



## Infusing Neuroscience and Education to Create Equity

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**Abstract:** Educational leaders of today are faced with the responsibility to promote equity within their setting despite the zip code or type of populations they serve. The field of education has the opportunity to significantly impact the academic and behavioral outcomes of students that interface with the system. Bradshaw, Goldweber, Greenberg, and Fishbein, (2012) suggest that transferring knowledge rooted in neurological, cognitive, and emotional regulatory factors in the educational field can lead to effective preventative programs that also support academics. The absence of this type of perspective in the educational field confounds the growth of theory as well as the advancement of educational practices in general (Anderson et al., 2016). Strengthening theoretical practice is what can help educators and politicians alike understand how to best develop enriching experiences for all students in all educational settings (Duckworth & Yeager, 2015). With the explosion of literature in neuroscience and the medical field in referencing how human beings respond to various stimuli and how this stimulus can hinder human beings from learning, it is crucial that educational leaders and policymakers find ways to infuse research from neuroscience into educational practice as well as policy for the sake of equity. This paper attempts to illuminate how the educational field can codify research from neuroscience along with the biology of trauma to help educational leaders and policy makers understand how to work best with underserved populations within school settings to promote equity and a healthier society.

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### Current Professional and Moral Challenges

Leaders of today and of the future have the potential to change the world and create equitable conditions for marginalized populations. Anyone trying to change the educational system should holistically understand the complete quest within the roles of a leader, as well as the power leaders have to offset inequities that have manifested throughout time. This is important because educational practices and policies that affect youth generally do not address or even begin to reflect awareness of the degree to which very early exposure to stressful experiences and environments have on the engineering of the brain, the body's stress response system, and the potential for unhealthy outcomes later in life (Center of the Developing Child, 2014). Neuroscience research helps us understand that all human beings are prone to stress. Stress is experienced on a wide spectrum by human beings (from healthy to toxic). Toxic stress can significantly impact academic functioning and more importantly, psychosocial well-being; which impacts a human being's DNA, mind, body, and soul (Harris, 2018). Repeated and concentrated toxic stress places children, youth, and adults at greater risk for delinquency, substance abuse, mental, physical, and

behavioral health problems, and impedes educational and employment success (Bond, Butler, Thomas et al., 2007, Edwards, Anda, Felitti, & Dube, 2004; Fergusson, & Horwood, 2007). The National Child Traumatic Stress Network (NCTSN, 2014) reported that as many as one out of every four children attending U.S. schools have been exposed to a traumatic event that can affect learning and/or behavior.

During the fall of 2016, enrollment of students having attended public elementary and secondary schools in the United States was approximately 50.4 million students (National Child Traumatic Stress Network- NCES, 2016). It is estimated that 1.2 million students drop out of high school every year (Eleven Facts About, n.d.). Specifically, it is reported that 50% of youth with “complex trauma” leave school before graduating or are not college ready after graduating from high school (Ferguson, Tilleczek, Boydell, Rummens, Cote, & Roth-Edney, 2005; Meichenbaum, 2006). Trends over the past decade have indicated that students are now taking longer to graduate from higher educational institutions, are experiencing poor academic preparation, lack clear understanding about how to navigate college, and are undecided about the major or career they would like to pursue (Complete College America, 2011). With many universities struggling with student on-time completion, the California State University (CSU) board has created a goal to increase on-time graduation rates from the current rate of 19% to 40% by 2025 (College Board Advocacy and Policy Center, 2011). Metzler et al. (2017) reports that a community college student who experienced Adverse Childhood Experience (ACE) can have challenges with academic success and completion compared to their counterparts who didn’t endure ACE.

On a macro - level, adverse childhood experiences are global public health issues with the United Nations estimating that over 275 million children worldwide experienced some form of violence at home (Anda, Butchart, Felitti, & Brown, 2010). The total estimated economic burden ACE’s pose nationally is over \$1 trillion (White Paper Steering Committee, 2013). The Adverse Childhood Experience (ACE) report (one of the largest studies of its kind) calls for an integrated approach to intervene early with children growing up being abused, neglected, witnessing domestic violence, or with substance abusing, mentally ill, or criminal household members (Felitti & Anda, 1997). Studies have revealed that student-teacher relationships help mitigate the negative impact of trauma, improve mental health and well-being, and optimize academic and social success (Mihalas, Morse, Allsopp, & McHatton, 2009; Shochet, Dadds, Ham, & Montague, 2006).

## **ACE and Neuroscience**

For years, adverse childhood experiences have been a largely unrecognized public health crisis and yet, the link between trauma and health is important to educational research (CDC, 2014). The ACE research study explores the common stressful and traumatic exposures affecting the (neuro) development of children. The ACE study was a decade-long study constructed to assess the childhood origins of many of the nation’s leading health problems, and the research generated was the largest study of its kind both in scope and in information collected. The Adverse Childhood Experiences study was a longitudinal study that involved 17,337 adults who became members of Kaiser Permanente Health Center in San Diego, California between 1995 and 1997. This voluntary study asked patients a total of 10 questions in reference to types of trauma they experienced as a child.

This study focused on 10 ACE categories (Anda, Edwards, Felitti, Koss, Marks, Nordenberg, Spitz, & Williamson, 1998) that are separated into three domains: abuse, neglect, and household dysfunction (Center for Youth Wellness, 2014). The first domain consists of three different forms of abuse: physical, emotional, and sexual. The second domain assesses physical

neglect and emotional neglect. The third domain identified five indicators of household dysfunction. These five indicators are comprised of domestic violence, substance abuse, divorce, incarcerated relative, and mental illness. The combination of three of any of these indicators from any domain at one time in a child's life is what is known as ACE (Center for Youth Wellness, 2014). ACE for a child were found to be pathways to social, emotional, and cognitive impairments that lead to increased risk of unhealthy behaviors, risk of violence or re-victimization, disease, disability, and premature mortality in adulthood (Anda et al., 1998).

The ACE study found that 64% of the population that was surveyed had at least one or more of the ACE criteria. Chronic and multiple adversities in childhood can cause mental health disorders such as depression, hallucinations and post-traumatic stress disorders (Anda, Edwards, Felitti, Koss, Marks, Nordenberg, Spitz, & Williamson, 2004). Neuroscientists studying the impact of trauma on brain development have determined that ACE or complex trauma alter brain structure and prevent learning. Dr. Bruce Perry created the term "complex trauma" for individuals who experience concentrated trauma in their lives and environments (Perry & Szalavitz, 2008). He describes this phenomenon similar to Post-Traumatic Stress Disorder (PTSD). Dr. Perry used soldiers coming back from war and exhibiting PTSD upon returning home from war as a comparison to complex trauma.

The difference between PTSD and complex trauma or ACE is that individuals who are exposed to repeated and concentrated toxic stress never leave the war and their brain's function is trying hard to cope with the toxic flow of stress saturating their developing brain just to survive within these conditions and environments. Van Harmelen et al. (2010) observed an association between ACE and an average 7.2% decrease in the volume of the dorsomedial prefrontal cortex PFC (dmPFC) compared to those who did not have ACE. This suggestion is critical as researchers suggests the importance of this region in social processing for the developing brain (Carlson & Birkett, 2016; Eickhoff et al., 2016). The connection between childhood trauma and a decrease in the size of the PFC considerably affects the ability to regulate emotions, particularly those involved in a stress response. Experiencing repeated stress as a child diminishes the normal architecture of the individual's brain. This causes an individual to readily perceive situations as life threatening, causing the individual to be more impulsive and vigilant in educational settings (CDC, 2014).

### **ACE in the Classroom**

Research studies from across disciplines postulate the negative impact of trauma on all aspects of a child's development. Blodgett's (2012), study found that classrooms in high school settings had at least 10 out of 30 (33%) students with an ACE. Blodgett determined that ACE was the greatest single predictor for health attendance and behavior issues in schools. This study suggested that adverse events were the second strongest predictor, after special education, for academic failure in public education. These findings inform educators of the frequency of students exposed to ACE within the classroom setting in order to begin to develop methods to support students, now, and in the long-term. By focusing on the needs and education necessary to combat ACE, there may be an opportunity to see more equitable school systems.

In the context of the education system, interacting with children who have suffered from toxic stress appears to be the new normal for public education. Blodgett and Lanigan (2018) reported on the association between repeated acts of toxic stress or adverse childhood experiences (ACE) and school success (2018), 44% of elementary school children were found to have exposure to at least one ACE, with 13% experiencing three or more recurring instances of repeated and various forms of abuse or neglect. With trauma being an underlying factor that hinders a child's

developmental process, it is important for educators to understand the experiences that lead children to poor health and adult outcomes. The Harvard University Center on the Developing Child (CDC) (2014) refers to the impact of toxic stress on a child's development and wellbeing as a threat to human society. Toxic stress occurs when a child experiences strong, frequent, and/or prolonged adversity- such as physical or emotional abuse, chronic neglect, caregiver substance abuse, or mental illness, exposure to violence, and or the accumulated burdens of family economic hardships—without adequate adult support (CDC, 2014). Prolonged stress response such as this can disrupt brain development, impact health and 'increase the risk for stress-related diseases and cognitive impairment, well into the adult years' (CDC, 2014). Children are also at higher risk when they exhibit greater distraction and thought suppression after a traumatic event, and when they experience low social support and poor family functioning after the event (Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012). If leaders fail to address the needs of these particular students coming into school systems suffering from this type of toxic stress or complex trauma, and not provide educators of public education with the training needed to offset these conditions, school systems will continue to foster inequity in public education systems (K-20).

### **ACE and Discipline**

As more research becomes available, educational leaders have a choice to continue with traditional ways of working with their district or sites, or adopt new ways that are being influenced by neuroscience, pediatric clinicians, and medical physicians alike in how human's best acquire learning. This is where this dynamic becomes an ethical and moral issue for educational leaders. Leaders or influencers of a system (district, site, or community) have the power to create equity and social justice in the system. When looking at school discipline disparity data it is well-documented that there is a visible disproportionality in expulsions and suspensions between races. Hispanic, Native American, and African American students are being suspended from public education settings at a much higher rate than their white counterparts (Gonzalez, 2012). This has led to a disproportionate amount of issues that stem from suspensions for these populations- such as the school to prison pipeline. In the past 50 years the fields of education and psychology have demonstrated that punitive types of discipline policies and practices are often associated with and can contribute to increased disorder in schools; which ultimately can lead to behavioral and academic problems among these students. Studies like ACE and research from neuroscience inform educational leaders how trauma hinders the brain and how to utilize the translational approach when developing educational and preventative programming to attempt to find equity within the public educational sector.

The way leaders implement discipline-practices lead to the inequities seen not only in education but within various institutional structures. Discipline is defined by the *Oxford English Dictionary* as "a branch of learning or scholarly instruction". When students suffering from complex trauma (especially those of color and from poverty) get in trouble, they do not contract discipline by definition, they receive punishment. Rather than teaching students through discipline, school systems use discipline to punish and shame these students, and could possibly be adding to the trauma that students with ACE face. Even with research demonstrating that punitive approaches not only disengage students from learning, they lead to the perilous conditions that breed inequity for historically disenfranchised populations.

Traditional methods of discipline emphasize control and compliance with high levels of accountability placed on individuals (Mirsky, 2007). Although punitive discipline policies have been found to have a harmful impact on all students in schools, they disproportionately impact

students of color, students with disabilities and students who identify as LGBTQ (Public Counsel, 2014), and if these students have trauma, the chances for being at risk grow exponentially. For example, although African American students make up only 15% of students in public schools, they make up 35% of the total students with one suspension, 44% with more than one suspension, and 36% of students who are expelled (United States Department of Education (USDE) & United States Department of Justice (USDOJ), (2014). The nature of the behavioral problems in schools is best understood as a result of being relegated to an environment that does not meet children's basic human needs for belonging, care and participation. In sum, the way educational leaders discipline students greatly impact's equity, creates disproportionality, and needs to be monitored with more intention from all educational leaders and policymakers with the new emerging research on the negative effects of punitive discipline on marginalized populations.

Traditionally, schools have dealt with students of trauma (like the ones described in the prior paragraph) with suspension, expulsion, alternative placement, medical diagnosis, and other ways that brain science suggests harms individuals more than helps them. Punitive practices place more focus on the rights and welfare of the school community over those of individual students; research has shown that they actually do not make schools any safer (Gonzalez, 2012). Furthermore, punitive discipline has been shown to alienate students from their schools and negatively impact the overall climate for learning (Public Counsel, 2014; Kimball, 2013). The idea that school safety comes from within, rather than from outside measures, has been evidenced in a growing body of research regarding school climate. Findings after an in-depth analysis of 37 school shootings, cited that "climates of safety, respect, and emotional support can help diminish the possibility of targeted violence in schools" (Gonzalez, 2014). When school climate is positive, school connectedness increases and the community of students and adults within are more caring and responsible for one another. The attention to climate and connectedness should be of the utmost concern in schools. According to Thorsborne & Blood (2013), "it is the challenging of mindsets where true culture change begins... where individuals transform [their] world view...to change their frame of reference by reflection on and challenging their beliefs and assumptions" (p. 59). This notion is important, as it shows how school systems can illuminate equity by the way leaders manifest their collective climate, and how intentional approaches can offset trauma; rather than reproducing it into the school setting.

### **Neuroeducation to Create Equity**

For year's various fields of research have indicated that disenfranchised students, specifically targeted by stigma and negative stereotypes, often ponder whether they belong in an academic setting (Goffman, 1963; Walton, 2014). Factors such as these (which most educators are unaware of and have had no training on) permeate multi-layered issues that disenfranchised students face all across the United States and leads to inequities in schools; especially within marginalized populations. Generally, factors that hinder student success overlap and are multifaceted. These complex issues raise challenges when attempting to measure exactly how to support students through their academic journey. Educational guidelines and curriculum that affect student's learning commonly do not address the extent of which, premature exposure of traumatic events coupled with "toxic" environments have on the architecture of the brain. This is one of the biggest issues that lead to inequity, because as this dynamic is being ignored; all students are then forced to learn exactly the same. By failing to integrate curriculum to stimulate the brain of all students (despite their exposure to trauma or toxic environments) educational leaders are allowing inequities to wreak havoc every day and often punishing these students for not being able to

comply to the status-quo of today's educational standard; despite the aforementioned research from neuroscience.

The nature of the behavioral problems in schools is best understood as a result of being relegated to an environment that does not meet children's basic human needs for belonging, care and participation. The lack of these stimuli combined with other complex traumatic effects can lead to student's brains not developing at a normal rate. This dynamic can manifest as behavioral issues in the classroom, due to the brain coping with complexity of toxic stress being outputted in their given situation. In fact, a child's own loss of connectedness to community is a crisis affecting society as a whole; children may simply be manifesting the symptoms and schools are reinforcing them. Discipline impacts equity and creates disproportionality. How a school's culture illuminates school safety or does not, and how school environments tend to student's basic needs, can re-traumatize students; which lead to the moral and ethical challenges mentioned within this paper. Scientific research clearly states that educational leaders must focus on creating an ethic of care and social justice that makes schools safer and students' happier, not only through reducing inequity, but also in terms of developing active citizenship skills, good self-esteem, open communication and team work in students, staff, and the community. This type of intentional community building in schools "... is a path to creating students who will be wise and humane adults, who care about justice, and who are able at pivotal times to put the common good before their own" (Weissbourd & Jones, 2014, p. 47).

## **Conclusion**

As leaders of educational systems it is a must to advocate for meeting children's basic needs such as: physiological needs, safety needs, love and belongingness needs, self-esteem needs, and self-actualization needs (Maslow, 1943). Within this philosophy, the antecedent to learning is having these needs met, so that individuals have the most receptive mind when it comes to holistic learning and may reach their own personal self-actualization. Therefore, any school environment, learning, and/or curriculum which does not offer a method to bridge the gap of basic needs of all students, is impeding the learning process for many underserved students as well as illuminating the inequities seen in education since its infancy. Paulo Freire has a name for a type of intentional activism, that he calls it "praxis" (Freire, 1985). This method of practice is effective because it can help schools understand their ethical and moral obligation to restore the school communities to meet the needs of children and to foster environments where adults can enjoy educating and all students can thrive. The well-being and best interest of each student should be a central focus and "non-negotiable" in education and educational training programs. This includes infusing education and neuroscience into a codified research field-neuro-education, in attempts to help public education begin to educate the brain according to best practice as a method to increase equity and critical learning. Through this intentional activism combined with evidence based practice, educational leaders and policies can advocate for equity in public systems that were not initially designed for all students.

For educational leaders and policymakers, it is imperative that they require training on the nature and severity of different types of stress responses to adverse childhood experiences and how these complex traumatic experiences manifest in the classroom to teachers and other educators. It is an obligation to transform education and infuse neuroscience research into education to support more equitable approaches for students who suffer ACE. It is important to note this obligation, since every year, parents from all over the United States send their children to public schools with good faith that all educators understand how the brain develops and learns. Yet, rarely do

educators take courses during their training that teach them how the brain learns and react to various stimuli within their environmental context.

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