

# EDUCATION



Education has a critical role to play in addressing climate change. An understanding of climate change and sustainability will be essential for future citizens, workers, and leaders, making the education sector key to building a more sustainable and resilient society. In fact, education has been identified as an underutilized social tipping point needed for decarbonization — the process of phasing out reliance on carbon across all parts of the economy.<sup>1</sup>

Climate change will affect every part of our society, from healthcare to agriculture to business, and ensuring students are prepared to live and succeed in a changing climate is becoming increasingly important. Schools, communities, Tribes, and out-of-school programs are already helping students develop the knowledge and skills they will need to live fulfilling lives and be active citizens. Integrating teaching and learning about climate change, climate solutions, and sustainability across disciplines and educational settings will help students understand the impact of climate change and what they can do to reduce their impact on the environment, build resilience, and enhance their own prospects in a clean energy future.

## Public Support for Climate Change Education

Students, parents, caregivers, and teachers have already expressed high levels of support for climate education. In 2019, 68% of parents and 74% of teachers thought that climate change and its effects on the environment and society should be taught in schools.<sup>2</sup> Additionally, 78% of all adults believe that schools should teach about the causes, consequences, and potential solutions to global warming.<sup>3</sup> Despite strong support for teaching climate change, only 42% of teachers reported teaching climate change in their classes.<sup>4</sup>

While 57% of teens report that climate change makes them feel afraid, 54% said it makes them feel motivated to take action.<sup>5</sup> Learning about climate solutions and how to take climate action can help students combat eco-anxiety — persistent worries about their own futures and the prospects for future generations.<sup>6</sup> Yet, 54% of teens say they have learned little or nothing about how to reduce the effects of climate change in school.<sup>7</sup>

Youth are already leading movements for climate action and climate justice.<sup>8</sup> In 2019, nearly 1 in 4 teenagers in the U.S. reported voicing their opinions on climate change in the prior three years through school walk-outs, protests, or writing to government

officials.<sup>9</sup> In 2021, 32% of adults in Generation Z reported personally taking action to address climate change in the past year.<sup>10</sup> Like Maya Green, students around the country are asking schools to address climate change so they can better understand and solve the problems they see in their communities.\*<sup>11</sup>



### WHAT WE'VE HEARD

At our first listening session, student activist Maya Green spoke about witnessing climate change while growing up in Charleston, South Carolina. She shared, “With increasing frequency over my lifetime, I’ve noticed the hurricane evacuations that come year after year... I’ve lived the worsening climate crisis. That definitely influenced my passion for taking climate action, but the school system has not really provided much of a space for that.”

\*See Alliance for Climate Education, Climate Generation, and Schools for Climate Action for more examples of students seeking climate education in schools.

# Connections to Local Communities

Climate change and sustainability education can happen in classrooms, through school-wide efforts, in afterschool and extended learning programs, in community-based programs, museums, science centers, media and more. Whether school- or community-based, each educational setting has unique opportunities to engage students by helping them make connections between their own experiences and academic content.

The impacts of climate change differ based on geography, meaning that communities across the country experience climate change in different ways — from droughts in California to sea level rise in Florida to flooding in Minnesota. Climate change education creates opportunities for teaching and learning about the relationship between human activity, local communities, and their environments. Grounding climate education in students' lived experiences can also increase student engagement and recognize the connection to culture and values.<sup>12</sup>

For instance, Indigenous communities have been teaching youth about the environment while seamlessly making connections between disciplines, culture, and language for generations. By reframing humans' relationships with nature to emphasize that humans are part of the natural world, Indigenous communities prepare youth to be responsible stewards of the land and make decisions that protect nature and their communities. All students deserve to learn about our relationship to our environment, the impact our decisions and actions have on our environment, and how we can be better environmental stewards.

Grounding education about climate change and sustainability in a local context can include connections and exposure to local job opportunities. Whether it's increasing exposure and training to careers in off-shore wind in Massachusetts or building awareness of careers in sustainable agriculture in Colorado, partnering with local employers and community colleges can help students be better prepared for the jobs within their community that will be needed to address climate change and better prepare them for the opportunities in the future.



## WHAT WE'VE HEARD

At our listening session on adaptation, we heard from science educator Michealrose Ravalier who teaches about climate change and climate resilience at Ivanna Eudora Kean High School in the U.S. Virgin Islands. Michaelrose shared: "Student engagement is critical and is at the base of addressing not just climate action and climate justice issues, but also allows students to take ownership of their responsibility in being good environmental stewards. And in doing so, it helps them to become emotionally stable, emotionally balanced, and emotionally resilient."

# K-12 Education

Schools provide critical opportunities for students to learn about climate change and sustainability across subjects and through a variety of engaging and relevant pedagogies. Climate change and sustainability can be incorporated into state standards, curriculum, and educator support.

## INTERDISCIPLINARY LEARNING

In school and across the curriculum, students can learn about the causes and effects of climate change and how to take climate action. Climate change education is frequently associated with science, but understanding the impacts of climate change and learning about climate solutions extends across disciplines. Subjects ranging from biology to civics to English can help students understand climate change, examine what can be done to advance solutions, and process their experiences of climate impacts.

Incorporating climate change into teaching and learning can happen through a number of mechanisms. State standards, curriculum decisions and materials, and educator support can all help teachers and students access education on climate change, sustainability, and the environment across subject areas.



### WHAT WE'VE HEARD

We heard from Melissa Lau, a middle school science teacher in Oklahoma, about how including climate change in classes other than science can help teachers as well as students. Melissa shared that because climate change is “such a big, broad topic and there [are] so many components to it,” only teaching about climate change in science classes puts additional pressure on science teachers. With more social studies teachers including climate change and climate solutions in their classes, Melissa said “having those cross-curricular connections is an amazing support.”



Photo by Allison Shelley for American Education: Images of Teachers and Students in Action.



## STANDARDS

One opportunity to increase access to climate change education is to include climate change and human impacts on the environment in state standards across subjects. State standards set expectations for what students should know and be able to do in each subject at each grade level. States have internal processes for establishing and revising their own standards. Having state standards on a given topic does not mean that information is necessarily taught to all students or that all students will have the same depth of knowledge about that topic, but it establishes a goal to be applied across the state.

Currently, New Jersey is the only state with climate change in K-12 standards across most subjects.<sup>13</sup> This means that whether in science, social studies, health, or art students will have the opportunity to learn about the ways climate change impacts us and our environment and explore climate solutions.

As of fall 2020, twenty-nine states and DC have state science standards that include human-caused climate change in at least one required science class.<sup>14</sup> Of these, 20 states and DC have adopted the Next Generation Science Standards (NGSS) as part of their state science standards. NGSS are a set of standards developed by states based on the National Research

Council's (NRC) 2012 research-based Framework for K-12 Science Education and which include language about human-caused climate change.<sup>15</sup> Fifteen states' science standards include climate change but do not specify that it is predominantly caused by humans.<sup>16</sup> Many of these states' standards are also informed by the NRC's framework, but often their standards addressing climate change have been modified to remove or deemphasize the role of human actions on climate change. States that do include climate change in their science standards do not necessarily reference climate change in other subject standards.

Social studies provides a critical opportunity for students to learn about climate change and how they can contribute to solutions, including through civic engagement. Social studies classes help students learn how individuals and societies interact with the environment and the ways individuals, businesses, and governments make decisions. Students are already making connections between climate change and civics outside of school by taking part in demonstrations and contacting government officials. Yet, only 17 states' social studies standards explicitly mention climate change\*, and only 18 mention environmental sustainability.<sup>17</sup>



### WHAT WE'VE HEARD

At our first listening session, we heard from New Jersey First Lady Tammy

Murphy about the process of working with educators to create standards that include climate change in every grade level and every subject area. The First Lady highlighted the urgency and relevance of climate change education, stating:

"We are handing [students] a real problem that has perhaps already affected their health and will certainly continue to affect every aspect of their lives. If we don't educate them and give them the tools they need to understand the dangers of climate change and how to combat it, no matter what career they pursue, then I believe we are borderline negligent."



\* Five states require and 12 states allow teaching climate change in social studies classes.

^ Sixteen states require and two states allow teaching about sustainability in social studies classes.

## TERMINOLOGY

- **Standards:** Statements that define what students should know and be able to do by the end of a certain subject in a specific grade. Standards for public schools are generally set at the state level.
- **Curriculum:** Lesson plans and other resources for teachers that detail how course content should be taught. Curricula are generally created or selected to align with relevant standards in a subject and grade level. Curriculum decisions are often made at the district or school level.

## CURRICULUM

There are many opportunities to include climate change and sustainability in curricula and make connections to existing school and community resources. While standards outline a state's expectations for *what* should be taught, curriculum determines *how* content is taught and often includes textbooks, materials, lesson plans or other resources for teachers that are aligned to the state standards. Curriculum decisions are generally made at the local level, meaning curricula and class offerings can differ by district and school. States can also support the development of curricula.

Climate change and sustainability education provide opportunities for deeper learning, where students develop skills such as critical thinking, collaboration, and communication that help them succeed in school and after graduation.<sup>19</sup> Curricula that take student-centered or inquiry-based approaches to teaching and learning also improve student achievement and engagement by helping students learn about relevant real-world problems and brainstorm solutions.<sup>20</sup>

Approaches such as place-based education and project-based learning allow students to investigate the environmental issues that matter to them and affect their communities.<sup>21</sup> Focusing on local issues and allowing student inquiry to drive learning can help students make connections to their cultures and lived experiences.<sup>22</sup> Outdoor learning in school grounds, local parks, and community gardens in urban, rural, and suburban areas also provides opportunities for students to safely learn about the climate and environment in their own communities.

Implementing other school-wide sustainability practices — from composting to energy conservation — creates opportunities for hands-on learning.<sup>24</sup> Schools that use solar energy or other elements of sustainable building design and operation can themselves be used as pedagogical tools. For instance, students in Stockton Unified School District learn about clean energy and energy conservation by using the district's solar dashboards and participating in the student energy patrol program.<sup>25</sup> School gardens, like those in Oakland Unified School District, help students learn about the benefits of local, sustainable food and understand how the local environment impacts food access.<sup>26</sup> Schools can also incorporate rain gardens which can help students learn about stormwater management and climate adaptation.



### BRIGHT SPOTS

In Seattle, the Learning in Places project is working with students, educators, and families to co-design culturally relevant science curriculum for grades K-3.<sup>23</sup> The program uses school gardens and community green spaces to help students learn about ecological reasoning and decision-making.



### BRIGHT SPOTS

California recently provided funding to San Mateo County to develop open access climate change and environmental justice curricula for all grades that align with the state's environmental principles and concepts.<sup>18</sup> The curriculum materials will be made freely available to all districts in California and around the country.



## EDUCATOR SUPPORT

Building on standards and curricula, educators are essential in ensuring students have the opportunity to engage and learn about climate change. Most educators believe climate change should be taught in schools, but many do not feel they have enough preparation or resources to do so. According to an NPR poll, 74% of teachers believe that climate change and its impacts on society should be taught in schools, yet 55% did not teach about climate change or discuss it with students.<sup>27</sup>

Providing pre-service training for teachers can help incoming educators feel prepared to talk and teach about climate change and sustainability in their classrooms. For teachers who are already in the profession, high-quality in-service professional development can help both new and veteran teachers incorporate climate change, climate solutions, and sustainability into their classrooms. Learning from other educators and sharing best practices can help educators better engage students in cross-curricular deeper learning.



### BRIGHT SPOTS

The ClimeTime network in Washington is one successful example of a state-funded professional development (PD) program where educators have the opportunity to develop the knowledge, skills, awareness, and tools to teach climate science in the classroom.<sup>28</sup> The network provides funding to all districts in the state as well as several community-based organizations and Tribes to create PD programs that align with state standards and address topics including environmental justice, culturally relevant teaching, and place-based education.



Photo by Allison Shelley for American Education: Images of Teachers and Students in Action.

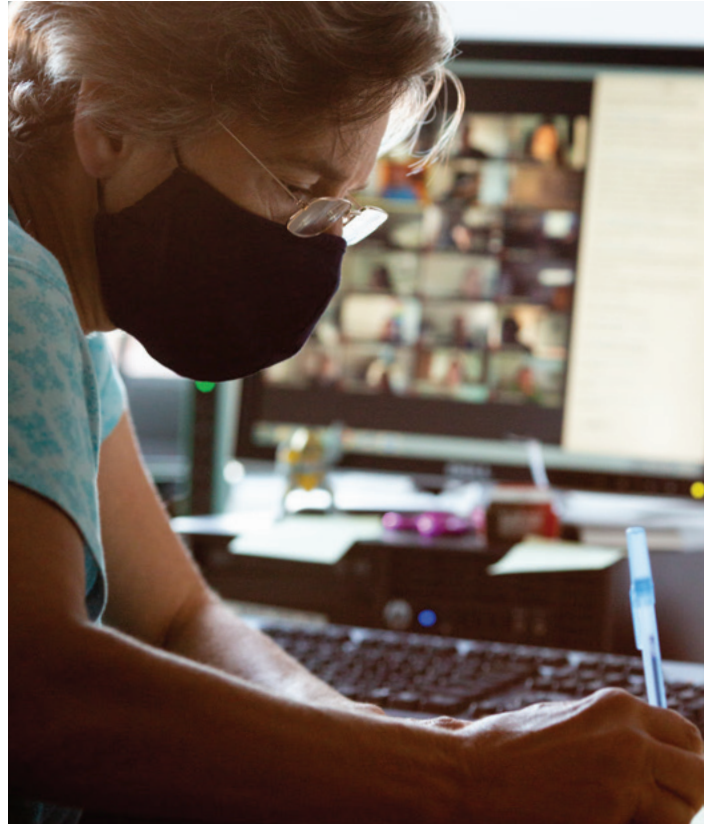


# Career and Technical Education

Career and Technical Education (CTE) presents an opportunity to prepare students for high-skill, high-wage jobs in the clean economy. CTE within schools prepares students to enter the workforce or pursue post-secondary education or training after high school. CTE programs also provide career exposure, hands-on training, and opportunities for work-based learning.<sup>29</sup> Some CTE programs enable students to graduate from high school with industry-recognized certifications or college-level credits. During the 2018-19 school year, over 8.9 million high school students took at least one CTE course.<sup>30</sup>

CTE programs span 16 different career clusters, ranging from Agriculture, Food, and Natural Resources to Hospitality and Tourism, and there are opportunities to incorporate sustainability across all clusters.<sup>31</sup> Jobs in clean energy industries, such as wind turbine technicians and solar panel installers, are some of the fastest growing in the country and can play an important role in the country's economic recovery from the pandemic.<sup>32</sup> In fact, a report from Pew Research Center found both mechanical and analytical skills are in high demand in emerging occupations related to the clean economy.<sup>33</sup> Currently, twenty-nine states have CTE programs or classes with an explicit focus on sustainability or clean energy.<sup>34</sup>

Climate change will impact every facet of our society, and as a result all industries will need a better understanding of their role in mitigating climate change and advancing a more sustainable society.<sup>35</sup> Students who are prepared to think about sustainability and climate solutions in whatever career path they choose will be better positioned for high-skill, high-wage jobs in the future and can help industries better address climate change.



## National Career Clusters Framework:<sup>36</sup>

- Agriculture, Food & Natural Resources
- Architecture & Construction
- Arts, A/V Technology & Communications
- Business Management & Administration
- Education & Training
- Finance
- Government & Public Administration
- Health Science
- Hospitality & Tourism
- Human Services
- Information Technology
- Law, Public Safety, Corrections & Security
- Manufacturing
- Marketing
- Science, Technology, Engineering & Mathematics
- Transportation, Distribution & Logistics

**Note:** Career clusters can differ by state and district. This national framework was developed by Advance CTE.



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## PARTNERSHIPS WITH BUSINESS LEADERS AND COMMUNITY COLLEGES

CTE often includes work-based learning and increasingly provides pathways to higher education. Developing partnerships with leaders in industries such as solar panel installation or electric vehicle engineering can help ensure students are qualified to get high-skill, high-wage jobs in high-demand industries after graduation. Additionally, partnerships with community colleges are essential to help students transition into higher education and training programs or graduate high school with recognized post-secondary credentials. On our listening tour we had the opportunity to learn about examples of these successful partnerships from New York to rural Colorado.

## CTE AND A JUST TRANSITION

Transitioning to a clean economy will create many new jobs — an estimated 18 million jobs globally.<sup>37</sup> Communities that rely on industries such as coal will need support to prepare for new, clean energy jobs. Ensuring that schools in these areas have green CTE programs can help today's youth benefit from the transitioning economy and find successful employment in growing industries.

A just transition must also include support for communities of color and Indigenous communities who are disproportionately harmed by the impacts of climate change.<sup>38</sup> Advancing equity and environmental justice means ensuring that those most impacted by climate change are able to benefit from climate solutions and high-paying jobs in the growing green economy. Expanding green CTE programs in these communities can help students of color and Indigenous students benefit from climate solutions.

Opportunity youth — those between the ages of 16 through 24 who are not enrolled in school or participating in the labor market — should also be part of a just transition to a clean economy. Sustainability-focused CTE and workforce development programs can help some of the country's 4.6 million opportunity youth gain the skills needed to obtain good jobs in clean energy industries.<sup>39</sup> Policymakers have also proposed establishing a Civilian Climate Corps to create a national service program to provide climate change mitigation and adaptation employment opportunities for youth with a focus on communities most affected by climate impacts.<sup>40</sup>



### BRIGHT SPOTS

- **P-TECH schools** provide an example of collaborative work with business leaders, community colleges, and community-based organizations to provide workforce development and career opportunities for low-income students of color.<sup>41</sup> The P-TECH model lets students both explore careers related to sustainability and climate change and learn the technical skills needed to qualify for jobs in sectors such as automotive engineering and construction. Students at P-TECH schools graduate with both a high school diploma and an associate's degree in six years and are first in line for jobs with industry partners. In New York, P-TECH recently announced a partnership with the New York Power Authority.<sup>42</sup> The agency will provide internships, mentoring, and pathways to jobs for P-TECH students expanding pathways for an inclusive workforce in clean energy.
- The **Environmental Sciences and Climate Institute (ESCI)**, a new collaborative between several school districts and community colleges in rural southwest Colorado, is intentionally designed in close collaboration with community college faculty and staff to ensure students in climate change related fields can smoothly transition into taking college-level courses.<sup>43</sup> The initiative includes project-based learning and outdoor learning for students as well as professional development for educators.
- **Bright Solar Futures** in Philadelphia works with the local Philadelphia Energy Authority to provide paid internships for students, giving them career exposure and compensating them for their work.<sup>44</sup> The three-year CTE program also prepares students to graduate certified in solar panel installation.



# Out-of-School Education and Informal Learning

Informal learning and out-of-school programs provide opportunities to engage children and youth in learning about climate change and the environment. Out-of-school settings — including afterschool programs, summer programs, and museum education — often have engaging opportunities for outdoor and experiential learning and enable students to pursue their interests. Museums, aquariums, and other sites of informal learning in the community can be key partners for schools in providing educational content and hands-on learning opportunities.<sup>45</sup> Out-of-school programs are also key spaces to develop youth leadership and social emotional skills through positive youth development.<sup>46</sup>

While out-of-school programs can increase key learning opportunities, students must have access to these programs in order to benefit from them. Currently, there are barriers to accessing afterschool programs. Recent data from Afterschool Alliance found that parents report cost, availability, and safe routes to and from programs as key challenges.<sup>48</sup> Any investments in out-of-school programs should center equity and work to ensure that programs are available to students in under-resourced communities and address the needs and strengths of youth and their families.



## WHAT WE'VE HEARD

During a listening session, youth activist Amara Ifeji spoke about gaining access to outdoor learning through out-of-school programs. Amara attended and subsequently led a stormwater management program in Maine that sparked her and other students' interest in taking environmental science and STEM classes in school. She shared: "This learning wasn't only transformative because it allowed me to explore and assert my passion, it also led me to commit to providing opportunities for other youth." After students attended a stormwater management program Amara facilitated, they all reported wanting to continue learning about environmental science both in and out of school. Amara then established her own program in Maine to increase opportunities for young women of color to have access to environmental education.



## BRIGHT SPOTS

The Pacific American Foundation uses place-based and culturally relevant out-of-school education to connect Hawaiian youth to their local environment.<sup>47</sup> For example, over the last 25 years, the Pacific American Foundation has restored a fish pond which has become a site for hands-on learning, or *ma ka hana ka 'ike* (through doing one learns). Executive Director Herb Lee shared that this learning connects students to the land, their culture, and provides opportunities to learn about conservation. The organization has also provided professional development for educators around their "place-based, culture-based, and project-based" curriculum. "Content and context are inextricably intertwined in Hawaii. Place has a lot to do with how we educate our youth."



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# Connections to Early Learning and Post-Secondary Education

Though this action plan is primarily focused on K through 12 education, we acknowledge that there are critical opportunities to include climate change and sustainability education in early childhood settings as well as post-secondary education. Age-appropriate environmental education — particularly through outdoor learning and play-based learning — in early childhood can help children develop social emotional skills and environmental literacy.<sup>49</sup> Once students complete their K-12 education, they can continue pursuing education and careers that address climate change and sustainability. Collaborative work and planning across early childhood, K-12, and post-secondary education is needed to most effectively support the education sector in addressing climate change and preparing children and youth in advancing a sustainable future.

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**Policymakers, educators, parents, caregivers, and students all have the opportunity to support climate change and sustainability education in their communities. Whether updating state standards, adopting place-based education, expanding CTE programs, or working with out-of-school program providers, each community has a variety of options to take climate actions that are in line with their local needs and priorities.**

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Photos by Allison Shelley for American Education: Images of Teachers and Students in Action.



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