the dorm. (QMHP 1)

Specific accommodations like this one go hand in hand with a more general move away from everyday punitive measures in correctional facilities. One corrections officer explained that in his institution, "restraints have gone way down" in response to the information they received at the NEAR Science trainings. Now, they are "really trying to look more just at the verbal de-escalation piece, and trying to get somebody in to talk with the youth that's not also a staff member that gives out consequences [i.e., punishments]" (JC1).

In the same way that the NEAR Science trainings encourage people to reframe difficult behaviors, these new narratives around trauma encourage professionals to see their workplace in a different way. Normalized aspects of the institutional environment, like a loud bell or a slamming door, come into view and are subject to scrutiny and change.

Restorative Justice

All of the schools and juvenile correctional facilities we visited had partnered with RJ-org to integrate restorative justice into the culture of the institution. Some schools had RJ facilitators on site for part of the week who mediated conflicts and facilitated agreements and worked to integrate "restorative values into school policies and the way that the staff operates on all levels" (RJ-org 2). This included the revision of disciplinary paperwork to reflect restorative values and instructing teachers on how to run daily talking circles in their classrooms.

Practices such as daily talking circles help to build relationships between the students and the teacher, which becomes the basis for building compassion, creating belonging, and addressing conflict. Because circles are a nonhierarchical practice and everyone has the opportunity to speak when holding the talking piece, students often share aspects of their lives that they might otherwise have difficulty giving voice to in the classroom:

> And so, I've encouraged teachers to do circles . . . and it'll oftentimes lead to pretty heart-wrenching conversations and empathy development among students who are like, "Oh I didn't know that. That's why so and so's always grumpy," you know. 'Cause you'll say "How was your weekend? Or tell me one thing you're looking forward to over the holiday?" And oftentimes there's nothing to look forward to. And those conversations do come up when you create space for them. (MSAP)

When the practice of a talking circle has been established, they can become the basis for addressing interpersonal conflict and other problems collectively. Here, an elementary school principal explains how these RJ practices have benefited his school community:

> The work with [RJ-org] has just allowed us to, if something happens, [it could be] a conflict [. . .] person to person, it could be in the classroom, it could be something going on in the school, society, our region, the world, or whatever, then [RJ practices are] just that avenue to be able to say, "OK let's circle up. Let's talk. Everybody has a voice." [There's] lot of good data that show that [this new approach] has improved attendance, it's improved violent offenses, those types of things. (ESP)

While the practice of talking circles is not new, the NEAR Science trainings have created new opportunities for RJ-org to work with schools to replace punitive justice with restorative responses to behavior. Because of the

common language of ACEs, RJ-org's practices are newly reinterpreted as biosocial, able to intervene in the biology of early life adversity by building resilience and positive relationships. As one of the restorative justice facilitators put it: "I think one of the things that we've really found from our research about ACEs and trauma is that one of the antidotes would be just connection" (RJ-org 1). By positioning RJ as offering a concrete solution to the problem of ACEs, RJ-org was able to win over teachers who were at first resistant to RJ practices such as talking circles as a daily part of school life and as an alternative approach to conflict resolution (RJ-org 3).

Because RJ requires a whole-school "buy-in" in order to transform institutional culture, having a variety of ways to explain and demonstrate the value of RJ is crucial to its success. The NEAR Science framework is one new and important avenue for establishing RJ practices as a means to improve relationships, prevent violence, repair harm, and create forms of accountability that do not rely on exclusion and separation from the school community (González 2012). In the juvenile correctional facilities we visited, talking circles were being used in lieu of solitary confinement in many cases so that harm is addressed *in* the community and not by removing the youth *from* the community. As one mental health professional put it, the staff were learning that holding youths accountable for their behavior is "not all about putting kids in rooms" (QMHP1).

When it came to assessing whether these new institutional practices were beneficial to kids, we observed that the measure of success was generally modest. Practitioners argued that it takes time to address the biological effects of trauma and build resilience, and so it is important to expect small improvements over time rather than a dramatic overnight change. For example, one of our informants described an elementary school student who "couldn't sit down, couldn't stay still, couldn't not talk, and usually what he said was mean" (ESP) and couldn't be in the classroom for more than half an hour without being disruptive. Because the elementary school was moving away from punitive discipline, this student was not expelled but was instead getting support to learn how to be in the class without being disruptive: "He's learning the skills to stay in the classroom. I talked to his second-grade teacher at the end of last year; she said he's still a little pain, he's a real pain, but he's *in the classroom*" (ESP). Many of the people we spoke to explained that for kids with high ACE scores "just showing up every single day" demonstrates "tremendous resilience" (ESP). It was thus essential for them that their institutions learn to "focus on progress rather than on perfection" (RJ 2) and to celebrate "small wins" (ESP) and incremental successes.

Conclusion

NEAR Science trainings and other trainings, conferences, and workshops based on the ACE Study propagate what Pickersgill (2018) characterizes as a "novel articulation of the imagined biological" (p. 104). At our fieldsite, actors have taken up and rescripted findings from the biology of early life adversity, offering a new paradigm for understanding disruptive and harmful behavior as linked to the biological effects of stress, abuse, and neglect. They interweave this research with other forms of knowledge and practice to create a narrative choreography that focuses on understanding harm in order to facilitate healing and foster resilience. While these biological knowledge claims have the capacity to stigmatize children and youth with ACEs, we found that through the relentless narrative coupling of the harm caused by ACEs with the capacity for change, these stories do a different kind of social and political work. Specifically, they normalized ACEs as common and redistributed responsibility for the health and well-being of young people. Inspired by these biosocial narratives, schools and juvenile corrections facilities have begun to move away from punitive justice by introducing new institutional practices grounded in restorative justice and trauma-informed care.

These changes ranged from small reforms, such as teaching kids breathing exercises, to actors questioning the very foundation of their institutions. As one of the informants from NEAR-org argued: "I think mental health, criminal justice, and education are the three fields that really need help understanding the vital impact of this science on their bottom lines and on their sustainability as a system" (NEAR-org 1). We found that professionals working in juvenile corrections facilities, in particular, used the biosocial narratives of the NEAR Science trainings to question the purpose and sustainability of incarcerating youth:

> I think we as a correctional system have been really good about punishing all the time, and it surely hasn't stopped kids from coming back to detention. And so [it is important to] really look at *why* they continue to make the same choices. So I think that we're learning that detention is not the answer to everything. (JC1)

Using the lens from the NEAR Science trainings, it is difficult to defend the practice of locking up kids in facilities designed to punish through social and environmental control and deprivation. One of the mental health practitioners framed the juvenile corrections facility we visited as an inherently

traumatizing environment, questioning whether incarceration can ever create positive change in the life of a young person: "Is what we're doing here a corrective emotional experience? Meaning, are we fixing a traumatic experience or replacing it with something better? We may think we are, but are we?" (QMHP1).

The NEAR Science trainings and trauma-informed care are still new. Although there have been promising reductions in suspensions and expulsions at trauma-informed schools (*Beyond Paper Tigers* conference field notes), it is uncertain whether and how these new models and practices will change institutions and lives in the long run.[5] Ken Ginsburg—keynote speaker at the 2017 *Beyond Paper Tigers* conference—argues that if trauma-informed practices are poorly or unevenly implemented, "trauma-informed" will become just another buzzword that "at-risk" youth will have to endure. As the language of trauma-informed practices travels to different geographical and institutional contexts, it is likely to be received and implemented in situated ways and transform over time. We understand the specific effects of the NEAR Science trainings at our fieldsite as deeply shaped by the specific constellation of actors who came together to effect change in this region. In particular, RJ-org's commitment to interrupting the school-to-prison pipeline and furthering social equity through restorative practices was essential to the specific changes we observed.

Biosocial narratives are neither inherently liberatory nor inherently oppressive. Hence, it is always necessary to investigate carefully and empirically how new narratives are taken up and adapted by different actors in their situated contexts. As STS scholars, we are uniquely positioned to bring these novel articulations back to life science researchers in the hopes of shaping future research agendas and study designs. With this in mind, we asked our interview partners what kinds of scientific studies they would like to see in the future. Perhaps not surprisingly, no one was interested in more studies that focused on the damage caused by ACEs. What they wanted to see were studies that investigate which practices best support resilience—a science that could truly be called a science of hope. Currently, research in the life sciences is often poorly aligned with the needs of professionals who work with children and youth, and there are few opportunities for professional interactions between these domains. Thus, rather than merely critiquing or describing this research and how it circulates in society, STS scholars could begin to facilitate experimental interactions between researchers and the communities of practice that count on their research to help children and youth to thrive despite experiences of adversity.

Acknowledgments

The authors would like to acknowledge the Office of Research and Sponsored Programs at San Francisco State University, which provided a Small Grant that facilitated our fieldwork. We would like to thank the three anonymous reviewers and the editors of *Science, Technology & Human Values*, Katie Vann and Ed Hackett, for their helpful feedback. And finally, we are grateful to our informants in education, juvenile corrections, and nonprofit advocacy, who took the time out of their busy schedules to speak to us for this project.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Martha Kenney received a Small Grant from the Office of Research and Sponsored Programs at San Francisco State University.

ORCID iD

Martha Kenney https://orcid.org/0000-0002-8900-8791

Notes

1. The ten adverse childhood experiences (ACEs) that make up the ACE score are as follows: emotional abuse, physical abuse, sexual abuse, mother treated violently, household substance abuse, mental illness in household, parental separation or divorce, criminal household member, emotional neglect, and physical neglect. People with four or more ACEs are considered at the highest risk for negative physical and mental health outcomes. Criticisms have been made about the narrow focus on "household dysfunction" to the exclusion of problems outside of the home (e.g., bullying, experience with the juvenile justice system), the omission of structural violence (e.g., racism, food and housing insecurity, living in an unsafe neighborhood, witnessing violence) (Finkelhor et al. 2015; Wade et al. 2014), and the predominantly white and middle-class makeup of the population studied (Cronholm et al. 2015). Although, interestingly, at our fieldsite, these limitations are also what make this study effective in framing ACEs as "common" rather than specific to populations already figured as "at risk." This is, of course, predicated on the false notion that problems that affect the white middle class are common, whereas those that affect marginalized people are not.

2. For a detailed description of talking circles, see: http://rjp.dl.umn.edu/sites/rjp.dl.umn.edu/files/talking_circles.pdf.
3. We use the metaphor of "narrative choreography" to indicate how the trainings reliably coordinate different biosocial knowledge claims and encourage/discourage particular interpretations. For example, after saying that ACEs can rewire the brain to expect danger everywhere, trainers are careful to avoid leaving the audience with the impression that people with a high ACE score are damaged or disabled. The next step in the narrative choreography is therefore the positive assertion that people with ACEs are well suited to high-pressure jobs such as "first responder." By following this sequence of steps, trainers are able to avoid the determinism and pathologization that are often associated with biological explanations for behavior.
4. The NEAR Science trainings creatively mix established epidemiological, neuroscientific, and epigenetic findings from the peer-reviewed literature with claims that are controversial in their fields (e.g., about transgenerational epigenetic inheritance) as well as with accounts from popular science books and TED Talks. The trainings present these claims as if they are part of a settled scientific synthesis about how stress and trauma affect the human body rather than findings from dynamically evolving research fields.
5. Furthermore, it is uncertain whether NEAR Science, restorative justice, and trauma-informed approaches alone can address racial disparities in suspensions and expulsion rates or whether other frameworks such as implicit bias training and cultural competency need to be included, too (Gregory and Clawson 2016; Gregory et al. 2018). This is an important area of future study.

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Author Biographies

Ruth Müller is Associate Professor of Science and Technology Policy and co-director of the Munich Center for Technology in Society at the Technical University of Munich. Her work explores the nexus of science, technology, society, and policy, focusing particularly on how institutional norms and values shape and interact with scientific knowledge production practices, on emergent knowledge cultures in the life sciences and in biomedicine, and on the circulation and interpretation of life science knowledge and biotechnologies in society and policy.

Martha Kenney (Associate Professor, Women and Gender Studies, San Francisco State University) is a feminist science studies scholar whose research examines the poetics and politics of biological storytelling. Her latest project on environmental epigenetics uses critical, creative, and empirical inquiry to interrupt dominant biological narratives and imagine more radical ecological futures.