

# Science of Adolescent Learning:

## Valuing Culture, Experiences, and Environments



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LEARNING**  
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The **Alliance for Excellent Education** (All4Ed) is a Washington, DC–based national policy, practice, and advocacy organization dedicated to ensuring that all students, particularly those underperforming and those historically underserved, graduate from high school ready for success in college, work, and citizenship. [all4ed.org](http://all4ed.org)

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## Executive Summary

Increasingly, educators are becoming aware of the impact that school culture, learning environments, and learning experiences have on educational outcomes. Findings from recent neuroscience, cognitive science, and psychological research provide a more in-depth understanding of why school culture matters for each student and why it is especially important for adolescent students to learn in environments that are safe, supportive, and culturally responsive. Multiple environmental factors—from community values and social expectations to poverty, prejudice, and inequity—influence classrooms, schools, and student learning. Learning environments also have expanded to include digital technology as today's adolescents increasingly use online spaces to learn and build relationships.

This report examines learning and development research that supports the Alliance for Excellent Education's (All4Ed's) Science of Adolescent Learning (SAL) Research Consensus Statements 11–16 (see page 4 for statements). The report highlights the following essential findings about adolescent learning and development:

1. Now, more than ever, educators know that supportive school cultures should promote ambitious learning goals, positive relationships, and critical thinking. As adolescents continue to develop their own identities along a number of dimensions and seek to understand the complex social systems and societies around them, educators and leaders must ensure that adolescent learning environments connect meaningfully to adolescents' cultural values and community experiences.
2. Neuroscientific evidence is advancing a greater understanding of the relationship between stress and learning. When the brain reacts to stress, it redirects the individual's attention and efforts to attempt to respond to the cause of stress. This reduces the individual's capacity to remember concepts and adapt to social situations, such as confrontations, effectively. Stress affects the learning of adolescents in particular because the brain structures involved in stress regulation still are developing.
3. Historically underserved and marginalized students often experience additional learning obstacles as a result of stressful experiences related to poverty and inequity. Increasing evidence shows how poverty can affect learning and the brain, absent appropriate support. This includes the impact of prolonged exposure to stress, inadequate access to nutrition and health care, and polluted environments. In addition, discrimination, bias, microaggressions, and stereotype threat can affect the learning and academic outcomes of students who identify with historically marginalized groups, regardless of their socioeconomic status or academic ability.

This report also recommends ways in which educators, policymakers, and advocates can support the learning and development of adolescent students, including historically underserved students and marginalized students, by applying SAL to policy and practice. By understanding the full range of cultural and environmental factors that affect adolescent learning, including technology, bias, and poverty-related conditions, educators and leaders can support adolescents as they learn to navigate increasingly complex social and political systems, leading to their academic and postsecondary success.

## About All4Ed's SAL Consensus Statement Report Series

In November 2017, All4Ed convened researchers, practitioners, and policy experts to examine advances in research and how recent findings from SAL can advance student learning and inform high school improvement strategies under the Every Student Succeeds Act (ESSA). During the event, an interdisciplinary group of researchers representing multiple scientific perspectives identified the most critical learning needs of adolescents.

After the convening, the researchers collaborated with All4Ed to develop a set of consensus statements about adolescent learning and development research, listed on pages 3–4. These statements, along with an accompanying series of reports, provide the foundation for [All4Ed's SAL initiative](#). Each of the reports listed below translates supporting research on adolescent learning and development that informs the consensus statements, which are grouped by theme. The reports also offer key considerations for education practitioners and policymakers on how best to support adolescent learning, particularly for students from historically underserved populations:

1. [Science of Adolescent Learning: How Body and Brain Development Affect Student Learning](#)
2. [Science of Adolescent Learning: Risk Taking, Rewards, and Relationships](#)
3. [Science of Adolescent Learning: Valuing Culture, Experiences, and Environments](#)
4. [Science of Adolescent Learning: How Identity and Empowerment Influence Student Learning](#)

The following researchers, all members of All4Ed's Expert Advisory Group, endorse the consensus statements and continue to support All4Ed's SAL initiative and this report series in their respective areas of expertise:

**A. Wade Boykin, PhD**, Howard University

**B. Bradford Brown, PhD**, University of Wisconsin–Madison

**Linda G. Castillo, PhD**, Texas A&M University

**Richard Clark, PhD**, University of Southern California

**Laurie Cutting, PhD**, Vanderbilt University

**Ronald E. Dahl, MD**, University of California–Berkeley

**Adriana Galván, PhD**, University of California–Los Angeles

**Simona Ghetti, PhD**, University of California–Davis

**Jay Giedd, MD**, University of California–San Diego

**Iva GreyWolf, PhD**, Society of Indian Psychologists

**Mary Helen Immordino-Yang, EdD**, University of Southern California

**Ben Kirshner, PhD**, University of Colorado–Boulder

**Sebastián J. Lipina, PhD**, Unidad de Neurobiología Aplicada (UNA, CEMIC-CONICET)

**Na'ilah Suad Nasir, PhD**, Spencer Foundation

**David Osher, PhD**, American Institutes for Research

**Amado Padilla, PhD**, Stanford University

**David Patterson Silver Wolf, PhD**, Washington University in St. Louis

**Royleen J. Ross, PhD**, Society of Indian Psychologists

**Laurence Steinberg, PhD**, Temple University

**Kaveri Subrahmanyam, PhD**, California State University–Los Angeles

**Ming-Te Wang, PhD**, University of Pittsburgh

**Kathryn Wentzel, PhD**, University of Maryland

To learn more about All4Ed's SAL initiative, visit [all4ed.org/SAL](http://all4ed.org/SAL).

## All4Ed's SAL Research Consensus Statements

### Consensus statements featured in report 1

1. In addition to body changes, the onset of puberty may trigger a second period of brain plasticity, increasing both the opportunity and vulnerability inherent in adolescence. Certain life conditions may cause the process of puberty to occur earlier or later, meaning that physical, cognitive, social-emotional, and other changes associated with puberty can begin at various ages.
2. Adolescents are in a stage of development during which the brain becomes more specialized and efficient. Learning experiences and environmental influences play key roles in this process. Learning and development are inextricably intertwined; these dual processes shape patterns of neural connections during adolescence.
3. As the brain becomes more interconnected during adolescence, young people are increasingly able to engage in adult levels of complex cognition, such as abstract reasoning, future thinking, and social cognition.
4. The ability to form memories and reflect on the accuracy of those memories continues to improve during adolescence. Adolescents become better able to assess their own learning, allowing for more time for additional information gathering and review.
5. Adolescents face an increased risk, compared to adults and younger children, for certain issues related to mental health, behavioral health, alcohol and substance use, accidents, trauma, sexual health, and nutrition due to physical, cognitive, and emotional changes they experience.

### Consensus statements featured in report 2

6. During adolescence, biological and environmental changes affect motivation and mindset. Because adolescents have an increased sensitivity to social evaluation, praising their learning process and successful strategies, not effort alone, can support development of a positive mindset and motivate them to learn.
7. Adolescents are more sensitive to some types of rewards, such as social recognition, than adults and younger children. Adolescents are more likely to engage in both positive and negative forms of risk taking, especially if peers support that behavior.
8. The transition from childhood into adolescence is associated with an increased sensitivity to social evaluation, including feelings of belonging, acceptance, admiration, and respect.
9. Peer relationships strongly influence adolescents, even more so than younger children, in ways that contribute to opportunities as well as vulnerabilities.
10. Compared to younger children, adolescents are able to spend more time with peers without adult supervision. However, support, communication of consistent expectations, and monitoring of activities and emotional functioning by adults are essential as adolescents become more independent.

(continued)

## All4Ed's SAL Research Consensus Statements *(continued)*

### Consensus statements featured in this report

11. Culture constructs the nature of learning environments and ways adolescents experience them including their values, motivations, and beliefs related to learning.
12. Adolescents seek learning environments that are consistent with and meaningful within the social and cultural contexts of their lives.
13. Digital technologies, such as computers, the internet, social media, and smart phones, dramatically have changed the way individuals learn, play, and interact with each other. Their impacts may be greatest for adolescents who are young enough to embrace novelty and old enough to master the technologies.
14. Adolescence is marked by significant biological shifts, resulting in heightened stress-induced hormonal responses. Stress is a major modulator of human learning and memory processes. As pressures around school, work, and relationships increase, adolescents experience greater stress.
15. In addition to physical, social, and emotional impacts that economic disadvantage has on adolescents, poverty and socioeconomic status are associated with a diverse set of neuroscientific structural and functional outcomes. Based on current evidence, the most sensitive systems are those related to executive functions, language, learning, and stress regulation.
16. Inequality, bias, and the persistence of structural discrimination constitute serious hazards to the positive development of all adolescents.

### Consensus statements featured in report 4

17. While adolescents still are developing self-regulatory systems, under some circumstances they make more rational choices with the similar mental capacity of adults. However, the expression of self-regulatory skills depends on context and learning opportunities.
18. For adolescents, social and emotional development involves exploring meaning and finding purpose; sometimes this development is at odds with institutional structures and expectations.
19. Adolescents are developing their own adult identity, trying to understand their roles and contributions in social contexts and communities. This identity development continues into adulthood, as the individual has more diverse experiences.
20. Adolescents seek opportunities for agency where they can decide how they spend their time and influence policies and practices of institutions that shape their lives.

## Valuing Culture, Experiences, and Environments

**There is a growing consensus that students' educational environments affect how they learn and develop. Ongoing correlational research shows how a range of factors, including pedagogical approaches and access to quality academic resources, contribute to different educational outcomes for students.**

Meanwhile, more recent neuroscientific discoveries examine how these factors influence the brain, learning, and behavior. During adolescence, the brain is adapting to meet the needs of its current and future environments. Consequently, adolescent students need learning environments that provide opportunities to engage in the types of advanced skills necessary for success in college, a career, and life. However, educators should understand that a student's learning environment is not limited exclusively to the classroom and school. The experiences and values that students learn in their families, communities, and broader sociopolitical systems likewise shape their perspectives and behavior. Consequently, school and district leaders, other educators, and communities must understand how in-school and out-of-school environments affect student learning and development.

Adolescents also are developing their own understanding of these systems, experiences, and values and how they, as individuals, fit within the larger societal picture. During adolescence, young people become more aware of social and cultural differences, group values, and inequities in how people live and are treated. They try to determine why such inequities exist and increasingly are motivated to seek answers, pursue social acceptance, engage in resistance, and broaden their relationships. At the same time, adolescents still are developing their capacity to regulate their emotions and cope with stress that can affect their learning negatively. Historically underserved student populations may feel that their schools, or society, misunderstand and undervalue their experiences and the realities of their environments. All adolescents need authentic support from educators in understanding and navigating these social complexities. Educators must explicitly and intentionally value every student's background and experiences to support them. This type of validation helps adolescents value themselves, view education as personally relevant, and challenge themselves to accomplish their academic goals.

The following sections examine the learning, development, and cultural research that supports All4Ed's SAL Research Consensus Statements 11–16 and recommend ways educators, policymakers, and advocates can apply adolescent learning and development research to policy and practice.

### Culture Matters in Adolescent Education

**SAL Research Consensus Statement 11: Culture constructs the nature of learning environments and ways adolescents experience them including their values, motivations, and beliefs related to learning.**

**Culture** refers to the set of meanings that a group, in a time and place, adopts or develops, and these meanings facilitate smooth social coordination, clarify group boundaries, and provide a space for innovation.<sup>1</sup> It encompasses the distinctive customs, values, beliefs, knowledge, art, and language of a society or a community. These values and concepts are further formed and passed on from generation to generation and help shape everyday behaviors and practices, perceptions, and meaning making.<sup>2</sup>

Culture constantly evolves and changes.<sup>3</sup> It is a concept often discussed among researchers, educators, and the public, but one that is not always understood due to its complexity and the difficulty involved in describing it without bias. In fact, experts have documented as many as 175 different definitions for "culture."<sup>4</sup> All cultures are human-made and learned through an individual's social and preexisting cultural environment, not passed down through genes. That means that culture is not biologically innate. However, culture can influence biological processes, such as reactions in the brain that identify different



stimuli as either pleasurable or stressful, that affect an individual's behavior and interpretation of the behavior of others. These reactions affect learning.

Individuals can identify with and participate in several cultures simultaneously and express their culture in multiple ways. These manifestations of culture, though, are not always easily apparent to others. The most noticeable expressions of culture appear in observable artifacts, such as clothing or music. Another way a group demonstrates its culture is through the values it holds, such as valuing individual achievement or group success. Values usually are ascertained through disclosure and inferences based on behaviors, since values cannot be observed directly. Other indications of culture are reflected in the basic underlying assumptions or subconscious beliefs about the world that members of a group hold. These often are taken for granted when people describe their own culture or the culture of others because they are difficult to identify, interpret, and understand. Additionally, groups with different cultures may interpret certain behaviors or gestures differently. For example, the "ring gesture" (thumb and forefinger touching) is interpreted as conveying agreement, approval, or acceptance in the United States, United Kingdom, and Canada, but considered an insult or obscene gesture in several Mediterranean countries.

The United States is a diverse nation containing immigrants from across the globe and multiple indigenous populations, making it a place with an array of cultures with distinct and unique characteristics of people who live and work together in complementary ways. The nation's demographic and cultural diversity continue to increase. Even racial groups, often falsely construed as homogenous because of their visual similarities, are multifaceted and include varying cultural values and practices unique to their members' current and ancestral countries of origin. Although **race** and culture sometimes are conflated, race reflects neither biology nor culture. Race is a social construct, based on visual appearances, that historically was used to create and sustain hierarchal power structures that continue to exist today.

**“Race is a social construct, based on visual appearances, that historically was used to create and sustain hierarchal power structures that continue to exist today.”**

## Why the Science of Adolescent Learning Matters for Education

Adolescence is a time of transition characterized by rapid physical, neurological, cognitive, and socioemotional development.<sup>5</sup> As students move toward adulthood, their bodies and minds change.<sup>6</sup> Those changes affect how they learn and, likewise, should influence how educators work.

A broad range of factors influence adolescent learning and development. These include *physiological* and *cognitive* factors, such as the maturation of neural pathways in the brain and the capacity to solve complex problems; *psychological* factors, such as the development of individual identity independent from parental figures; and even differing, sometimes conflicting, *cultural* and *societal* expectations.<sup>7</sup> Consequently, rather than being a time of deficit, adolescence is a period of immense learning and opportunity.

Research about adolescent learning and development draws from a variety of disciplines, including but not limited to neuroscience, cognitive sciences, psychology, sociology, cultural studies, and medicine. By drawing from these multiple disciplines, the science of adolescent learning synthesizes what researchers know about adolescent learning and development and challenges traditional thinking about what it means to teach and learn during this developmental period. Furthermore, it offers a body of evidence that goes beyond simply observing students in the classroom and making assumptions about their learning and the strategies that support student needs. It provides a scientific understanding about how adolescents learn that can, and should, influence the approach to education reform.

Early childhood education benefited dramatically from efforts to increase educator and public knowledge about the importance of the early years of life for brain development and learning.<sup>8</sup> Now educators, policymakers, and the public generally understand that quality education during early childhood can have lasting positive effects long into adulthood.<sup>9</sup> Similarly, recent evidence shows that adolescence represents a second critical window for human learning and development.<sup>10</sup> Consequently, education leaders have a responsibility to ensure that education systems align with research about adolescent learning and development.

Racial differences have been used to determine the types of opportunities different groups can access, which to some extent has contributed to the experiences of individual racial groups in the United States. Shared experiences sometimes result in cultural commonalities among people of the same race.

Historical power disparities between racial groups can create lasting effects, and such imbalances persist in the United States. As a result, descriptions of the general U.S. culture often predominately reflect the culture of white Europeans. This assumed generalized U.S. culture does not include the cultural values of people of color and other marginalized groups. Moreover, this description is misleading since it falsely assumes that all white Europeans share the same culture because they are members of—or appear to be members of—the same race. Consequently, the resulting values and expectations ascribed to this perceived U.S. culture influence the nation's social systems, including the public education system, in ways that are biased and contribute to educational inequities.

**Cultural archetypes** are “traits” based on similar beliefs, values, or behaviors exhibited by a multitude of cultures often used to articulate and understand cultural similarities and differences. It is important to note that cultural archetypes

are *generalizations* and do not reflect the dynamic nature of cultures or how they evolve. Furthermore, the place and conditions in which a group exists can influence the cultural archetype that characterizes that group at a given time.<sup>11</sup> The United States broadly displays a more individualistic cultural archetype because of the influence of western European ideas and institutions and the social disadvantage experienced by those not assimilating to these privileged ideals; however, the degree to which these individualistic values are expressed varies by region and population.<sup>12</sup> **Individualism** refers to a cultural preference for valuing the concept of the self and independence over the group. (See Table 1: Features of Individualist and Collective Cultures.) People of western European descent who live in the Great Plains and mountain West regions show the greatest degree of individualism, likely due to their low-density populations.<sup>13</sup> Meanwhile, a general pattern of relative **collectivism**, a cultural archetype in which the group is prioritized over the individual, exists among the Native American populations in these same regions.<sup>14</sup> Other cultural groups within the African American, Latino, and Pacific Islander populations of the United States also are much less individualistic than the general U.S. cultural archetype.<sup>15</sup> Recent evidence from neuroscience shows that the cultural values of individualism and collectivism influence brain functions underlying identity development.<sup>16</sup>

TABLE 1: Features of Individualist and Collective Cultures

Individualism	Collectivism
Focused on independence and individual achievement	Focused on interdependence and group success
Emphasizes self-reliance and the belief that one is supposed to take care of one's self to get ahead	Emphasizes reliance on the collective wisdom and resources of the group and the belief that group members take care of each other to get ahead
Learning happens through individual study and reading	Learning happens through group interaction and dialogue
Individual contributions and status are important	Group dynamics and harmony are important
Competitive	Collaborative
Technical/Analytical	Relational

Reprinted from Z. Hammond and Y. Jackson, *Culturally Responsive Teaching and the Brain: Promoting Authentic Engagement and Rigor Among Culturally and Linguistically Diverse Students* (Thousand Oaks, CA: Corwin, 2015).

While culture refers to the set of meanings and behaviors adopted by a group, **cultural identity** describes the aspects of culture that an individual shares with the members of one or more groups. Since a person can identify with multiple cultures at the same time, influences from these multiple cultures, combined with age, gender, religion, personality, and other personal characteristics, shape the sense of self that individuals construct and use to define who they are. These intersecting identity factors partly contribute to variations among in-group cultural practices.<sup>17</sup> For example, younger generations may not agree with historical beliefs held by older generations about the expected roles of family members or the importance of specific customs, even though both generations identify with the same culture. Additionally, environmental, political, and societal factors influence how individuals express their cultural identity by affecting access to external representations of culture—such as specific music, clothing, or foods—or the ability to practice cultural customs in certain settings. Consequently, people who share the same culture may express it in different ways, even though they share the same underlying cultural values and beliefs.

**“The task of forming a coherent cultural identity that allows adolescents to become contributing members of society presents challenges that may be stressful or even considerably more problematic for some adolescents.”**

Prior to **adolescence**, forming a cultural identity is driven by exposure to different cultures provided by parents, guardians, and immediately accessible communities. As adolescents expand and diversify their relationships, the development of their cultural identity becomes a conscious process and decision as they encounter larger social circles and subsequently diverse cultures.<sup>18</sup> Today, adolescents are coming of age in a multicultural world where creating a cultural identity has become even more complex. Often, adolescents face the task of integrating diverse cultural beliefs and behaviors conveyed to them by multiple social influences—influences that, at times, are at odds with one another (e.g., parents and media). The task of forming a coherent cultural identity that allows adolescents to become contributing members of society presents challenges that may be stressful or even considerably more problematic for some adolescents. However, adolescents can overcome these challenges as they develop new skills in communicating effectively with diverse people and build healthy **self-esteem**

and empathy—attributes that allow adolescents to function well psychologically and contribute in a multicultural society.<sup>19</sup>

## Connecting School Environments to Broader Contexts

**SAL Research Consensus Statement 12: Adolescents seek learning environments that are consistent with and meaningful within the social and cultural contexts of their lives.**

While interrelated, and often used interchangeably, school climate and school culture refer to different aspects of the school environment. **School climate** refers to behavior or the shared perceptions of students and educators, while **school culture** refers to the shared values and norms of a school.<sup>20</sup> School climate can be thought of as the measurable manifestations of culture, which is a more abstract construct.<sup>21</sup> For example, while school leaders can measure climate by assessing student engagement and school safety, those measures may not accurately reflect the values and underlying assumptions held by students and educators. However, the culture of a school set by leaders and teachers determines the climate students experience.

**“[W]hen school leaders focus on developing a positive school climate and culture, rather than boosting academic performance alone, they are more likely to see improvements in student learning.”**

Research finds that a principal's impact on student learning within a school is not direct; it depends on the culture and climate of the school.<sup>22</sup> Consequently, when school leaders focus on developing a positive school climate and culture, rather than boosting academic performance alone, they are more likely to see improvements in student learning. Conversely, a school culture that focuses exclusively on the school's overall academic performance can affect student achievement negatively and potentially overlook low-performing groups of students.<sup>23</sup> Additionally, district leaders play a key role in empowering school leaders with the structures, support, and resources necessary for school personnel to maintain an academically, socially, and developmentally appropriate culture of learning in middle and high schools.

A school environment includes the student, the experience of the student within the classroom, the school setting in which classroom interactions take place, the school district that sets guidelines and expectations for the school, and the larger communities and political systems in which school districts are located. Schools are embedded in larger social systems that are influenced by the community, state, and national context, which in turn affect school culture.<sup>24</sup>

Dominant cultures drive institutional patterns that affect learning environments. The attitudes and ideologies of each of the cultures within a learning environment influence and are influenced by the other components of the learning environment. These cultural influences are evident in the makeup of the economic, social, educational, legal, and political systems a person experiences at any given time. The priorities and expectations related to adolescent learning depend on the values and beliefs of the cultures influencing the education system and community. For instance, if the culture considers adolescence a developmental stage of increased opportunity, then social, political, and educational structures likely reflect that belief. This belief could result in a greater investment of resources and services to support adolescent learning opportunities, which in turn affect industries, political decisions, and the portrayal of adolescents in the media. However, if the culture considers adolescence a time of risk, then social, educational, and political structures might instead emphasize disciplinary and behavior prevention programs.

“**The priorities and expectations related to adolescent learning depend on the values and beliefs of the cultures influencing the education system and community.**”

These cultural influences also affect familial expectations about adolescents' education and the interactions between families, communities, and schools. When the beliefs and values of these influential groups reflect a common goal related to adolescent learning, the student's learning environment becomes more consistent and more supportive. As a result of strengthening this value, familial and community involvement in a child's education may increase during adolescence because of stronger linkages between cultural values and adolescent learning. This can help reverse current parental school involvement trends by increasing opportunities for family involvement in middle and high schools that are both academically and developmentally appropriate.<sup>25</sup>

Some learning environments can burden historically underserved and marginalized students with an additional, largely invisible layer of adversity.<sup>26</sup> Terms such as *culturally appropriate*, *culturally congruent*, and *culturally compatible* used to describe school improvement goals and approaches related to addressing the disconnect between students' school and home experiences often connote a goal of educating historically marginalized students in the knowledge and skills needed to succeed in mainstream or predominant society.<sup>27</sup> By contrast, **culturally responsive approaches** promote a more dynamic or synergistic relationship between home and community values and school culture.<sup>28</sup> In a study of one culturally responsive intervention, students' grade point averages increased and their likelihood of failing a class decreased when educators used motivational strategies aligned with the students' broader cultural values; the intervention showed positive results regardless of the students' previous academic performance.<sup>29</sup> However, there is a need for additional large-scale and robust studies measuring the impact of culturally responsive approaches to strengthen the evidence base supporting these interventions, particularly as psychological, sociological, and developmental research provides increasing evidence of the impact of culturally responsive strategies on student learning.<sup>30</sup>

When historically underserved and marginalized students are secure and supported in their cultural identities, they are better protected from the psychological consequences of discrimination and cultural bias in school settings.<sup>31</sup> Learning environments best support students' academic success when they allow students to imagine school as the path to a successful future, conceptualize strategies to succeed on that path, and see obstacles and failures as an expected part of the learning process.<sup>32</sup>

## The Influence of Technology

**SAL Research Consensus Statement 13: Digital technologies, such as computers, the internet, social media, and smart phones, dramatically have changed the way individuals learn, play, and interact with each other. Their impacts may be greatest for adolescents who are young enough to embrace novelty and old enough to master the technologies.**

An additional aspect of the modern adolescent's learning environment is the growing prevalence of digital technology



and virtual learning. Since the invention of the World Wide Web in 1989, humans have changed the way they interact with one another and their social, cultural, and learning environments.<sup>33</sup> Adolescents have an advantage in mastering new technologies because of the higher levels of brain plasticity and increased sensitivity to the social environment that occur during this stage of development. (For additional information, see reports 1 and 2 from All4Ed's SAL consensus statement report series, [Science of Adolescent Learning: How Body and Brain Development Affect Student Learning](#) and [Science of Adolescent Learning: Risk Taking, Rewards, and Relationships](#).) The term **digital natives** collectively refers to individuals who were born or experienced childhood as use of the internet and digital technologies became more prevalent.<sup>34</sup> These individuals represent a generation that interacted with these technologies during the formative periods of their development.

There are many misconceptions about digital natives and the impact that technology has on their learning and well-being. There is little evidence that digital natives exhibit a distinctly different learning style from previous generations. Current evidence does not suggest that internet use has either a profoundly positive or negative effect on brain development, and future studies are needed to investigate brain measures and the effects on behavior, cognition, and well-being in a representative sample of the population.<sup>35</sup> Another common misconception about the relationship between adolescents and technology results from the paradigm that technology poses a “danger” because it is unknown or has been loosely connected to a specific threat dominating much of the current public discussion about social media. This rhetoric around technology use by young people echoes that which was used to characterize other technological advances such as print media, the telephone, and television.<sup>36</sup> The initial wave of research on the use of social network sites focused mostly on identifying positive and negative impacts.<sup>37</sup> But adults should not let their own fears prevent them from understanding the uses and impacts of digital technologies, because adolescents who are more inclined to take risks will be left to navigate these digital environments without support.

A key characteristic of digital natives is their dualistic relationship with online and physical spaces.<sup>38</sup> Digital natives demonstrate the capacity to learn and adapt to new technologies in ways that allow them naturally to cross the border between real life

and digital spaces.<sup>39</sup> It is important to note, however, that while computer and internet-based technologies are embedded in the lives of many children and adolescents, the characteristics of digital natives are not uniform across the United States and the world.<sup>40</sup> Access to technology, particularly high-speed internet, historically has been and still is limited to individuals of middle-income and higher socioeconomic status and those living near affluent urban and suburban areas.<sup>41</sup>

The internet and social network sites support, facilitate, and perhaps even intensify the natural developmental processes of adolescents by providing new contexts for reflecting upon and trying out new identities, learning and attempting new social skills, and establishing group affiliations. Some research shows several positive influences of social network sites on adolescents' social and emotional development, including enhanced peer relationships, broadened opportunities to affiliate with peers (including with groups that are less accessible within traditional social contexts), and increased occasions for self-disclosure—all of which can enhance learning and well-being.<sup>42</sup> Social network sites also play a role in the expression of racial/ethnic identity and orientation to other racial groups. In general, the internet can reinforce ethnic identity by connecting adolescents to groups and individuals beyond those in their local community.<sup>43</sup> African American, Latino, and Asian (specifically Indian and Vietnamese) college students tend to include more elaborate descriptions in their social media profiles than do Caucasian students, with ethnic identity a salient part of their social media interactions.<sup>44</sup> Lesbian, gay, bisexual, transgender, and questioning/queer (LGBTQ) adolescents also use social network sites as a means of self-expression. LGBTQ adolescents report that the internet is a useful and more comfortable context in which to express their sexual orientation and gender identity and connect with their LGBTQ peers.<sup>45</sup>

Meanwhile, the internet and digital technology have transformed certain issues related to adolescent development, like intimacy, sexuality, and identity. For instance, social network sites amplify the risks associated with the expansion of adolescent social environments by increasing the number of people with whom they interact, the speed at which those interactions take place, and anonymity. Social media can increase the pressure on adolescents for self-disclosure, raise the likelihood for and magnitude of negative feedback, and promote unhealthy social comparisons, all of which

can contribute to depression. It also provides a platform for anonymous bullying behavior, also referred to as cyberbullying. Research suggests that real-world relationships and contexts influence adolescents' electronic communication at least as much as electronic communication influences their real-world relationships and developmental outcomes.<sup>46</sup> Given the connection between the physical and virtual worlds, the challenge for adults is to keep adolescents both physically and psychologically safe while simultaneously allowing the adolescents the opportunity to use digital technologies to explore and interact with others in ways that benefit their social, emotional, and cultural development.

## How Stress Affects Learning and Development

**SAL Research Consensus Statement 14: Adolescence is marked by significant biological shifts, resulting in heightened stress-induced hormonal responses. Stress is a major modulator of human learning and memory processes. As pressures around school, work, and relationships increase, adolescents experience greater stress.**

Adolescence is a time of increased opportunity for learning, but it also represents a period of heightened stress due to the many biological and social changes individuals face, including physical maturation, drive for independence, increased sensitivity to social interactions, and brain development.<sup>47</sup> **Stress** refers to a human's biological and psychological responses to any demand or threat. First, the individual judges a situation and decides whether it is stressful. This decision is based on sensory input and processing (i.e., the things an individual sees and hears in the situation) and stored memories (i.e., what happened the last time the individual encountered a similar situation). In addition to the effects that stress can have on the physical health of an individual, stress can both directly and indirectly disrupt learning processes in the brain.

Once an individual perceives an experience as stressful, the **hypothalamus**, the brain structure primarily responsible for triggering stress responses, activates and signals the **adrenal medulla** and **pituitary gland** to act. When responding to a short-term stressor, the adrenal medulla receives the signal and begins to produce hormones, including **adrenaline**.

Adrenaline prepares the body for a “fight-or-flight” response that increases sweating, heart rate, pulse, and blood pressure and decreases digestion. These biological responses evolved as mammals needed to use their energy efficiently to respond to survival threats. If the body is responding to a long-term or chronic stressor, the pituitary gland receives a signal from the hypothalamus. The pituitary gland responds by producing **adrenocorticotrophic hormone (ACTH)**, which stimulates the **adrenal glands** to produce the hormone **cortisol** in humans. Cortisol helps the body maintain adequate and steady blood sugar levels to help cope with a prolonged stressor. This stress response also makes sense in an evolutionary context, as it allows mammals to maintain their energy levels when faced with a lasting threat to their survival, such as an inability to quickly reach a nutrition source.<sup>48</sup>

However, elevated levels of cortisol can affect the brain negatively and may impede self-regulation and learning. Evidence suggests that the adolescent brain may be more vulnerable than the adult brain to the effects of stress because brain areas and structures involved with learning—such as the **prefrontal cortex**, emotion-processing systems, and other related neural circuitry—still are developing.<sup>49</sup> The prefrontal cortex is an area of the brain highly involved in self-regulation, but it develops at a slower rate than the brain's emotion-processing systems. Consequently, adolescents are prone to heightened emotional reactivity with less capacity to regulate those emotions.<sup>50</sup> In addition, in adolescents who were exposed to early and sustained stress during their childhood, researchers observe changes in **gray matter** volume and the neuronal integrity of the **frontal cortex** and reduced size of the **anterior cingulate cortex**, brain structures still developing during adolescence.<sup>51</sup> In contrast, the **hippocampus**, which develops mainly in the first years of life, is less affected by exposure to stress during adolescence.<sup>52</sup> The hormonal and structural changes caused by stress affect students' abilities to learn by altering their capacity to pay attention to stimuli beyond what is causing them stress, remember concepts, and respond appropriately to other social stressors.

“[S]tudies show that adolescents are more vulnerable to lasting consequences of environmental stress. Adolescents who experience chronic or traumatic stress because of adverse childhood experiences (ACEs), such as physical, sexual, and emotional abuse and neglect, are more likely to participate in unsafe behaviors.

Additionally, studies show that adolescents are more vulnerable to lasting consequences of environmental stress. Adolescents who experience chronic or traumatic stress because of **adverse childhood experiences (ACEs)**, such as physical, sexual, and emotional abuse and neglect, are more likely to participate in unsafe behaviors. For example, highly stressed adolescents may initiate drinking alcohol as a coping mechanism. The adoption of unhealthy lifestyles to cope with chronic and traumatic stress might explain why more ACEs are associated with tobacco use, illicit drug abuse, obesity, and promiscuity, as well as why the risk of pathologic gambling is higher in adolescents and adults who were maltreated as children and during adolescence. Adolescents and adults who manifest higher rates of dangerous risk-taking behaviors also are more likely to have trouble maintaining supportive social networks and are at higher risk of school failure, gang membership, unemployment, poverty, homelessness, violent crime, incarceration, and becoming single parents.<sup>53</sup> For more information about adolescent risk taking and ways in which educators can encourage students to engage in positive and prosocial risk-taking behaviors, see All4Ed's report [\*Science of Adolescent Learning: Risk Taking, Rewards, and Relationships\*](#).

Further research is needed to understand better why exposure to certain types of **trauma**, or deeply disturbing or distressing experiences, during adolescence has long-lasting effects on the brain. Even though adults with histories of physical or sexual abuse early in life show volume reductions in the hippocampus, those changes are not evident in adolescents who experience such abuse as children; this suggests that a unique brain response to stress occurs during adolescence that researchers should explore further.<sup>54</sup>

**“While certain stressful or traumatic experiences may affect adolescents uniquely, adolescence also is a period when an individual's resilience in the face of stress strengthens.”**

Yet, while certain stressful or traumatic experiences may affect adolescents uniquely, adolescence also is a period when an individual's resilience in the face of stress strengthens. Experimental animal research strongly emphasizes that the period of adolescence coincides with the development of long-lasting resilience to detrimental biological effects and behavioral changes that can result from stress.<sup>55</sup> When exposed to lower-

level, nonthreatening stress, such as worry about academic performance or social evaluation, adolescents can practice healthy coping strategies that improve their ability to deal with more stressful experiences in adulthood, thus providing a developmental advantage.<sup>56</sup>

## Poverty and Socioeconomic Status

**SAL Research Consensus Statement 15: In addition to physical, social, and emotional impacts that economic disadvantage has on adolescents, poverty and socioeconomic status are associated with a diverse set of neuroscientific structural and functional outcomes. Based on current evidence, the most sensitive systems are those related to executive functions, language, learning, and stress regulation.**

One major source of stress affecting the learning experience of historically underserved students is related to poverty. Defining **poverty** is a complex and nuanced task and depends on several factors, such as geographic region, cultural expectations, structural constraints, quality of learning environment, education level, and income level, among others. Poverty is not a culture, as the people who experience it do not willingly embrace it as a part of their lives, nor do they normalize or glorify the negative aspects of poverty, despite what some academic approaches and media portray. Also, the coping skills individuals adopt to manage the stress related to poverty should not be mistaken for norms or beliefs.<sup>57</sup> While terms like *poverty*, *socioeconomic status*, and *low-income* technically have different meanings, especially to researchers seeking to answer specific questions, the public tends to use the terms interchangeably. The U.S. Department of Education (ED) typically considers any student who is eligible for free or reduced-price lunch as economically disadvantaged. Regardless of the term used, leaders and educators should understand how their decisions and practices affect students from low-income families and communities.

Children living in socioeconomic disadvantage are more likely to experience cognitive delays and emotional problems, but the underlying causal pathways between disadvantage and developmental outcomes are not clear.<sup>58</sup> Research does not show a direct effect of poverty on children's intellectual, psychological, and biological development; rather the *conditions* that arise from low-income status contribute to

developmental challenges that arise during adolescence and other developmental stages. Consequently, interventions should focus on improving the negative conditions disproportionately experienced by those in poverty to reduce the effects of low socioeconomic status on developmental outcomes.<sup>59</sup>

Parents of adolescents in poverty often face the challenges of food insecurity, inadequate housing, dangerous neighborhoods, unemployment, racial and ethnic discrimination, and poor health. Dealing daily with these multiple problems can lead to greater psychological stresses among low-income parents than middle- to high-income parents. Poverty-generated stresses contribute to parenting styles characterized by harsh discipline and punitiveness and by low levels of warmth and support.<sup>60</sup> In turn, these practices could be associated with adolescent behavior problems such as aggression and delinquency.<sup>61</sup> Research shows that poverty-related stress is particularly harmful for children and adolescents, exacerbating its physical and psychological impact on them more than on adults.

There also is growing evidence that supports the association between the conditions that arise from childhood poverty and changes in the brain. Individuals who experience poverty at early ages can show increased adult neural activity in the **amygdala**, leading to more intense stress responses, and lower levels of activity in the prefrontal cortex, preventing the regulation of resulting emotional responses such as depression or aggression. The combination of these effects, further described in All4Ed's report [\*Science of Adolescent Learning: How Body and Brain Development Affect Student Learning\*](#), result in decreased capacity for emotional regulation during conscious efforts to regulate negative emotion and cope with stress, which can lead to difficulty learning as well as disruptive and avoidant behaviors.<sup>62</sup>

Research indicates that much of poverty's effect on children's intellectual development is due to a lack of cognitive stimulation, resulting from decreased opportunities for parents to engage with their children. When individuals are stimulated cognitively through engaging activities, such as those that require creativity or problem solving, positive effects, such as higher academic performance, are more likely to be exhibited in the individual's intellectual development.<sup>63</sup> Environmental conditions of the neighborhood can affect intellectual development in greater ways than lack of engagement. Evidence shows that living near

areas contaminated by hazardous waste increases the potential for the development of cognitive disabilities and negatively affects other school-based cognitive, developmental, and behavioral outcomes. Children and adolescents exposed to highly polluted areas show lower academic test scores, increases in behavioral incidents at school, a higher probability of repeating a grade, and an increased likelihood of having a cognitive disability. These negative outcomes most likely result from high pollution, rather than genetic or other environmental factors, because the outcomes of siblings who were not exposed to the polluted conditions (either in utero or after birth) do not reflect those trends.<sup>64</sup>

Socioeconomic inequalities also are associated with mental health problems in children and adolescents. Persistently low socioeconomic status and a decrease in socioeconomic status are major predictors of the onset of mental health problems in children and adolescents. This increased likelihood of mental health issues can contribute to the cycle of poverty, or the restricted social mobility of socioeconomically disadvantaged people and the transmission of poverty across generations. Future generations can be affected not only by the socioeconomic deprivation of their parents but also by the associated mental health issues they may face as a result of their experience in poverty.<sup>65</sup>

Poor neighborhood conditions can affect depression by increasing levels of daily stress, elevating youths' vulnerability to negative events, and disrupting social ties. These conditions, disproportionately experienced by individuals living in poverty, can predispose adolescents to depressive symptoms because youth are exposed to more chronic stressors.<sup>66</sup> Poverty-related stress contributes to worsening symptoms of depression and anxiety, delinquency, attention problems, and poor physical health, each of which can affect school attendance, academic engagement, and learning.<sup>67</sup> Adolescents who grow up in poor economic conditions, and those whose mothers were depressed in the early postnatal period, have higher baseline levels of **glucocorticoid**, a mediator of the biological stress response, indicating higher stress levels.<sup>68</sup> High levels of glucocorticoid in the early morning that vary noticeably from day to day during the transition to adolescence are not associated with depressive symptoms during early adolescence, but they do predict increased risk for depression by age sixteen.<sup>69</sup>



## The Effects of Inequality, Bias, and Discrimination

**SAL Research Consensus Statement 16: Inequality, bias, and the persistence of structural discrimination constitute serious hazards to the positive development of all adolescents.**

Adolescents from historically underserved student groups disproportionately face other major sources of stress from inequality, bias, and discrimination. **Inequality** refers to a difference in treatment, access to social services (such as education), and outcomes (such as wealth) and affects specific individuals and entire subgroup populations.<sup>70</sup> When individuals or subgroups explicitly are treated unjustly as a result of having certain characteristics, such as being of a specific race or gender, it is referred to as **discrimination**. The U.S. Office of Civil Rights enforces several federal laws that prohibit discrimination in programs or activities that receive federal funds from ED. These laws prohibit discrimination in schools based on race, color, and national origin, as well as sex, disability, and age.<sup>71</sup> Although students may experience discrimination as a result of other marginalized identities they possess, such as their sexual or religious identity, those identities are not protected under current federal law.

The development and understanding of identity throughout childhood and adolescence fundamentally influence individuals' behavior and attributional inferences about themselves and others. Adolescents from historically marginalized and underserved populations disproportionately experience stress related to the inequality they experience. Researchers measured discrimination-related stress and self-esteem in adolescent high school students who self-identify as African American, Hispanic, East Asian, South Asian, and non-Hispanic white, as well as the amount and quality of preparation their caregivers provided to those students to manage discrimination-related stress. Youth from all ethnic backgrounds report distress associated with instances of perceived racial prejudice encountered in educational contexts.<sup>72</sup> Instances of institutional discrimination in stores and by police are higher for older youth and particularly for African American and Hispanic teenagers. Asian youth most frequently report encounters with peer discrimination, although youth from all ethnic groups feel they sometimes are excluded from peer activities because of

their race.<sup>73</sup> The amount and quality of preparation for coping with racial bias that adolescents receive from their caregivers are associated with how distressed they feel after experiencing institutional and educational discrimination. Students who experience greater distress due to educational and peer discrimination also are more likely to have lower self-esteem than students who are more prepared to cope. However, further research is needed to examine how peer discrimination directly affects adolescent social development and well-being.<sup>74</sup>

In addition, millions of children and youth who are undocumented immigrants or who have undocumented immigrant parents encounter numerous obstacles in their learning and education experiences.<sup>75</sup> While some undocumented children enter the U.S. education system at an early age, giving them additional time to learn English if needed and to become familiar with U.S. schools, more youth arrive as adolescents, during their middle and high school years. These students often assume adult responsibilities within their families or serve as an intermediary between their parents and teachers since undocumented adults face poor working conditions, low wages, lack of access to benefits, and limited opportunities for employment—all factors associated with low academic achievement for their children.<sup>76</sup> Parental engagement at a child's school is a positive predictor of academic achievement, higher self-esteem, greater academic achievement, and higher rates of high school completion and college enrollment; however, school engagement often is challenging for immigrant families because of language barriers and the perception of school as an unsafe or intimidating place because of fears of deportation.<sup>77</sup> Barriers to parental involvement are particularly problematic for immigrant families living in racially and ethnically isolated communities.<sup>78</sup> These underserved and low-performing schools often lack adequate resources to support students and their families and hold low expectations for immigrant students.<sup>79</sup>

Although historically underserved students sometimes encounter outright discrimination, more often they face implicit biases inside and outside of school. **Implicit biases** are based on the attitudes an individual may have about a particular person or group. They are especially difficult to identify and address because they can produce unintentional behavior that diverges from a person's avowed or endorsed beliefs or principles. For example, educators may show implicit bias in grading by assigning relatively high grades to the average performance

of students in one subgroup while assigning lower grades for the same level of performance to students in another subgroup without realizing the inequality of their actions. Meanwhile, an **explicit bias** is consciously endorsed. If that bias then results in an action that leads to the unfair treatment of a subgroup, the action may be considered discrimination. Biases can be either favorable or unfavorable. **In-group bias** favors the group to which an individual belongs; while this type of bias may be more socially accepted, it still negatively affects individuals outside of the group.<sup>80</sup>

Research shows that educators are likely to have different expectations of students' academic performance and behavior depending on their characteristics. These varying expectations can result in achievement differences or gaps between groups of students, although the size of these achievement gaps differ across classrooms. These gaps have been observed most between students of different racial and ethnic identities. Researchers find that these different teacher expectations and differing sizes of ethnic achievement gaps relate to the implicit biases of teachers. Teachers with negatively prejudiced attitudes appear more predisposed to evaluate students of color as less intelligent and having less-promising prospects for their school careers. In addition, the achievement differences between students of color and white students are larger in the classrooms of these teachers than in the classrooms of less prejudiced teachers.<sup>81</sup>

Educators communicate these expectations to students in several ways. They may create a warmer social and emotional climate for students for whom they have high expectations and give such students increasingly more difficult and challenging learning materials. They also may provide these students with more opportunities to participate in class and more informative feedback.<sup>82</sup> While this communication of expectations presumably is subtle, mostly nonverbal, and usually unintentional, students nevertheless perceive and internalize teacher expectations and may alter their classroom behavior and motivation as a result, thereby achieving the expectations set for them.<sup>83</sup> This phenomenon is especially concerning for students who perceive educators as having low expectations of them; the effects tend to be even stronger when the student perceives those expectations to be inconsistent or different across student subgroups.<sup>84</sup>

Even students attempting to disprove the low expectations of some educators and others around them face additional stress from stereotype threat. If many people hold the same beliefs about individuals or groups with certain characteristics, particularly if those beliefs are oversimplified or prejudiced, these beliefs evolve into a **stereotype**. **Stereotype threat** refers to a distinct psychological state marked by cognitive activation of racial stereotypes and strong motivation to avoid being judged by such stereotypes. For example, racial groups stereotyped as being less intelligent may feel greater pressure to succeed academically to debunk the generalization. Research suggests that this state results from a greater degree of self-evaluative threat that arises from the additional risk of fulfilling a negative group stereotype and consequently increases the emotionality and stress levels of the individual experiencing it.<sup>85</sup> Research shows that interventions that render negative stereotypes irrelevant decrease the effects of stereotype threat on performance, although additional research on the cause of these intervention effects still is needed.<sup>86</sup>

Because stereotypes are common, they contribute to the creation and sustainment of systemic inequality and discrimination. **Systemic inequality** produces inequality even in the absence of biased individuals. For example, wealth inequality, which has grown in recent decades, is likely to persist in subsequent generations if gaps in the attainment of higher education credentials remain for students of color and students from low-income families, since higher education is associated strongly with upward economic mobility.<sup>87</sup> The relationship between family wealth and educational attainment holds even when family income and other characteristics are considered, suggesting that family wealth is an important factor in promoting greater educational achievement. The fact that children from low-wealth families, which are disproportionately people of color, are less likely to go to college has implications for the continued pattern of wealth and racial inequality in the United States.<sup>88</sup> Because many systemic factors can affect the learning and educational outcomes of students, it is essential for school and district leaders and educators to create equitable education systems that not only provide adolescents with equal access to resources and opportunities for learning, but also account for the disproportionate effects of bias and discrimination. **Equity** affects the biological, psychological, and social development of all children and improves educational outcomes.

## Implications and Opportunities for Education Practice and Policy

Culture and learning environments inside and outside of schools and online affect the learning opportunities adolescent students experience and their development and capacity to learn overall. Educators must consider how the intersection of school and societal cultures can support or hinder student learning and create culturally responsive environments for the diverse students they serve. Historically underserved students in particular are more likely to face the effects of poverty, negative bias, and discrimination, including chronic stress, lack of academic motivation, and stereotype threat, all of which influence adolescent learning and development.

### What do these findings mean for educators?

- District and school leaders, as well as educators, should assess whether districts and schools respond equitably to diverse needs using qualitative and quantitative measures, such as access to opportunities and resources, assessment bias, diversity of high-quality teachers, and student surveys of their experiences.
- Proposed decisions about adolescent education at the school and district levels should include opportunities for feedback from diverse groups and community representatives throughout the decisionmaking process. Student motivation and community collaboration are more likely to increase when there is inclusive dialogue among leaders, educators, families, and students.
- School leaders and educators should engage with all students, their families, and communities to learn about their cultural backgrounds and values. With that knowledge, educators can implement inclusive educational and organizational strategies, such as incorporating key perspectives into instruction and extracurricular activities, using inclusive language, and connecting academic topics and goals to the cultural values of students to ensure that district and school structures are equitable and respond to the needs of students outside the dominant culture.
- Technology should be [integrated strategically](#) into academic instruction using [blended learning](#) approaches to create a [personalized learning](#) experience for students.

At the same time, school and district leaders should be prepared to address potential equity concerns that may arise from expected technology use, such as differences in students' home access to the internet, professional learning opportunities for educators, and data privacy considerations.

- District and school leaders also should provide opportunities and resources to improve educator diversity and build school capacity around cultural responsiveness, such as strategies for [recruiting and retaining diverse teachers](#) and [providing culturally responsive instruction](#).
- School and district leaders, educators, and counselors should collaborate to provide students and families with information about healthy strategies for coping with stress and access to other mental health resources.

### What do these findings mean for policymakers and advocates?

- Evidence suggests that adolescents are more likely to excel in their academic pursuits if they are taught in ways that connect to their culture and values. Therefore, as the U.S. Congress considers the reauthorization of the Higher Education Act, it should provide opportunities for prospective educators to learn evidence-based culturally responsive practices through Title II and Title III teacher and leader preparation programs.
- A range of factors outside the classroom affect a student's ability to learn. Quality instruction is critical but insufficient on its own to ensure that students from historically underserved backgrounds have the support they need to excel. Therefore, Congress should expand funding for integrated student support through programs such as the Student Support and Academic Enrichment Grants program, Promise Neighborhoods, and Full-Service Community Schools. In addition, ED and the U.S. Department of Health and Human Services (HHS) should issue guidance to states and school districts regarding ways in which resources from ED and HHS can be integrated to support students comprehensively.
- The authorization for the Education Sciences Reform Act expired in 2008, although Congress has continued funding the law since that time. When Congress reauthorizes the statute, it should prioritize research on effective ways to incorporate culturally responsive practices into the nation's education system effectively.

## Conclusion

More than ever, research shows how school culture influences adolescent learning and development. When students feel that their schools recognize and value their cultural and community beliefs, their motivation to engage in academic and extracurricular activities increases. Culturally responsive practices also support historically underserved and marginalized students in coping with the bias, discrimination, and negative stereotypes they too often face because of their cultural, racial, and socioeconomic identities.

Adolescents are especially vulnerable to the effects of stress due to their developmental stage. Their regulatory systems are not yet like those of adults as they continue to become more independent and self-sufficient. Consequently, adolescents need additional support in stress management, particularly given the growing evidence that shows how stress affects learning and academic outcomes.

Policymakers and educators should capitalize on the learning opportunities that diverse cultures and communities offer. They can do this by incorporating aspects of out-of-school learning environments, such as technology and current and historically relevant connections to academic work, in school experiences. In addition, continued research on effective culturally responsive practices is critical. As educators and leaders continue to draw from the best available studies, they also should contribute to larger research efforts around culturally responsive practices to support policy and advocacy.



Photo by Allison Shelley/The Verbatim Agency for American Education: Images of Teachers and Students in Action



## Endnotes

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## Glossary

**adolescence.** The period of human development that starts with biological changes associated with puberty and ends once specific social expectations—determined by factors like family, culture, and society—are met.

**adrenal gland.** An endocrine gland adjacent to the kidney. Its outer layer, the adrenal cortex, secretes such hormones as androgens (male sex hormones) and *glucocorticoids* (see Glossary for definition). Its inner core, the *adrenal medulla* (see Glossary for definition), secretes the hormones *adrenaline* (see Glossary for definition) and *noradrenaline*. Also called *suprarenal gland*.

**adrenal medulla.** The inner portion of the adrenal gland that controls hormones that help individuals cope with physical and emotional stress. The main hormones secreted by the adrenal medulla include *adrenaline* (see Glossary for definition) and *noradrenaline*, which have similar functions.

**adrenaline.** A neurotransmitter and adrenal hormone that is synthesized primarily in the *adrenal medulla* (see Glossary for definition). As a hormone, it is secreted in large amounts when an individual is stimulated by fear, anxiety, or a similar stress-related reaction. As a neurotransmitter, it increases the heart rate and force of heart contractions, relaxes bronchial and intestinal smooth muscle, and produces varying effects on blood pressure. Also called *epinephrine*.

**adrenocorticotrophic hormone (ACTH).** A hormone secreted by the *pituitary gland* (see Glossary for definition), particularly when a person experiences stress. It stimulates the release of various other hormones, primarily *cortisol* (see Glossary for definition), from the adrenal cortex, the outer layer of the adrenal gland.

**amygdala.** An almond-shaped structure in the brain that is a component of the limbic system. Through this system of widespread connections with other brain areas, the amygdala has an important role in memory, emotion, perception of threat, and fear learning.

**adverse childhood experiences (ACEs).** Stressful or traumatic events, including abuse and neglect. ACEs also may include household dysfunction, such as witnessing domestic violence or growing up with family members who have substance-abuse disorders. ACEs strongly relate to the development and prevalence of a wide range of health problems throughout a person's life span, including those associated with substance misuse.

**anterior cingulate cortex (ACC).** The front, more curved part of the cingulate cortex, a structure in the forebrain that forms a collar around the corpus callosum. The ACC is divided into two distinct areas believed to have essential roles in numerous activities: (1) the dorsal anterior cingulate cortex, and (2) the ventral anterior cingulate cortex. The dorsal anterior cingulate cortex, often considered the "cognition" division, is implicated in a range of executive functions, such as attention allocation, error and novelty detection, working memory modulation, cognitive control, response conflict, and response selection. The ventral anterior cingulate cortex, often considered the "emotion" division, is thought to be involved in mediating anxiety, fear, aggression, anger, empathy, and sadness; in perceiving both physical and psychological pain; and in regulating autonomic functions (e.g., blood pressure, heart rate, respiration). Although the precise mechanisms by which these processes occur in the ACC remain unknown, researchers have theorized that a reciprocal relationship between these divisions help maintain a balance between cognitive and emotional processing to enable self-regulation.

**collectivism.** A social or cultural tradition, ideology, or personal outlook that emphasizes the unity of the group or community rather than each person's individuality. Most Asian, African, and South American societies tend to put more value on collectivism than do Western societies, insofar as they stress cooperation, communalism, constructive interdependence, and conformity to cultural roles and mores. Compare to *individualism* (see Glossary for definition).

**cortisol.** The primary stress hormone of humans. In response to stress or injury, blood cortisol levels increase, as does blood pressure, while activity of the immune system decreases and

release of inflammatory substances in the body is contained. Cortisol improves the body's ability to manage stress and to repair itself. Exposure to prolonged stress, however, can lead to excessive levels of cortisol, which can have deleterious effects on the body.

**cultural archetype.** A set of similar beliefs, values, or behaviors found in multiple *cultures* (see Glossary for definition).

**cultural identity.** A sense of self that individuals develop as they take certain aspects of each of the *cultures* (see Glossary for definition) to which they belong and use them to shape and define who they are.

**culturally responsive approaches.** The process of using familiar cultural information and strategies to scaffold learning. These approaches emphasize diverse community values, relationships, personalized learning, and critical social awareness.

**culture.** The distinctive customs, values, beliefs, knowledge, art, and language of a society or a community. These values and concepts are passed on from generation to generation, and they are the basis for everyday behaviors and practices. Culture also can be expanded to include other topics, such as familial roles; communication patterns; affective styles; and values regarding personal control, individualism, collectivism, spirituality, and religiosity.

**digital native.** A person born or brought up during the age of digital technology and therefore familiar with computers and the internet from an early age.

**discrimination.** Differential treatment of the members of different ethnic, religious, national, or other groups. Discrimination is usually the behavioral manifestation of prejudice and therefore involves negative, hostile, and injurious treatment of the members of rejected groups.

**equity.** In education, the term *equity* refers to the principle of fairness. Inequities occur when biased or unfair policies, programs, practices, or situations contribute to a lack of equality in educational performance, results, and outcomes.

**explicit bias.** The attitudes and beliefs individuals have about a person or group on a conscious level. Much of the time, these biases and their expression arise as the direct result of a perceived threat. Compare to *implicit bias* (see Glossary for definition).

**frontal cortex.** The cerebral cortex of the frontal lobe in the brain. It is associated with decisionmaking, planning, insight, judgment, the ability to concentrate, and impulse control.

**glucocorticoid.** Any corticosteroid hormone that acts chiefly on carbohydrate metabolism. Glucocorticoids include *cortisol* (see Glossary for definition), corticosterone, and cortisone.

**gray matter.** Any area of neural tissue that is dominated by cell bodies and devoid of myelin (fatty cells), such as the cerebral cortex and the H-shaped periaqueductal gray of the spinal cord.

**hippocampus.** A seahorse-shaped part of the forebrain located in the region of the temporal lobe that is important for declarative memory and learning.

**hypothalamus.** The part of the brain with primary control of the autonomic (involuntary) functions of the body. It also helps integrate autonomic activity into appropriate responses to internal and external stimuli. Additionally, it is involved in appetite, thirst, sleep, and sexuality.

**implicit bias.** Refers to the attitudes or stereotypes that affect an individual's understanding, actions, and decisions in an unconscious manner. These biases, which encompass both favorable and unfavorable assessments, are activated involuntarily and without a person's awareness or intentional control. Residing deep in the subconscious, implicit biases are not accessible through introspection and are different from known biases that individuals may choose to conceal for the purposes of social or political correctness. Compare to *explicit bias* (see Glossary for definition).

**individualism.** A social or cultural tradition, ideology, or personal outlook that emphasizes the individual and his or her rights, independence, and relationships with other individuals. Compare to *collectivism* (see Glossary for definition).

**inequality.** The state of not being equal, especially in status, rights, and opportunities.

**in-group bias.** The tendency to favor one's own group, its members, its characteristics, and its products, particularly in reference to other groups. The favoring of those inside the group tends to be more pronounced than the rejection of those outside the group, but both tendencies become more pronounced during periods of intergroup contact.

**pituitary gland.** A pea-sized gland in humans that lies at the base of the brain and is connected to the *hypothalamus* (see Glossary for definition). Its role in regulating the production of other hormones has resulted in its designation as the "master gland of the endocrine system."

**poverty.** In pure economic terms, *income poverty* is when a family's income fails to meet a federally established threshold that differs across countries. Typically, it is measured with respect to families and not the individual and is adjusted for the number of persons in a family.

Frequently, poverty is defined in either relative or absolute terms. *Absolute poverty* measures poverty in relation to the amount of money necessary to meet basic needs such as food, clothing, and shelter. The concept of absolute poverty is not concerned with broader quality-of-life issues or with the overall level of *inequality* (see Glossary for definition) in society. The concept therefore fails to recognize that individuals have important social and cultural needs. This, and similar criticisms, led to the development of the concept of relative poverty. *Relative poverty* defines poverty in relation to the economic status of other members of the society—people are poor if they fall below prevailing standards of living in a given societal context. An important criticism of both concepts is that they largely are concerned with income and consumption.

Today, it is widely held that one cannot consider only the economic part of poverty. Poverty also is social, political, and cultural. Moreover, poverty undermines human rights—economic (the right to work and have an adequate income), social (access to health care and education), political (freedom of thought, expression, and association), and cultural (the right to maintain one's cultural identity and be involved in a community's cultural life).

**prefrontal cortex.** The most anterior (forward) part of the cerebral cortex of each frontal lobe in the brain. The prefrontal cortex functions involve attention, planning, working memory, and the expression of emotions and appropriate social behaviors.

**race.** A socially defined concept sometimes used to designate a portion, or "subdivision," of the human population with common physical characteristics, ancestry, or language. The term also loosely applies to geographic, cultural, religious, or national groups. The significance often accorded to racial categories might suggest that such groups objectively are defined and homogeneous; however, there is much heterogeneity within categories, and the categories themselves differ across cultures. Moreover, self-reported race frequently varies owing to changing social contexts and an individual's possible identification with more than one race.

**school climate.** Refers to the school's effects on students, including teaching practices, diversity, and the relationships among administrators, teachers, parents, and students.

**school culture.** Refers to the way teachers and other staff members work together and the set of beliefs, values, and assumptions they share. A positive *school climate* (see Glossary for definition) and school culture promote students' abilities to learn.

**self-esteem.** The degree to which the qualities and characteristics contained in one's self-concept are perceived to be positive. It reflects a person's physical self-image, view of his or her accomplishments and capabilities, and values and perceived success in living up to them, as well as the ways in which others view and respond to that person. The more positive the cumulative perception of these qualities and characteristics, the higher one's self-esteem. A reasonably high degree of self-esteem is considered an important ingredient of mental health, whereas low self-esteem and feelings of worthlessness are common depressive symptoms.

**stereotype.** A set of cognitive generalizations (e.g., beliefs, expectations) about the qualities and characteristics of the members of a group or social category. Stereotypes simplify and expedite perceptions and judgments and often are exaggerated, negative rather than positive, and resistant to revision even when perceivers encounter individuals with qualities that are not congruent with the stereotype.

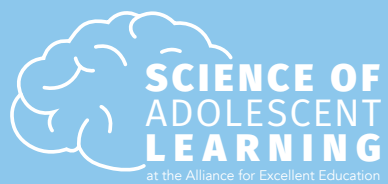
**stereotype threat.** An individual's expectation that negative stereotypes (see Glossary for definition) about his or her member group will adversely influence others' judgments of his or her performance and that a poor performance will reflect badly on the member group. This expectation may undermine the individual's actual ability to perform well.

**stress.** The physiological or psychological response to internal or external stressors. Stress involves changes affecting nearly every system of the body, influencing how people feel and behave. For example, it may be manifested by palpitations, sweating, dry mouth, shortness of breath, fidgeting, accelerated speech, augmentation of negative emotions, and longer duration of stress fatigue.

**systemic inequality.** A condition that arises out of attributing an unequal status to a category of people in relation to one or more other categories of people, a relationship perpetuated and reinforced by a confluence of unequal relations in roles, functions, decision rights, and opportunities. Also called *structural inequality*.

**trauma.** Any disturbing experience that results in significant fear, helplessness, dissociation, confusion, or other disruptive feelings intense enough to have a long-lasting negative effect on a person's attitudes, behavior, and other aspects of functioning. Traumatic events include those caused by human behavior (e.g., rape, war, industrial accidents) as well as by nature (e.g., earthquakes) and often challenge an individual's view of the world as a just, safe, and predictable place.

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