# Climate Education vs. The Climate Crisis


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# AN INTRODUCTION TO CLIMATE EDUCATION

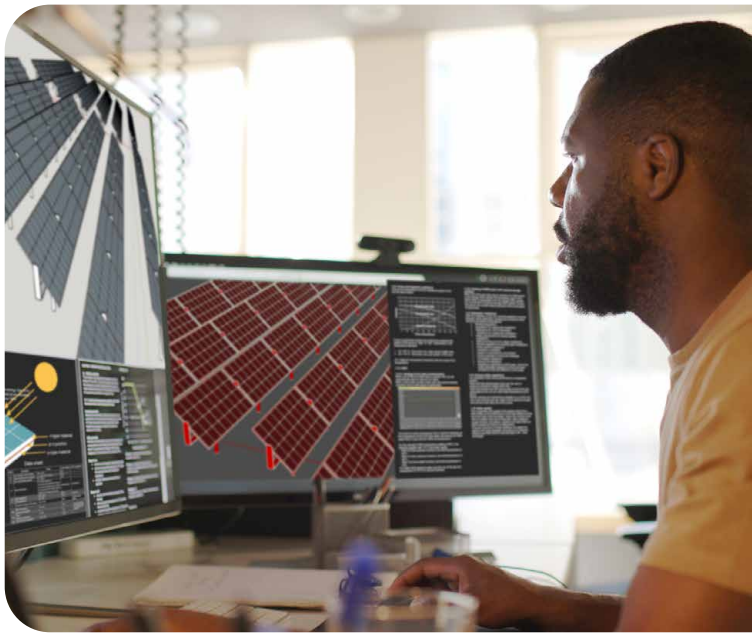
EARTHDAY.ORG wrote this report to introduce climate education, evaluate the current state of climate education, and explore next steps.

This report is intended for anyone who wants to learn more about the subject and provides the background necessary to advocate for increased access to climate education. We are at a critical moment in the fight against climate change and it is imperative that education is recognized as a key part of the solution.

- **Environmental Education:** "Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions." (EPA[1])

- **Climate Education:** "Climate education is cross-cutting by nature, meaning it encompasses many topics like math, civics, economics and history. Similarly, all aspects of our daily lives are connected to climate — from the food we eat, to the way we travel to work, to the products we buy. The interconnectedness of the systems involved in climate change

amplifies the need for environmental and climate education to include concepts outside of STEM (science, technology, engineering and math) like the arts, English, economics and history. Individuals connect to the environment in different ways depending on their own individual identities based on how they live, where they were raised, and what fields of study they choose for their careers." (EARTHDAY.ORG[2])



## A BRIEF HISTORY

Environmental education can trace its roots as far back as the Enlightenment in the **1700s** with philosophers such as Jean Jacques Rousseau[3] and Louis Agassiz[4] advocating for students and thinkers alike to study nature and its natural processes. This however evolved into the Conservation Education Movement[5] around the time of the Dust Bowl in the **1930s** in the United States. Wisconsin became an early leader in the environmental education movement by mandating that preservice teachers have "adequate preparation in the conservation of natural resources."

**1970** was a critical year for environmental activists. In the year prior, Nixon signed into law The National Environmental Policy Act of 1969 (NEPA)[6], which remains a pillar of environmental law in the USA today. This was followed by another major legislative accomplishment, the National Environmental Education Act of 1970, which helped to create the Office of Environmental Education in the U.S. Dept. of Health, Education and Welfare. On the wave of this environmental activism, millions marched for the first ever Earth Day[7] on April 22nd, 1970. The efforts of Denis Hayes, one of the founders of Earth Day, led to over 20 million Americans (10% of the United States population at the time) taking to the streets to protest the issue of pollution. The year ended with Nixon signing the Clean Air Act[8] on December 31st.

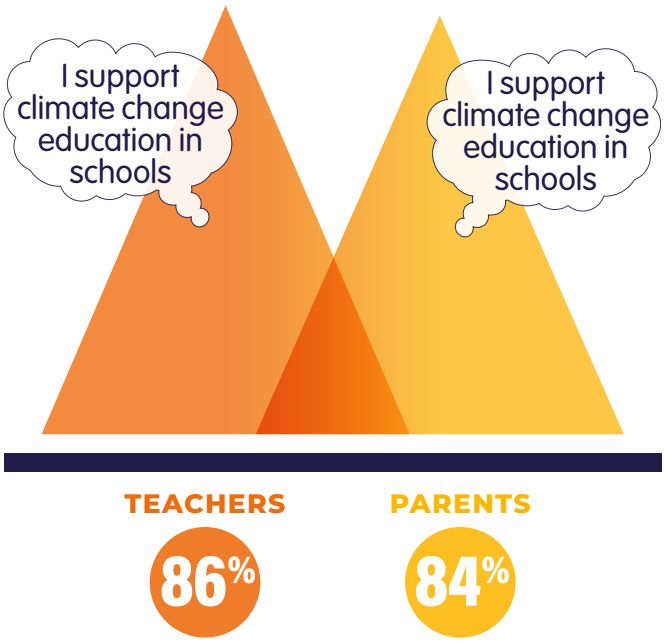
Awareness of the environment and our impact on it continued to grow and would eventually lead to the National Environmental Education Act[9] in **1990**. This act required the EPA to provide national leadership to increase environmental literacy. The EPA also established and funded the Office of Environmental Education to implement this program. The transition from simply learning about the environment to fully realizing not only our power, but our responsibility to it, was fully underway. Internationally, other countries in Europe and Asia began creating their own environmental education offices. As we moved into the 21st century, the threat of climate change morphed from a distant concern of some individuals to a very real existential threat to humanity. During this time, there were efforts made to standardize the federalized U.S. education system as demonstrated with the creation of the No Child Left Behind Act[10].

This move towards national standardization led to the creation of the Next Generation Science Standards[11] (NGSS) in **2013**. The NGSS recommended man-made climate change be taught beginning in fifth grade and incorporated into all science classes. The aim of these standards was to improve science learning drastically; however, these standards are not mandated or tested. Because of this, in many places, they are merely suggestions to educators. Currently, teachers are simply encouraged to cover these standards. This results in some districts opting to do so while others do not.

Internationally, a number of conferences on environmental education have been held demonstrating the universal recognition that we must teach our children about the planet and its systems. The first intergovernmental conference on environmental education[12] was held in 1977

in Tbilisi, Georgia. This conference outlined the subject and its importance was organized by UNESCO and UNEP. In 1987, UNEP hosted countries in Moscow to develop the "Outline international strategy for action in the field of environmental education and training for the 1990s."[13] The product of the conference outlines key pillars of environmental education that influence research today, including access to information, teacher training, and programs and materials. In the late 1990's and early 2000's, the lens of environmental education was widened to include sustainability and eventually climate change, This was demonstrated at the **1997** Environment and Society: Education and Public Awareness for Sustainability Conference[14] in Thessaloniki, Greece, and the Fourth International Conference on Environmental Education towards a Sustainable Future[15] in Ahmedabad, India, in 2007. More recently, climate education has been featured at the United Nations Conference of the Parties. COP27 in Sharm El-Sheikh, Egypt featured the first ever climate education pavilion[16] and climate education was featured in the Education Pavilion at COP28 in Dubai, UAE.

## IT'S NOT JUST ABOUT SCIENCE CLASSES

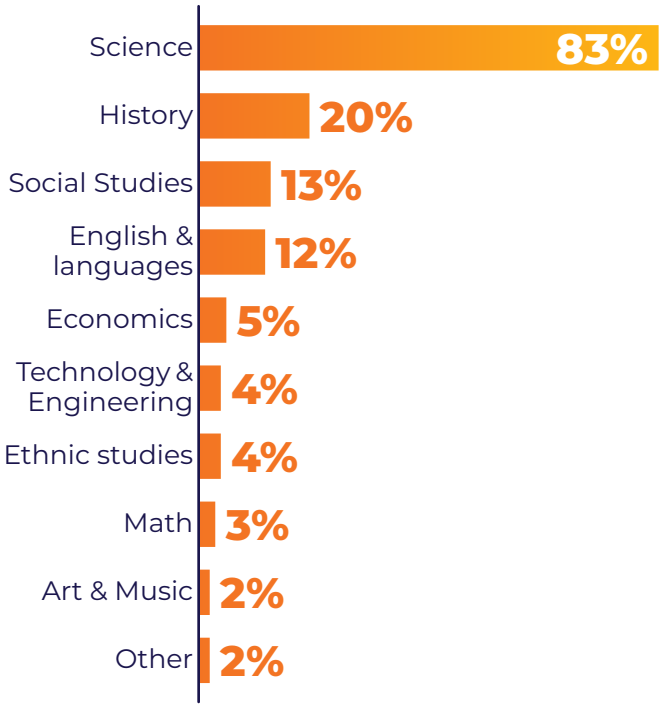



Students in their science classes across the world are increasingly exposed to the scientific principles behind climate change, exploring concepts such as greenhouse gas emissions, rising global temperatures, and the consequences for ecosystems. But climate education must be embraced more widely, across all core subjects and electives — not just science.

In 2006, the National Oceanic and Atmospheric Association (NOAA), in partnership with others, funded a workshop to debate the need for a common set of curriculum guidelines specifically for climate education. Guidelines that could be implemented at local, state, and national levels. This discussion resulted in an interagency effort that would produce the Climate Literacy: The Essential Principles of Climate Sciences[17] guide, now in its fifth reiteration. It was a highly commended piece of work focused on teaching climate education in science and earth science classes. This has left educators in other subjects lacking supporting materials to teach climate education in their subjects. A significant portion[18] of educators in

the United States believe it is important to teach climate education to their students. The need to teach climate education across curriculum is recognized internationally.

## **SURVEY:** CLASSES IN WHICH STUDENTS LEARN ABOUT CLIMATE CHANGE




For example, a survey by University College London, UCL[19] discovered that teachers in Great Britain — not just those teaching geography and science — would like to include climate change in their classes. But of those who had started doing this, 70.5% of them had been forced to train themselves on the subject rather than receive formal training.


OF TEACHERS SURVEYED SAID THEY HAD RECEIVED **FORMAL PROFESSIONAL DEVELOPMENT** RELATED TO CLIMATE CHANGE AND SUSTAINABILITY


Teachers around the world are putting climate education on the school agenda, one way or another, because they can see its value. The Teach for All Global Network[20] listed these examples of teachers supporting climate education at the grassroot level:

- Teach For Zimbabwe fellow Edson Dongo and his student Tiyiso describe the Learners in the Fight Against Climate Change initiative.[21]
- Teach For India alumnus Nikhil ji Sharma shares how his students are developing concrete sustainability solutions.[22]
- Teach First Deutschland fellow Jens Becker discusses his students' agency in creating $CO_2$ Backpacks that make the concept of carbon footprints tangible.[23]
- Teach For Pakistan fellows Maha and Rabia and their student Abdullah share the story of Abdullah's locally-rooted climate leadership.[24]

The support for interdisciplinary climate education exists because teachers recognize that climate education provides the knowledge "for individuals and communities to know and understand about Earth's climate, the impacts of climate change, and the approaches to adaptation or mitigation."[25] To develop a comprehensive understanding of the climate crisis among students, it is imperative for climate education to be embedded throughout all courses and grade levels, K-12, globally.


OF EDUCATORS **DO NOT TEACH CLIMATE EDUCATION** IN THEIR CLASSES BECAUSE THEY DO NOT BELIEVE IT ALIGNS WITH THEIR SUBJECT

A recent U.S. poll found that 65% of educators reported not teaching climate education in their own classes because they did not believe it aligned with their subject.[26] But climate education aligns with all subjects: students could be reading about climate refugee stories in their English class, considering the avenues for advocacy in Civics, learning about how the climate crisis causes inequity in Economics classes, and understanding the impact of plastics, made largely from oil, on greenhouse gas emissions in Earth Science classes.

This approach allows for all students, regardless of their areas of academic strengths, to confidently engage in climate education. It will also provide students with cross-content knowledge valuable in developing effective solutions. It also means climate education cannot be obscured in just a few standards in one subject area.

02

# THE SOCIAL, ENVIRONMENTAL, AND ECONOMIC BENEFITS

At EARTHDAY.ORG we believe there are three core reasons why all students should be provided with quality climate education in school. We outline these reasons here, in summary, and then detail them in the remainder of this chapter:

1. **CLIMATE ANXIETY:**
   Students are increasingly anxious about the state of the planet and many are suffering from climate anxiety. By engaging with the topic and using social emotional learning techniques, teachers can play an important role in alleviating this anxiety to support their students' well-being.

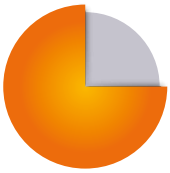
2. **GREEN MUSCLE MEMORY:**
   Once we provide students with the information they need to modify their behaviors and to reduce carbon emissions, it will become second nature to them. That is why, to develop green muscle memory, climate education needs to be taught consistently to children across all subjects, from Kindergarten to graduation.

3. **GROWING THE GREEN ECONOMY:**
   If we are to find ways of mitigating and coping with the problems that the climate crisis is causing and will cause us in the future, we will need to motivate future generations to find solutions and develop new types of industry. This will create massive economic opportunities. The U.S. has

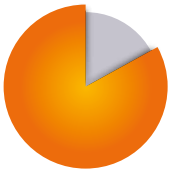
already invested $738 billion in the Inflation Reduction Act in the US[1], the EU Green Deal[2] is a trillion dollars, and China's investments[3] in renewables and battery technology potentially reaches as much as $3 trillion. This public investment is a means of competing for more private investment and consequently green jobs. Climate education is how we can prepare young people for this future and teach them the skills they will need to join this growing green workforce to help drive the global green economy.

## CLIMATE ANXIETY & SOCIAL EMOTIONAL LEARNING

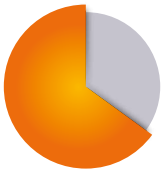
**SURVEY:** 10,000 YOUNG PEOPLE (16–25 YEARS), FROM 10 COUNTRIES RESPONDED



75% SAY THE FUTURE IS **FRIGHTENING**

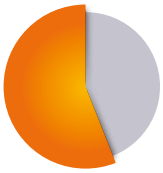


83% SAY PEOPLE HAVE **FAILED TO CARE** FOR THE PLANET



65% SAY **GOVERNMENTS ARE FAILING** YOUNG PEOPLE

40% SAY THEY ARE **HESITANT** TO HAVE **CHILDREN**



56% SAY HUMANITY IS **DOOMED**

Students today have another important reason for fully understanding climate change — the emergence of climate anxiety.[4] Climate anxiety is a real and fundamental distress about the impact of climate change on humanity.[5] This goes beyond merely worrying about climate change and becomes overwhelming and, in some cases, debilitating.

Students are constantly receiving news about the state of the planet's climate, but their learning is not always standardized, thoughtful, accurate, or age-appropriate, and this can have damaging effects on our children's mental health. Although all ages can experience stress from climate change, younger adults report the highest rate of psychological distress.[6] If we are going to tackle the mental health crisis that is impacting them,[7] then we need to look at the role climate change is playing and how climate education can address this concern.

In 2021, Bath University[8] published their results from a survey carried out across 10 countries, in collaboration with five universities, which was described as landmark. They asked 10,000 young people, aged 16–25 years of age, about climate change and how it made them feel. The results are shocking:

- Two-thirds reported feeling sad, afraid, and anxious.
- Three-quarters of them said they thought the future was frightening.

- 56% said they think humanity is doomed.
- There was most concern in the global south.

> *This shows eco-anxiety is not just for environmental destruction alone, but inextricably linked to government inaction on climate change. The young feel abandoned and betrayed by governments.*
>
> Caroline Hickman, Lead Author, Bath University

Currently, students are exposed to climate disasters and alarming headlines in the classroom and at home — often without the time or understanding to fully process it all. If a teacher wants to 'make room' to discuss the latest climate disaster making headlines, they have to find that time in one of their existing class periods. But that is not easy to do and is often unsatisfactory:

- One class period is not enough time to provide context, analysis and discussion in a meaningful way.
- This might mean that teachers unintentionally emphasize the 'doom and gloom' scenarios without having room for discussing solutions.
- If this is the only time a student gets to discuss the issue of climate in a classroom and it is not taught well or standardized, it could have a potentially negative impact on students.

The overwhelming number of students experiencing climate anxieties and fears, some 75% according to the Bath University-led survey, demonstrates the need to address these issues in the classroom and one tool to help do that is by using social-emotional learning (SEL) skills.

Social emotional learning[9] is a process that allows young people to acquire and use emotional IQ, knowledge, and skills to develop healthy identities, to manage their emotions, find empathy and maintain supportive relationships with friends, family and mentors. SEL helps young people to make responsible decisions for themselves and for others. Today, 27 states in the U.S. have adopted social-emotional curriculum.[10]

Embedding social-emotional skills within climate education can achieve the following:

- Develop coping skills to alleviate anxieties about the climate crisis.
- Strengthen problem-solving skills and strategies about planetary health.
- Create a sense of resilience which increases student agency for action.

In addition, this approach allows teachers and students to explore climate justice[11] and equity. Developing these social-emotional competencies while learning about environmental stewardship leads to a reciprocal relationship[12] that has a positive effect on the planet and people.

Teaching about climate education positively influences the mental health of young individuals[13] by providing avenues for activism and fostering a sense of belonging and agency, particularly for marginalized youth. Furthermore, studies[14] indicate adolescents utilizing meaning-focused coping strategies in the context of climate change experience heightened positive affect, life satisfaction, and optimism; they also engage in more pro-environmental behavior compared to their peers.

Teaching climate education also has another tangible impact: it creates a green muscle memory that over time actually reduces our carbon emissions and instills good planet stewardship behaviors, making them instinctive.

## GREEN MUSCLE MEMORY

Green muscle memory is the term EARTHDAY.ORG created to describe learned behaviors that become instinctive, that move us toward net-zero carbon emissions and which occur with little conscious effort.

The key to developing a green muscle memory is learning and repetition. Teaching children that modifying their own behavior can make a real difference in their own lives and in the lives of those around them. It is easy to identify times in which learning has resulted in behavior changes in individuals such as wearing seatbelts, wearing sunscreen, and eating a healthier diet. All of these behaviors are learned. Once we are told the consequences of our actions or of our lack of action, the vast majority of us modify our behaviors, Including children, and start to perform these tasks with little or no thought.

Universal climate education works in the same way. Once we provide students with the information they need to modify their behaviors and to reduce carbon emissions, it will become second nature to them. That is why, to develop green muscle memory, climate education needs to be taught consistently to children across all subjects, from Kindergarten to graduation.

At first glance, it may be difficult to connect these individual climate lessons to a meaningful decrease in $CO_2$ emissions, but learning leads to real awareness and measurable behavioral changes.[15] For example, following Greta Thunberg's protests around climate change, 30% of Swiss residents surveyed[16], said they had made changes to their transportation, buying, and recycling habits. In one country alone, that is millions of individuals making daily decisions that combat the climate crisis.

Notably, students completing a one-year university-level course on climate change[17] exhibited a significant and lasting reduction in individual carbon emissions, with an estimated decrease of approximately 2.86 tons of $CO_2$ per year per student. The data strongly supports the potential of climate education to contribute meaningfully to addressing environmental challenges.

Additionally, research suggests a well-designed climate education curriculum[18] can be as effective as established climate change mitigation techniques, emphasizing the

pivotal role education plays in sustainability efforts.

A 2020 study from the Department of Meteorology and Climate Science, San José State University, San José, California[19] supports this idea and identified a connection between climate education and decreases in student carbon emissions. According to the study, if 16% of secondary school students around the world, in middle and high-income countries, studied climate change, it would result in cutting almost 19 gigatons of $CO_2$ by 2050.[20] This is equivalent to removing emissions from nearly 80 million homes.

While these early metrics may benefit from more data and further analysis, it is clear that climate education in our schools will have a direct impact on carbon emissions across the planet and initiate real change.

In addition, when students and young people learn about climate education, it can have network effects[21] that positively influence friends, family, neighbors, and coworkers. An Intergovernmental Panel on Climate Change from the United Nations in 2020[22] outlines how structural changes to our behavior, our green muscle memory, goes beyond individual accountability and can instinctively help us make better decisions in our everyday lives which collectively have a much bigger impact on the health of the planet — for example, future architects will design greener buildings, future city planners will make biking more accessible and landlords will decide to install energy-efficient appliances.[23]

If we use climate education to develop a planet-friendly green muscle memory in our children, these green behaviors will work their way into their adult lives and, as a result, into the business world and industry of the future.

## GROWING THE GREEN ECONOMY

In response to the growing climate crisis, we have seen the emergence of a wave of green technologies and industries: from an explosion in electric car production to an increased demand for solar panels to the creation of wind farms. This nascent green economy is faced with the challenge of minimizing carbon emissions, drastically reducing all kinds of waste and pollution (especially plastics), increasing energy efficiency, and protecting biodiversity.

Oxford Economics projected[24] that the transition to a net zero emissions environment by 2050 will create new industries worth $10.3 trillion to the global economy. This will create a waterfall effect as renewable energies and green technologies create more markets for more types of green goods and green services.

The green economy is already receiving vast amounts of public funding from the United States' Inflation Reduction Act, the EU Green Deal, and China's investments in renewables and battery technology. The Global North is backing the green economy as a means of competing for more private investment and consequently green jobs. Climate

education is how we can prepare young people for this future and teach them the skills they will need to join this growing green workforce to help drive the global green economy.

**NEARLY HALF OF YOUNG PEOPLE SURVEYED FELT THEY DID NOT HAVE THE RIGHT SKILLS FOR A SUCCESSFUL CAREER IN THE GREEN ECONOMY**

Considering the vast economic potential, we need to ensure climate education is truly universal, and is available across the Global South as well. Given that children start to make decisions about potential career paths[25] at a young age, we need to provide young people with a better understanding of climate change, the green economy it will create, and how they can best participate in this economic revolution and its benefits.

The World Economic Forum[26] Davos Labs Youth Recovery Plan from 2020 found that almost half of young people felt they did not have the right skills for a successful career in the green economy, and according to the World Economic Forum's Future of Jobs Report from 2020, employers estimated that four in 10 workers would need to be reskilled.

Given that research demonstrates that when students know more about a field, such as STEM, they are much more likely to consider a career in that field, we need to better prepare our children for the jobs that will be available to them. Considering that 91% of teenagers[27] already think they know what career they want, we need to introduce students to green economy job options early on.

03

# HOW THE HISTORICAL CONTEXT TRANSFORMS EDUCATION SYSTEMS

It is not easy to create change in the United States education system; it is a highly decentralized system with strong political forces. However, it has been done before when the state of the world and political will align.

For example, the Industrial Revolution demanded more education to support the innovations of the time. To support this mission, more school was required: "from 1818 to 1858 the number of students in the UK exploded from 675,000 to 2,500,000" and "the government required that every child that worked in a factory get at least two hours of education per day."[1] Another example comes from the space race. After the launch of Sputnik, Washington created the National Defense Act in 1958 which provided more than one billion dollars[2] for science education. The effects of this were seen in classrooms across America — "In classrooms, educational tools began to change. Lab kits and overhead projectors were added, and educational films became part of the curriculum." More recently, it was recognized that computers would be key to a prospering economy and schools incorporated computer literacy programs.

Computer literacy is a critical case study to analyze as a pathway for mandatory climate education in K-12 public education.

Companies such as Apple[3] were early innovators who tried to make computer classes as much a part of the American education system

as Math and English classes. In the early days[4], typing classes prepared high school students, mostly women, for secretary positions. However, as technology advanced, there was less of a gender divide, and the age of students receiving these classes became lower.

Computer literacy initially started with a narrow scope and was compartmentalized as its own class. However, as society and the world changed and evolved, so did the method of teaching computer literacy, which became deeply embedded into the other subject areas. Which is why we see school districts, such as Fairfax County Public Schools in Virginia, adding their own curriculum in addition to the state-mandated computer literacy standards; their 'Digital Citizenship'[5] curriculum is described as "[...] the norms of appropriate, responsible behavior (and its positive and

negative impact on self and others) with regard to technology use."

Computer literacy demonstrates the importance of including key stakeholders, including businesses, to support implementation and stress the economic advantage of adoption and developing an interdisciplinary approach.

04

# THE CURRENT STATE OF CLIMATE EDUCATION

Climate education is taught around the world today and we can learn from their successes. This section provides a history and analysis of climate education in the United Kingdom, Australia, Chili, India, Mexico, Morocco, Ghana, and the United States.

## ITALY

In 2019, Italy became the first country[1] to make climate education compulsory in their national curriculum at every grade level. One of the key events spurring Italy into taking action in regard to climate change is the imminent threat of danger with rising water levels in the city of Venice.[2]

Leadership in Italy took notice of this crisis and its connection to climate change. Minister of Education, Lorenzo Fioramonti, decided it was necessary to dedicate significant effort and money toward climate education and crafted legislation to do so. He states that, "Without faster progress on education there will be no chance of achieving the goal of net zero carbon emissions by 2050."[3] Following this, Italy implemented sweeping reforms requiring each student, starting in elementary school, to receive 33 hours of climate education per year.

However, within a month of the legislation passing, Fioramonti resigned, citing a lack of funding.[4] This story highlights the importance of supporting climate education legislation and policy with the funding quality curriculum and successful teacher training require.

## UNITED KINGDOM

The United Kingdom's Department for Education has developed a comprehensive sustainability and climate change strategy with the goal of making the UK's education sector a global leader in sustainability and climate action by 2030.

The strategy[5], aligned with recommendations from the Committee for Climate Change, aims to prepare young people for a world impacted by climate change, reduce emissions from education and care buildings, adapt education infrastructure to climate change effects, and enhance biodiversity and air quality in and around educational settings. The strategy focuses on key action areas such as climate education, green skills and careers, and international collaboration.

Through engagement with educators, specialists, experts, and young people, the Department of Education aims to inspire action on the international stage and support the UK government's 25 Year Environment Plan and Net Zero Strategy.[6] The strategy emphasizes collaboration with the education sector and ongoing involvement with young people as it is implemented.

## AUSTRALIA

Climate education in Australia[7] has become an increasingly prominent aspect of the national curriculum, reflecting a growing recognition of the importance of environmental awareness and sustainability.

The Australian curriculum incorporates sustainability as one of its cross-curriculum priorities, ensuring students engage with climate-related content across various subjects. In Geography and Science, students explore climate change, delving into topics such as the impacts on ecosystems, global patterns, and human contributions to climate variability. Efforts have been made to integrate real-world examples relevant to Australia's unique environmental context, fostering a connection between classroom learning and the country's diverse ecosystems.

While there are ongoing challenges, including the need for consistent implementation and comprehensive teacher training[8], Australia has taken a positive step by committing to include climate education in its national curriculum. This reflects a commitment to equipping the next generation with the knowledge and skills necessary to understand and address the complex challenges posed by climate change.

## CHILE

Chile has been making efforts to integrate climate change education into its curriculum to address the growing global concern about environmental issues. The country recognizes the importance of preparing its citizens, particularly students, to understand and respond to the challenges posed by climate change.

In recent years, there has been an increased emphasis on environmental education in Chilean schools. The Ministry of Education[9] has taken steps to incorporate climate-related topics into various subjects, including science and social studies. This interdisciplinary approach aims to provide students with a comprehensive understanding of the causes, impacts, and potential solutions to climate change.

Furthermore, NGOs and environmental groups such as the Columbia Climate School[10] have played a crucial role in promoting climate education in Chile. They often collaborate with schools and educational institutions to organize workshops, seminars, and outreach programs that focus on climate change awareness and sustainability.

Challenges persist, including the need for more standardized and structured climate education[11] across all levels of the education system. Additionally, teacher training programs related to climate change might need more support to ensure educators are well-equipped to deliver effective and engaging lessons on this complex topic.

Chile has recognized the importance of climate education and has taken steps to integrate it into the national curriculum. Ongoing efforts involve collaboration between government bodies, NGOs, and educational institutions to ensure a comprehensive and standardized approach to climate education in the country.

## INDIA

In 2003, the Supreme Court of India mandated[12] that schools include environmental education at all levels of formal schooling. Later, in 2023, this mandate was extended[13] by the University Grants Commission (UGC) to all undergraduate programs in the country. India's 2020 National Education Policy[14] emphasizes the significant role climate education must play in educating the workforce of the future; indeed, the terms climate change and climate science both make an appearance as early as the third paragraph of the document's introduction.

Despite these victories, widespread climate literacy has yet to take hold in India, with 54% of the population either unaware of climate change as a problem or reporting to know just a little about it (Yale[15]). To address existing gaps in public awareness of the issue, top Indian universities have developed environmental education degree programs to train young

people on how to identify and implement climate mitigation solutions. New programs include a BSc major in environmental science and sustainability at Azim Premji University, the Anant School for Climate Action at Anant National University, and the Ashoka Centre for People-Centric Energy (ACPET) at Ashoka University (Forbes[16]).

NGOs also contribute to the growth of climate education in India. The Teachers Training Program on Climate Change has trained over 500 teachers to help young people understand the causes of climate change, its impacts, and what can be done to mitigate them. This program is offered remotely through the learning management system (LMS) Moodle and received a U.N. Global Climate Action Award.[17]

Another NGO example is the Citizen Consumer and Civic Action Group (CAG), who in February 2023 developed a climate education curriculum for two Chennai-based schools serving students of mixed socioeconomic backgrounds. The lessons in this curriculum were designed to foster critical thinking and curiosity among young people. Excitingly, it worked. 75% of students at these schools demonstrated a basic understanding of the causes and impacts of climate change, up from 55% beforehand, and even teachers' understanding of the subject improved by 25% (Forbes[18]).

## MEXICO

The Mexican government has allocated $4.4 million dollars[19] to the National Institute of Ecology and Climate Change to use towards climate education in public schools. Mexico's 2022 Nationally Determined Contributions[20], submitted to the United Nations, also recognizes the need for climate education and how climate change disproportionately affects women more than men. However, it does not delve into specifics about how they will implement changes to the current national curriculum to include climate education.

Climate change is explicitly addressed in Natural Science and Geography[21], encompassing concepts like energy consumption, air pollution, global warming, risks, and vulnerability. Students primarily acquire cognitive knowledge about climate change and are urged to modify their behavior to mitigate vulnerability, with a focus on raising awareness about Mexico's ecological footprint. The textbooks emphasize Mexico's contribution to emissions, drawing attention to the principles of climate justice.

Non-governmental organizations are also stepping in to assist with climate education in Mexico. One such example is América Latina para la Educación Climática (ALEC)[22] which aims to promote climate education across Latin America through providing resources, expert convenings, and teacher professional development.

## MOROCCO

In 2012, Morocco passed the National Charter for the Environment and Sustainable Development, which is meant to provide a framework for the pursuit of sustainability goals throughout the country.

The Charter explicitly names the fight against climate change and, in Article 8, clarifies the role of education in this fight. Specifically, it points out "the need for environmental and sustainable development awareness programs, academic learning opportunities, and training for the people of Morocco." (GEEP[23]).

In response to this mandate, the Ministry of National Education, Vocation Training, Higher Education, and Scientific Research introduced environmental curricula "at all levels of formal education" by way of two smaller sub-directorates (UNESCO[24]).

However, in Morocco, education was decentralized in 1999. As a result, regional districts, environmental NGOs, and civil society organizations often work in tandem to implement environmental education programming. To fill this space, NGOs have provided guidance and resources. Of these, the Mohammed VI Foundation for Environmental Protection[25] has developed multiple programs to support educators and students wanting to learn more about protecting our environment.

## GHANA

Since the launch of Ghana's National Climate Change and Green Economy Learning Strategy, in 2016, Ghana has begun to integrate climate change into their general primary school education system.[26] By 2019 they had carried out several initiatives to get climate education into classrooms:

- Identification of climate change and green economy themes for inclusion in pre-tertiary curricula.
- Analysis to assess climate change and green economy knowledge among school children and teachers.
- Preparation of Teaching and Learning Materials tailored to the new primary curriculum.
- Training of over 600 primary school teachers to teach on climate change.

As of late in 2019, 12 out of 16 regions of the country had undergone training and it was hoped that this would extend to include all the 275 of the individual districts of the country.

Ghana is looking for partners to extend the teaching of climate change and green economy literacy to secondary education, and it is their aim to work with teacher training institutes to strengthen the focus on climate change and green economy in the standard training program for all teachers eventually.

In 2021, Reverend John Ntim Fordjour, the Deputy Minister of

Education, of Ghana announced[27] that his nation had made climate education a priority in its reformed standard based curriculum. He stressed his country's commitment towards increasing the role education plays in building a more just and sustainable world through the implementation of education for sustainable development by 2030.

## THE UNITED STATES

Domestically, one of the biggest challenges facing climate education in the United States is that decisions regarding education are often left to individual states and school districts. This creates a patchwork educational system in the U.S. with different standards and different paths for implementation of new curriculum.

Many states follow the Next Generation Science Standards[28] (**NGSS**), which is an initiative first developed in 2013 by the **National Research Council, National Science Teachers Association, American Association for the Advancement of Science, the nonprofit Achieve**, and 24 U.S. states. They recommended man-made climate change be taught beginning in fifth grade and incorporated into all science classes. These recommendations are not mandated, however, and their implementation can vary between states and districts.

Right now, 19 states and Washington, DC, have adopted NGSS standards in their entirety, and 25 additional states have made some changes in their own curriculum based on these standards. **Despite these changes, climate education is not receiving the time it deserves in the classroom in the US.** A March 2016 study[29], entitled **Mixed Messages: How Climate Change is Taught in America's Public Schools**, by the **National Center for Science Education**, found that 75% of public school science teachers do cover climate change. This sounds encouraging, but if we look closer we can see there is still a lot of room for improvement because a February 2016 survey[30] of 1,500 middle and high school teachers discovered that they spent just one to two hours during the entire academic year on climate change.

Many states focused on incorporating climate education, such as New Jersey, California, and Maine, are using third parties, organizations such as Subject to Climate[31], Climate Literacy and Energy Awareness Network (CLEAN[32]), and Ten Strands[33] to create K-12 resources for their educators. Others, such as Washington State, have created their own resource hubs, such as ClimeTime.[34] Though these states are offering resources and partnering with nonprofits and nongovernmental organizations to create lessons for free, very few are providing direct funding for teachers' professional development, training, and resources.

Several states have incorporated climate education into their K-12 systems. Here is a deeper dive into those states:

## NEW JERSEY

New Jersey is the leader in climate education in the U.S. education system and, so far, is the first and only state to integrate climate education across all grade levels, K-12, and subject areas. They have also made a serious investment in training their educators: "New Jersey set aside $4.5 million in grants in 2023 to support and train educators and ensure students in underserved districts also have access to climate change education. The state has appropriated another $5 million toward climate change education in its 2024 fiscal year budget." –Laura Fredrick, New Jersey Department of Education spokesperson via NPR.[35]

Its schools are required to teach climate change across all subjects, including visual and performing arts, health and physical education, science, social studies, world languages, computer science, and key skills. The state of New Jersey has created sample lessons for educators to use in their classrooms.

Climate Columbia describes how they achieve this:[36] "Kindergarten through second graders can explore artwork responding to climate change from different perspectives. Grades three to five science classes may teach how energy and fuel are derived from natural resources and their impacts on the environment. Middle school students compare the environmental effects of different technologies that tackle climate change issues and evaluate them in computer science class. High school students collaborate with students from other countries in social studies class to develop solutions to environmental justice issues."

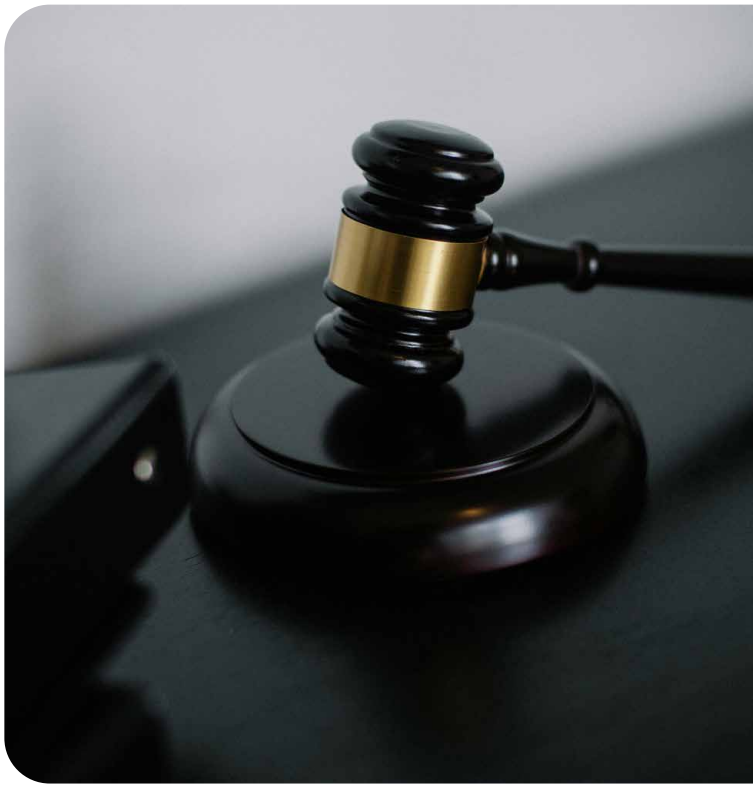
> *"As our state and our world move closer to clean energy and green technologies, we have a unique opportunity here in New Jersey to properly equip our students to be at the forefront of the high paying jobs that power the future. The establishment of the Office of Climate Change Education, led by the incredible Sarah Sterling-Laldee and dedicated specialists, will help develop best practices and approaches to assist our best-in-the-nation teachers in educating the next generation of climate literate leaders of the future green economy.*
>
> First Lady of New Jersey Tammy Murphy[37]

## WASHINGTON STATE

The Washington State Legislature has demonstrated a steadfast commitment[38] to climate education by earmarking $6 million for the subject, building upon the $10 million allocated in 2018.

By aligning with the Next Generation Science Standards (NGSS), Washington became the pioneer state to allocate funds explicitly for

climate education, emphasizing the integration of climate science into teacher training initiatives. The legislature initially appropriated $10 million over three years, starting in 2018, to provide grants for teacher training, establishing climate science as a central theme. These funds facilitated the establishment of ClimeTime[39], Washington's dedicated climate education resource hub, symbolizing the state's proactive approach to equipping educators with the tools and knowledge needed to incorporate climate science into their classrooms.



## CONNECTICUT

In 2022, Connecticut passed a law requiring public schools to incorporate lessons on human-caused climate change into their science curriculum in line with the NGSS. The new law was designed to ensure climate education was not subject to political debate or budget restraints. 90% of students in the state were already learning about climate change, but the law[40] was another attempt to make climate education compulsory. Students learn about man-made climate change, solutions to it, and its impacts on different communities. Fifth, eighth, and eleventh graders are all tested on the subject of climate change.

## CALIFORNIA

The California Assembly is currently deliberating on the legal mandate[41] of integrating climate science into school curricula. According to the bill, the proposed California course of study for students would emphasize the causes and effects of climate change, as well as methods for mitigation and adaptation. The Climate Resilient California Schools report[42] underscores the growing necessity for climate education, emphasizing the role of teacher training and the preparation of students for careers in the green economy.

Governor Gavin Newsom signed legislation allocating $6 million for the creation of free educational resources[43] on climate change and environmental justice, ensuring accessibility for all K-12 students in the state. Additionally, Assembly Bill 130[44] aims to establish the California Center for Climate Change Education at West Los Angeles College, allocating $5 million for its development and initial operations, focusing on fact-based education about climate change and its direct relation to equity and environmental justice issues.

# THE FIGHT AGAINST CLIMATE EDUCATION IN THE U.S.

The story of climate education in the U.S. has to also include examples in which states or school districts are actively fighting against teaching that the climate crisis is real and that it is damaging to the planet. For example:

- Idaho state legislators rejected education standards mentioning climate change.[45]
- Texas State Board of Education encouraged schools to consider the positive aspects of fossil fuels.[46]
- A school district in Pennsylvania halted the teaching of a book in which young adults are faced with climate disasters.[47]
- A bill in Ohio required professors to teach 'both sides' of climate change.[48]
- Materials denying climate science were approved to be included in Florida's state curriculum.[49]

These examples of political interference with regard to climate education demonstrate a key challenge to universal adoption. Because educational standards are adopted by individual states, they can easily be impacted by the politics or business interests of a given state. This further demonstrates the need for all individuals to understand the realities of climate change and the value of climate education in addressing this crisis.

05

# THE ROLE OF MULTILATERAL ORGANIZATIONS

Ensuring that all children have access to quality climate education is a massive undertaking that will require the support of and funding from multilateral organizations. Below is an analysis of several multilateral organizations, their missions, and the impact on climate education.

## UNFCCC

The United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty among countries aimed at combating "dangerous human interference with the climate system" by stabilizing greenhouse gas concentrations in the atmosphere. Launched at COP22 in Marrakech, Morocco, UNFCCC developed Action for Climate Empowerment (ACE)[1] Guidelines to provide a roadmap for education, training, and public awareness.

ACE recognizes that education is a critical tool for reaching our climate goals and supporting communities through the climate crisis. UNFCCC also supports climate education through a library of over 2,100 climate change learning materials including materials specifically designed for teachers and students. Additionally, UNFCCC holds a database that tracks countries' NDCs. Nationally Determined Contributions (NDCs), developed by the Paris Climate Agreement, signal to the world the work a country intends to implement to reach its climate goals. Including climate education in an NDC develops the possibility for international organizations to allocate funding to reach the stated climate education goals.

## UNESCO

UNESCO has made education a key pillar to responding to the climate crisis through its Education for Sustainable Development for 2030[2] framework. This framework will integrate climate change awareness into curriculum, teacher training, and educational policy. Additionally, UNESCO partners with 81 countries and over 1,100 organizations in the Greening Education Partnership (GEP). As a global community of collaboration, GEP works to mainstream climate education through quality standards and curriculum guidance. Another way UNESCO supports climate education is through their work at the Office for Climate Education (OCE) established with France in 2020. The OCE provides climate education resources and support for teachers and students.

## GPE

The Global Partnership for Education (GPE) is the largest global fund dedicated to supporting education initiatives in lower-income countries. GPE connects 59 developing countries with donor countries, civil society, students and teacher foundations, and the private sector to improve education outcomes. One pillar of GPE is focused on supporting access to climate education. To achieve this, GPE developed their Climate-Smart Education Systems Framework that seeks to "protect and advance quality, relevant, and equitable education, protect the planet's life systems, [and] promote climate justice."[3] Climate education is also


supported in GPE through grants. For example, Japan pledged 3 Million USD to support climate education across sub-Saharan Africa.

## GEF

The Global Environmental Facility is a group of funds "dedicated to confronting biodiversity loss, climate change, pollution, and strains on land and ocean health."[4] The GEF is a key player in combating the climate crisis and their commitment is illustrated by their financial commitment to protecting the planet. The GEF has "contributed more than $23 billion and mobilized $129 billion in co-financing for over 5,000 national and regional projects."[5] The GEF has done limited work directly involving education through projects focused on farmer field schools[6] and resource management[7]. However, the resources of the GEF and the potential of climate education to address the GEF's key goals offer the opportunity to develop many programs that support teachers and students in understanding the causes and solutions to the climate crisis.


06

# WHERE DO WE GO FROM HERE?

Today's youth are increasingly recognizing the imminent challenges posed by climate change and are passionately advocating for comprehensive climate education and solution-oriented measures.

For example, more than 50 youth organizations have urged world leaders to invest in and prioritize climate education accordingly at COP27 and COP28 under the banner of the Climate Education Coalition[1]. To address these urgent concerns and fulfill the growing demand for extensive climate education, it is imperative to integrate climate education seamlessly across all subject areas and grade levels. Achieving this ambitious goal necessitates the development of individualized teacher training programs and curricula, ensuring educators are well-equipped to deliver all encompassing and impactful climate education.

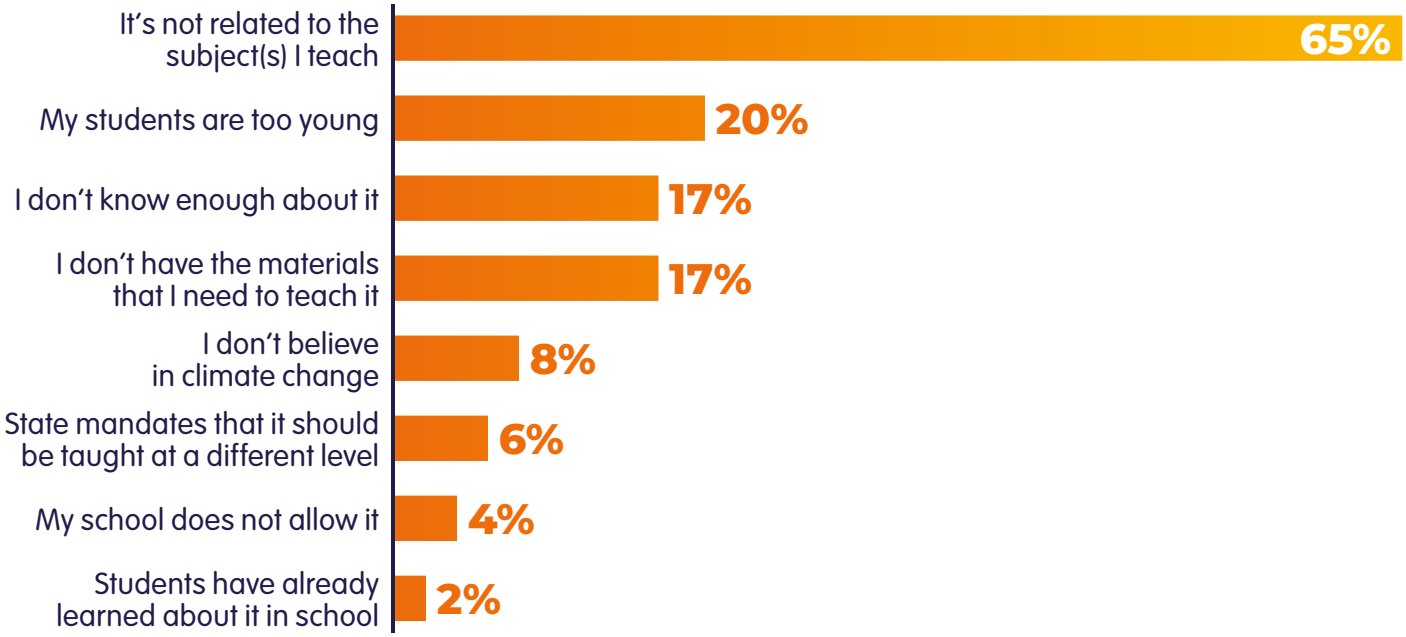
## ASSOCIATED COSTS AND FUNDING

The potential sources of funding for climate education vary greatly based on location. In the United States, for example, less than 8% of funding comes from the federal government[2]. This will require states and districts to provide the vast majority of funding for climate education. In other countries where the national government is the main school funder, like the UK[3], funding for climate education can be provided for all schools in a country from a single source.

Incorporating climate education into all subjects will require increased investment in public education. To receive funding, it is critical that citizens understand climate education and how it will pay dividends for children and society. The main components requiring funding will be the development of curriculum and teacher training.

Developing a climate education curriculum is critical to ensuring climate education reaches students. Currently, 17% of educators do not teach about climate change because they do not have the materials[4]. The development of these materials involves multiple costs, including research, material development, distribution, evaluation, and systems to increase accessibility. However, it's important to note costs can vary widely based on factors such as location, the amount of curriculum being developed, and the resources already available for free use in specific languages.

**SURVEY:** REASONS TEACHERS DON'T TEACH CLIMATE CHANGE




Source: Poll of 505 teachers. This question was asked of the 55% of teachers who said that they do not teach climate change. Respondents could select up to three answers. "Other" and "Don't know" responses not shown.

## CURRICULUM DEVELOPMENT

The first step in developing climate education materials involves hiring subject matter experts and educators to create engaging and accurate curriculum materials. Quality curriculum will provide students with a variety of ways to interact with climate education including textbooks, workbooks, online resources, visual aids, infographics, and multimedia content. To make climate education more engaging and relevant for students, there are a variety of technology options to be developed and implemented, including interactive tools and virtual reality lessons[5].

## DISTRIBUTION

Once materials are developed, there will need to be a plan for their distribution. This will look different in different regions; it may involve a digital hub for downloading the materials — or a budget for printing and distributing hard copies in areas with less access to computers or reliable internet[6]—but the New Jersey Office of Climate Education[7] can provide a framework for the development and distribution of materials.


## EVALUATION

Before the materials are in place for an extended period of time, a system will need to be put in motion to monitor and evaluate the effectiveness of the curriculum developed. To achieve this, researchers must develop tools to evaluate the impact on students' knowledge of the climate crisis and any behavioral changes linked to increasing sustainability.

## ACCESSIBILITY

In many regions, it will be critical to translate the curriculum into multiple languages to reach a broader audience. Also, the material will need to be adapted to include cultural histories and contexts and to align with a variety of educational systems. The materials should also consider the accessibility and inclusivity of the material for students with different learning styles and those with learning disabilities.

## TEACHER TRAINING

Once materials are developed, a system needs to be in place to train teachers. Firstly, training should focus on increasing teachers' understanding of climate change as lack of knowledge on the subject is a common reason teachers do not currently teach it[8].

Secondly, training should demonstrate how to incorporate these new materials into their classrooms. To achieve both of these objectives,

experts in climate education will need to work directly with teachers through a variety of professional development opportunities such as workshops, seminars, or local conferences on the subject.

A state or district will need to determine their own needs and costs to train their teachers effectively, but for reference, New Jersey set aside $4.5 million in grants in 2023[9] to support and train educators and ensure students in underserved districts also have access to climate change education.

## ACTIONS NEEDED

It is with great urgency we call on leaders in government, education, the media, and business to call for climate education.

Luckily, we have examples of quality climate education we can use as a framework for bringing climate education to all children worldwide. The evidence is clear: climate education has the ability to combat the physical and psychological effects of the climate crisis and to prepare the next generation to thrive in the green economy.

To achieve these goals, we propose the following recommendations:

# ACTION PLAN

1. Climate education should be incorporated into all subjects across all grade levels as soon as possible to combat the climate crisis, address the teen mental health crisis, and spur the green economy.

2. Leaders in government, business, and education should identify and promote the mutually beneficial outcomes of climate education, including green skills and green technology.

3. Leaders in government, business, and education should collaborate to foster the political will to fund climate education.

4. Governments and international organizations should provide the funds to implement climate education.

5. Governments should incorporate comprehensive, compulsory, and assessed climate education into their Nationally Determined Contributions (NDCs), outlined in Article 4 of the Paris Climate Agreement.

6. Funding for climate education should be allocated to experts, including voices from youth, educators, and civil society, to develop the curriculum and teacher training needed for the successful implementation of climate education.

7. Climate education materials should be based on science, promote climate justice and equity, and be accessible to all learners.

8. Systems should be established to monitor and evaluate the effects of climate education and adjustments should be made as needed.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