

Climate Education Policy in New York: Preparing Students for a Climate-Altered World

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Executive Summary: New York's lack of comprehensive, interdisciplinary and standardized K-12 climate education curricula highlights a gap in the state's climate action plan. Education plays a key role in building climate literacy and encouraging sustainable behaviors. The climate crisis is complex and requires engaging students in systems thinking to gain a holistic understanding of its root causes, global impacts, and solutions, including preparing students to enter the growing green jobs sector. Existing learning standards and proposed legislation do not address these needs. Compulsory climate education across New York is necessary to prepare students for a climate-altered society, engage youth in climate discussions, model state leadership and support economic competitiveness. Teachers, students, and parents *want* climate education, but gaps in New York's education policies have left educators without the resources or bandwidth to teach it. Analysis of gaps in New York state policy, existing literature, and model programs, suggests that to increase student climate literacy, the state legislature should amend its education laws and create a K-12 climate education mandate with the following key components:

1. An Office of Climate Literacy should be established either within the New York State Education Department or the Board of Regents.
2. Curricula should be comprehensive, interdisciplinary, and justice-centered. They should be place-based, solutions-oriented, and engage students in building relationships with their communities.
3. Robust funding mechanisms should be identified to support schools, teacher training, and professional development, and for creation of a task force - housed within a new state Office of Climate Literacy - to guide equitable implementation of the mandate.
4. Resources for professional learning should be identified and developed, in collaboration with teachers.

I. Introduction

The climate crisis is the defining issue of our time, with increasingly visible and threatening global effects. Climate education is a crucial component of climate action; in 2021, the United Nations Educational Scientific and Cultural Organization (UNESCO) called on its member states to include climate and environmental education as a core component of all schools' curricula by 2025. A survey distributed to New York City teachers by the Climate and Resilience Education Task Force (CRETf) in June 2021, in partnership with the local teacher's union, revealed that the majority of public school educators spend only 1-2 hours over an entire academic year on climate change (NWF and UFT 2021).

Climate education is largely excluded from local, state and federal climate action plans. New Jersey is the only state to require climate education in K-12 public schools. New York must rise to this challenge to establish itself as a climate leader because it is a matter of generational and environmental justice. New York City is the largest school district in the country, with 75,000 teachers serving over one million students, 73% of whom are economically disadvantaged (NYSED Database n.d.). The state has 212,000 teachers who serve 2.54 million public school students - the fourth largest enrollment number by state in the nation - 57% of whom are economically disadvantaged (NCES 2022).

A comprehensive, interdisciplinary K-12 climate education is necessary in public schools to empower young New Yorkers to develop and implement climate solutions. A resolution, (0375-2014), introduced by the organization Global Kids and passed by the New York City (NYC) Council in 2016, called on the New York State Education Department (NYSED) to include lessons on climate change in K-12 schools. New York State rolled out adapted Next Generation Science Standards (NGSS) in 2017, which included some lessons on climate change; however, this is both insufficient and does not cut across disciplines. NGSS does not require climate

change education below grade 6 and is limited to a cursory explanation of the causes of climate change in middle school grades. In high school, there is a stronger focus on anthropogenic climate change, however these lessons are not solutions oriented, nor are they interdisciplinary (NYSED n.d.). Climate education policy has since stagnated, with proposed legislation continuously stalled in the state senate, leaving students without the critical lessons they need and teachers without support, curriculum, or training.

We are already witnessing the dire consequences of the climate crisis: increasing unlivable hot zones, climate migrations, political instability due to droughts and land damage, stronger and more destructive natural disasters, and dire health consequences - all of which disproportionately threaten socially vulnerable groups like children, low-income communities, and communities of color (Masson-Delmotte et al. 2021, Lynn et al. 2011, p. 3). Addressing the climate crisis is inseparable from our current national reckoning with racism, given that social inequities will worsen as climate change intensifies. It is crucial, therefore, to address the climate crisis for the safety and well-being of frontline communities, with equity and justice at the core of our response. Education is a key part of this. With gridlock and polarization dominating today's political landscape, the challenge of tackling the climate crisis lies in the hands of younger generations. Children as young as nine are calling out their elders and governments for their failure to address the climate crisis; they have sued their governments, filed legal complaints, and used social media to build a youth movement that has mobilized millions to take to the streets for mass school strikes (Anderson 2019, Parker 2019). We fail our children by not providing them the education they need, demand, and deserve to survive in the world we leave for them.

II. Why should climate education be mandated in New York?

Education mandates have long been used as a means of standardizing K-12 learning content within states; however, resources and needs in schools vary greatly across rural and urban school districts, and mandates that are not backed with funding and support for teachers and administration are often met with backlash from schools that simply lack the means to effectively implement the reforms on their own.

Additionally, schools in New York are already required to cover a wide variety of state standards across subjects and grade levels (NYSED 2023). The Legislative Analyst's Office in California has argued that states “should not mandate an activity unless it is of fundamental importance to the education system” (Soland 2010). Given the urgency of the climate crisis, climate education is essential for students, and should be required through a mandate. Implementing climate education in New York is important for a multitude of reasons. Four of the most relevant are:

1. Preparing students for a climate-altered society;
2. Meeting public demand: education for today's youth;
3. Engaging youth in climate discussions; and,
4. Modeling leadership and maintaining economic competitiveness.

i. Preparing students for a climate altered society

Climate education not only accelerates wide-scale behavioral change, but also builds the competencies and knowledge to enhance technological and policy adaptations (Kwauk 2020). UNESCO called education, “an essential element of the global response to climate change,” noting that it increases climate literacy in young people, encourages behavior changes, and helps them adapt to climate change related trends (UNESCO 2015). An educated citizenry understands the need to move towards net zero carbon economies and has the training and

skills needed for the green jobs that will accomplish that.

This includes jobs in emerging sectors, such as clean energy and energy efficiency, and in sectors that are increasingly requiring the skills obtained through climate education. The climate sector, which includes jobs in renewables, policy, conservation, education, and infrastructure, is growing every year, especially in New York. NYC's Climate Mobilization Act is projected to increase demand for over 20,700 green jobs by 2030 in NYC alone (Johnson n.d.).

A 2020 NYC Council report emphasized the importance of a green jobs pipeline that provides high school and college students with pathways to enter these developing professions (Johnson n.d.). Providing students with climate education can encourage them to pursue careers in fields such as sustainability, climate policy and education, or conservation. Incorporating climate education into both standard curricula for K-12 students and Career and Technical Education (CTE) programs, which provide high school (and college-aged) students with technical skills and training for future careers, is necessary to introduce students to green jobs and equip them with the skills and knowledge needed to perform them.

Additionally, many green jobs, including in developing sectors, such as renewable energy and energy storage, zero waste, water conservation, and regenerative agriculture require innovative and skilled employees. Existing sectors are also facing an increased demand for new or updated skills, including electrical and software engineering, carpentry, urban planning, and construction., (DiNapoli 2022). Including pathways focused specifically on climate solutions that provide students with new and updated skills will help meet the growing workforce demand in these areas and will further develop students' resilience as they adapt to living in a climate-altered society.

The benefits of encouraging students to explore green jobs are multifold. Done correctly, development in the green jobs sector can foster inclusion, provide a positive way for individuals to engage in climate action, and provide a secure future to frontline communities historically excluded from similar occupations. Average wages in the clean energy sector are 10-20% higher than the national average for workers in similar fields. Even lower wage earners can earn five to ten dollars more per hour in the clean energy sector than in other comparable jobs (Muro 2019). This means that even New York high school graduates who do not attain a bachelor's degree (~60% in 2021 in NYC) can pursue a successful green future after high school (USCB n.d.).

ii. Meeting public demand: education for this generation

Americans *want* climate education. A 2021 report from the Yale Program on Climate Change Communication revealed that 78% of Americans, regardless of political affiliation, agreed that “schools should teach about the causes, consequences, and potential solutions to global warming” (Leiserowitz et al. 2021). Additionally, two 2019 NPR/Ipsos surveys reported that two-thirds of Americans and more than 80% of parents support teaching climate change in schools. However, the 2021 CRETF NYC teacher survey revealed that just 52% of teachers reported teaching climate change in classes.

This is reflected nationally, where 86% of public school teachers agree that climate change should be taught in school, yet less than half of teachers actually touch upon it (Kamenetz 2019). The CRETF survey also asked whether teachers would support a climate education mandate. 59% of respondents were in favor of such a mandate (NWF and UFT 2021). Despite support for climate education, most teachers aren't seriously talking to their students about climate change; teachers report lack of time, insufficient access to curricular resources, difficulty connecting climate change to their content areas,

and lack of confidence in their own knowledge as barriers (NWF & UFT 2021). Without a requirement for climate education, teachers often must choose prioritizing other required curricula over climate change discussions.

iii. Engaging youth in climate discussions

Parents and teachers aren't the only ones demanding climate education. Youth around the world, from global organizations to individuals, have spoken out loudly demanding quality climate education that helps them understand and take action on climate change. A global youth UNESCO survey from 2022 found that 89% of the 17,500 survey respondents felt that schools should be important spaces for learning about climate change (UNESCO 2022).

A national survey of teenagers aged 14-18 found that 65% of students want to learn more about how climate change will affect the future of the Earth and society; half said they want to learn what they can do to lessen the effects of climate change and how the climate crisis will impact their career choices (Will & Prothero 2022). Education is central to fostering independence, cultivating leadership skills, and giving students the power to change, control, and understand their role in the world. For a majority of K-12 students in the United States, a public school education provides a basic understanding of how the world works and how students can make a difference within it.

Teaching about the climate crisis goes hand-in-hand with civic education. Knowledge is power; it leads to more informed voting and personal sustainable decision-making in individuals (Kwauk and Winthrop 2021). Youth will be the ones most affected by climate change and they deserve to understand the world they are inheriting. Authors Kwauk et al., and organizations like Thoughtbox Education in the UK, have proposed innovative frameworks to reimagine education in a way that dismantles the underlying systems of oppression, inequity, and racism that are at the root of the current ecological breakdown.

They cite the need to provide students with an understanding of the complexities of the climate crisis, as well as tools for emotional wellbeing. Students must engage in systems thinking to learn about the scientific, social, cultural, economic, and political implications of the climate crisis, and to be prepared to adapt and live with climate impacts. Investing in the next generation of New Yorkers and providing the public with the necessary education – one they want – is just as important as, *and will help accomplish*, reducing greenhouse gas emissions, developing clean energy, and preparing communities for climate impacts.

iv. Modeling climate action leadership and supporting economic competitiveness

Climate education is an important contributor to New York's economic competitiveness. A well-informed population, equipped with the attitudes and skills necessary for climate action, reflects the state's commitment to be a leader in the fight against climate change as it integrates an environmental perspective into all components of a State's social, economic, and political priorities, and puts the climate crisis at the forefront of the State's agenda (Garcia 2022, Nahm & Urpelainen 2022). Increasingly, in the race to both reduce emissions and capitalize on the growth of clean energy markets, climate impacts are setting the stage for states' and nations' economic policies (Nahm & Urpelainen 2022).

New York is not just a state; it is made up of people whose individual actions can have a significant impact when combined together. Education helps students develop a personal connection to climate solutions, prepare youth to enter society in a climate altered world and leads to a net positive impact on the environment (Otto et al. 2020). Including education in New York's climate action strategy is necessary to reach the targets set forth in the state's landmark 2019 Climate Leadership and Community Protection Act (CLCPA), while simultaneously preparing its future workforce and voting population

for life in a climate-altered world (Paredes et al. 2020).

Studies suggest that if just 16% of high school students in middle- and high-income countries were educated about climate change, carbon dioxide could be reduced on the scale of nearly 19 gigatons by 2050 (Kwauk & Winthrop 2021). This is equivalent to the annual energy use of over 9.2 billion homes. Additionally, research has shown that climate education can lead to attitude and behavior changes, and helps people make informed decisions (United Nations n.d.). One study found that a year-long community college course on carbon emissions and climate change decreased the students' yearly carbon dioxide (CO₂) emissions by 2.86 tons, suggesting that similar education programs applied statewide could significantly reduce carbon emissions (Cordero et al 2020). Additionally, climate action helps create a sustainable economy that is less likely to be impacted by the effects of the climate crisis, such as increasing oil prices as fossil fuels become more scarce, costs related to increased climate disasters, and threats to New York based businesses and financial markets (Cho 2019, Pinner and Rogers 2021).

The U.S. Department of Education's (USDE's) own climate adaptation plan, published September 2021, states that, in order to fulfill the Department's mission to "promote student achievement and preparation for global competitiveness," the department must support climate literacy to bolster mitigation and adaptation. The USDE further identifies the importance of emphasizing equity in this process (USDE 2021). This federal directive must be embraced by New York State as a core part of its climate action policies and economic strategies, both to model leadership and support economic competitiveness.

III. Climate education in New York

i. Existing policies

Through different policy initiatives and learning standards, New York has attempted to include

climate education in public schools over the past decade. These efforts have included the CLCPA, NYC Council Resolution 0375-2014, and the NGSS. However, they have either lacked enforcement mechanisms or have only applied to science classes.

Climate Leadership and Community Protection Act (CLCPA)

In 2019, New York State passed the CLCPA, which sets a target to reduce statewide carbon emissions by at least 85% by 2050 from 1990 levels (New York State 2023). The final scoping plan, which serves as a framework for how the state will accomplish this ambitious goal, acknowledges the importance of providing younger generations with climate education as one of the potential strategies for meeting the goals of the CLCPA, but does not identify any concrete ways of incorporating such education in schools (Climate Action Council 2021).

Resolution 0375-2014

In 2014, a campaign launched by high school students working through the NGO Global Kids led to the approval of Res. 0375-2014 by the NYC Council. The resolution, which passed in 2016, called on NYSED to include climate change lessons in K-12 curriculum. It noted that educating younger generations on climate change is important for future citizens to make scientifically informed decisions, however the resolution lacked an implementation mechanism and legal force. While education policy is legally the state's jurisdiction, districts like NYC do have the ability to pilot special curricula and initiatives. (Constantinides 2014). To be sure, there are an increasing number of formal and informal climate education programs and *initiatives* in New York City, like the NYC Solar Schools Education Program, through the NYC Department of Education's Office of Sustainability in partnership with the nongovernmental organization (NGO) Solar One.

The program offers curricula, in-school programming, and teacher workshops. Additionally, the NYC Department of Education's Office of

Sustainability hosts events and workshops focused on climate education, as do some of the 40+ partners who collaborate with the Office (a complete list of partners is available on the Office's "Sustainability Partners" webpage). There are many more organizations that don't officially partner with the Office that also offer climate education focused programs.¹

Promising educational programs and initiatives exist in the state as well; The Wild Center in Tupper Lake, New York hosts youth climate summits and opened a new climate solutions exhibit in 2022. However, neither the city nor the state created or passed specific climate education *policies* in response to Resolution 0375-2014 to acknowledge the urgent need for holistic and systemic climate education and interdisciplinary K-12 standards and curricula.

Next Generation Science Standards in New York

In 2017, New York State public schools began implementing a new set of state science standards modeled after the Next Generation Science Standards (NGSS). The NGSS are a set of expectations for K-12 student knowledge developed under the National Research Council (NRC) and Achieve, an educational reform NGO, which includes anthropogenic climate change in its curriculum. A coalition of states attempting to introduce uniformity to science education developed the NGSS in 2013 (NGSS n.d.).² These standards provide guidelines for teaching climate change to grade 6-12 students; however, content is limited to earth science courses, which are not mandatory for many students (Pidgeon 2018).

The introduction of new science standards is an important step; however, the change is not interdisciplinary or comprehensive across grade

¹ Some of these include American Littoral Society, Billion Oyster Project, Gowanus Canal Conservancy, Jamaica Bay Rockaway Parks Conservancy, RETI Center, and others

² Twenty states and the District of Columbia have since adopted the NGSS while twenty-four states have developed their own standards based on recommendations in the National Research Council Framework for K-12 Science Education. (NGSS Hub n.d.)

levels, nor does it provide teacher support to meet these new requirements (in the CRETf survey, only 38% of teachers surveyed used the NGSS standards to teach about climate change) (NWF and UFT 2021).

ii. Gaps in New York climate education policies

Despite the aforementioned efforts to incorporate climate change lessons into public education, New York State's existing policies have significant gaps. Additionally, while several climate education bills have been introduced in the New York state legislature since 2019, all have had one, if not all, of the following shortcomings:

1. Lack of funding;
2. Lack of support for professional learning;
3. Lack of a comprehensive, interdisciplinary K-12 curriculum.

Lack of funding

The majority of efforts to incorporate climate education into public curriculum have not provided adequate sources of funding, if at all. Funding is critical to successful education policy because teachers and administrators need resources for their professional learning and support in implementing changes. Teachers and administrators need resources for their professional learning and support in implementing changes. (Kwauk 2020). Moreover, proposed legislation in New York has failed to identify funds specifically for schools and regions in frontline communities. These communities are least likely to have sufficient independent funding and resources, which denotes a lack of equity in the proposed policies (USCCR 2018).

Lack of support for professional learning

The majority of proposed efforts have also lacked necessary support for professional learning and teacher training on integrating climate content into curricula. Education mandates without financial or professional support often have the opposite of their intended effect - they overwhelm teachers with more requirements and not enough resources to implement them (Soland 2010). A 2015 report on

training needs for teachers regarding sustainable development found that there is a need to strengthen childhood education training in order for teachers to acquire the competencies needed to teach sustainability. training needs for teachers regarding sustainable development found that there is a need to strengthen childhood education training in order for teachers to acquire the competencies needed to teach sustainability. (García-Esteban and Murga-Menoyo 2015).

First, institutional barriers hindering teachers include insufficient resources and time allotted to teach about climate issues, and an unwillingness by school districts to allow for variations from rigid state mandates (NWF & UFT 2021). Second, educational barriers—with respect to inadequate teacher training, trainers' own lack of knowledge, and schools' reluctance to pursue professional development to update teaching practices—prevent teachers from gaining the sufficient skills to teach about climate change. Finally, cultural barriers are presented when the beliefs or values of a teacher don't align with the prevailing science or state science standards. Few of the proposed climate education bills have explicitly identified how to support professional learning, if at all. Support for professional learning needs to include sufficient funding for training opportunities, as well as assistance in implementing the skills and tools teachers and administrators learn in these settings. (Darling-Hammond et al. 2017).

Lack of comprehensive, interdisciplinary curriculum

Finally, and arguably most importantly, most of the proposed bills have not provided a comprehensive, interdisciplinary curriculum that spans students' entire educational career. Both existing and proposed programs are relegated to science classrooms, particularly in middle and high school earth science classes. Given the multidisciplinary nature of the climate crisis, and the social, political, economic, and emotional effects it has, curricula must be interdisciplinary and follow students through their entire academic career. Curricula

should create a culture of caring for the environment, help students understand systems of interdependence, and educate them about climate solutions (NSTA 2016).

Education can also help to cultivate emotional resilience. More and more students report feelings of climate anxiety or fear about the future related to climate change; a 2020 survey of young people ages 16-25 found that up to 68% reported feeling sad, anxious, angry, powerless, helpless, or guilty about climate change; 65% agreed that governments are failing young people (Hickman et al. 2021). Education has been a proven method of helping youth cope with climate anxiety, and feelings of environmental loss, grief and betrayal as a result of government inaction on climate change. Open discussions about the climate crisis and its solutions in the classroom can help to engage students in collective problem-solving, which can cultivate a sense of personal agency. Such discussions can help young people develop life skills such as coping with uncertainty, teamwork, and empathy (Herr 2021, Marks et al. 2021). Additionally, they can help transform anxiety into motivation towards action, which is an important component of social-emotional learning (Pihkala 202). We must therefore provide students with the tools, space, and education they need, from a very early age, to become empowered agents of change.

iii. Introduced state bills

The New York State legislature is empowered to pass laws that can direct the education department to change its standards and curriculum. During the 2021-2022 legislative session, a collection of eight bills were introduced in the New York State legislature that attempted to address some of the gaps in K-12 climate education. These bills, while not comprehensive enough on their own, would have represented important steps forward in attempting to advance climate literacy in New York. The bills all died in committee; however, at the time of this writing, several have been reintroduced in the 2023-24 legislative session by Senators May (S.243

and S.287), Gounardes (S.278 with a companion Assembly bill A01559), Parker (S.730), and Assemblymember Rosenthal (A01866).³

IV. Existing policies and efforts in other states⁴

i. Background

Due to the decentralized nature of the nation's school system, states are largely responsible for creating their own climate education policies. To date, most states lack comprehensive, fully-funded climate education policies, programs, and/or curricula. A 2022 joint study by the Monitoring and Evaluating Climate Communication and Education Project (MECCE) and the North American Association for Environmental Education (NAAEE), found that only 17% (136/802) of U.S. education policies mentioned climate change at least once (MECCE and NAAEE 2022). Moreover, the study found that climate change content was most often found in environmental/climate change and science subjects, rarely in social studies or language arts, and never in mathematics, highlighting the incomprehensive nature of current policies.

Successful state-level climate education legislation that does exist shares a common theme; almost all bills and programs aim to educate students about the emerging multidisciplinary challenges of climate change, while equipping educators with the tools they need to effectively incorporate climate education in their classrooms. New Jersey has led the way as the only state to mandate climate education across K-12 learning standards; however, Washington also has a successful voluntary program.⁵ These states model different strategies that could be employed in New York.

ii. New Jersey Student Learning Standards

In June 2020, New Jersey became the first state to incorporate climate education across its K-12

³ For further information on these bills, see Appendix A.

⁴ There are no existing federal policies with legal force relating to climate education. However, for a brief analysis of two proposed policies, see Appendix B.

⁵ Additional state efforts, including California's relatively successful voluntary program, are outlined in Appendix C.

learning standards when the state School Boards of Education adopted the 2020 New Jersey Student Learning Standards (NJSLS). New Jersey's First Lady Tammy Murphy spearheaded the effort and was joined by a wide range of stakeholders including teachers, administrators, education faculty, and those representing public, nonpublic, and charter schools across rural, urban, and suburban districts (Office of the Governor 2020). Seeking input from a variety of stakeholders and including teachers and students in the development process is a critical component of a successful climate education policy. New Jersey's is the most aggressive and comprehensive action taken in the U.S. and represents an ideal K-12 climate education model. It is interdisciplinary, justice-centered, and includes a thorough implementation plan that identifies funding needs.

The 2020 NJSLS mandate that climate change education be taught across seven content areas: Career Readiness, Life Literacies and Key Skills, Comprehensive Health and Physical Education, Computer Science and Design Thinking, Science, Social Studies, Visual and Performing Arts, and World Languages. The standards led to the creation of the Climate Change Education Thought Leader Committee within the New Jersey School Boards Association (NJSBA), which is tasked with determining how these standards will be implemented across the state. A report on New Jersey's K-12 climate education needs was published by the Committee in February 2022 and seeks to, "Ensure that all New Jersey public school teachers are prepared to fully integrate climate change education across grade levels and content areas within five years of adoption of the 2020 New Jersey Student Learning Standards" (Madden 2022). The Committee identified 34 recommendations focusing on areas of professional learning, curricular resources, community-based climate change education, and what boards of education can do to support the process.

iii. Washington

Prior to New Jersey's climate education mandate, Washington state was heralded as the country's leader in climate education policy. However, while the New Jersey mandate makes K-12 climate education a requirement, Washington established a voluntary grant program in 2018, known as ClimeTime, that provides funds to professional learning partners for teacher training in the NGSS that related to climate science, with the goal of building science teachers' capacity to "help youth understand climate science and promote a thriving and sustainable environment" (ClimeTime n.d.).

ClimeTime was established through a \$4 million budget proviso⁶ by Governor Jay Inslee; it received an additional \$12 million between 2019 and 2023 and is facilitated by the Office of the Superintendent for Public Instruction (OSPI) in collaboration with the UW Institute for Science + Math Education (OSPI n.d.). Funding flows through all nine Education Service Districts and seven community based organizations (CBOs) and focuses on underfunded and underserved schools. The program ignited state-supported climate science learning and led to the creation of climate education curricula, professional development for teachers, and student learning assessment tools (Ruskey 2018).

The 2018-2019 ClimeTime Report notes that 99% of participating teachers were "satisfied with the new skills that they gained to integrate environmental learning into their classrooms" (ClimeTime n.d.). Despite the program's initial success and plans to expand operationally, it would require an estimated \$50-70 million for the program to reach all 1.1 million Washington students. This represents just 0.002% of Washington's State Board of Education's pre-Covid annual budget of \$28.1 billion (Ruskey 2018, Office of Financial Management n.d.). Although Washington's voluntary program has been relatively successful, few states have passed concrete climate education legislation.

⁶ Budget provisos are a line in the state budget usually inserted by individual legislators that gives temporary authorization for the use of state money.

V. Looking forward: addressing pressing needs

New York stands at a precipitous moment in deciding the course of education for its students. Having assessed both New York's current efforts and other states' successful climate education programs, four critical components to a climate education mandate in New York state stand out:

1. Establishment of an Office of Climate Literacy;
2. Justice-centered and interdisciplinary curricula across all K-12 grades and content areas;
3. Funds for a climate education mandate and a task force to guide implementation; and
4. Professional learning opportunities and resources for teachers.

i. Establishing an Office of Climate Literacy

In 1992, the Office of Environmental Justice was created within the White House to address current and historical environmental injustices. The office has focused public attention on environmental justice issues, led to innovative inter-agency collaborations, spawned historic federal and state investments in environmental justice projects, and led to convenings, strategies and initiatives to identify and address local and national environmental justice issues that had been overlooked for decades.

Meeting the urgent need to advance climate literacy will involve a similar public commitment by the state, including the Governor, educational leaders at the Board of Regents, who create educational policies, and NYSED, which implements those policies. It will also require the state to recognize that climate literacy is a unique but critical need. Currently, NYSED has 14 "Education Areas" which include Bilingual Education, Cultural Education, Native American Education, among others. Given that adverse climate impacts are predicted to worsen over time, especially for the most vulnerable, climate literacy deserves to be designated as an Education Area within NYSED. This would demonstrate

NYSED's belief that it is an important category for the state education department.

In addition, advancing climate literacy in New York will require funding for dedicated staff who can commit time to analysis, planning, public engagement, internal and external coordination – not only with a coordinating taskforce, but with government agencies, school districts, educational partners, families, and others. As such, a new state Office of Climate Literacy could be established to serve this critical function, which could potentially be housed under NYSED or within the Board of Regents. An office that is continually prioritized in the state budget could help guarantee stable and sufficient funding for climate education.

ii. Justice-centered, comprehensive, and interdisciplinary curriculum

For over half a century, research has shown that learning that is relegated to classrooms is not sufficient to form lasting habits and informed decisions about the environment (Sharp 1943). Education across subjects and beyond the classroom is vital for inspiring real advances in climate literacy and environmental stewardship. Research suggests place-based approaches to climate change education are most likely to help individuals observe direct effects of human impacts on their environment and lead to attitude and behavior changes (Khadka et al. 2021).

The UNESCO Associated Schools Network (ASPnet) program, which connects over 12,000 schools across 182 countries, integrates sustainability and climate action into every aspect of school life through hands-on, collaborative learning in students' communities and in nature, largely in countries with limited education budgets. This whole-school approach emphasizes interdisciplinary learning through activities like planting trees and learning to replace school appliances with green counterparts, fostering a culture of environmental stewardship. The whole-school approach creates lasting bonds between communities and schools, teaching

students that the climate crisis cannot be learned, or fought, in science classrooms alone. ASPnet found that when given the opportunity, most students are interested and excited about making positive change in their schools and communities through practical application of curriculum, which not only encourages a solutions-oriented mindset, but helps offset the climate anxiety that many young people face today (Hickman et al. 2021).

A similar approach has been taken with the NJSLS which will integrate climate education across seven content areas and will include projects outside the classroom and within New Jersey communities. In fact, the NJSBA 2022 report highlighted community-based climate education as one of the state's four key climate education needs (Madden 2022). Washington's ClimeTime program also emphasizes the necessity of extending climate education beyond the classroom and offers ways for teachers to provide students with applied learning, such as place-based field trips and meetings with local indigenous communities. Funding for teacher training is available for all nine Washington educational districts, as well as tribal schools, CBOs, and community-based nonprofit tribal education organizations (CBTEOs), emphasizing the importance of education outside school (ClimeTime n.d.).

ASPnet, the NJSLS, and ClimeTime all show that a successful climate education program must extend beyond science classes and allow for relationship building between disciplines and within communities, with a focus on providing access to underserved regions. New York must not, therefore, relegate climate education to science classrooms alone. A climate education policy must be interdisciplinary, taught across subjects, and include hands-on, collaborative projects that develop students' relationships with their community. An effective curriculum will discuss the intersectional social, political, and economic aspects of the climate crisis, giving students a holistic understanding of the

issue and potential solutions across a multitude of disciplines.

iii. Funding for a climate education mandate

Despite the fact that education is consistently the biggest recipient of state funds compared to other major function/operation areas, as shown in New York State's Open Budget FY 2022 breakdown, climate literacy is allocated very little, if any, of those funds. Additionally, costs for education mandates are often higher than anticipated, highlighting the need to identify robust funding mechanisms from the start so school districts are prepared to implement curriculum (Soland 2010). Even New Jersey has appropriated just \$5 million to support the climate education mandate in the governor's proposed budget; this amount will likely prove insufficient. Aside from content, financial support for implementation is arguably the most important aspect of an education bill. This support should include funding for an Office of Climate Literacy with a task force to guide implementation of a mandate, similar to New Jersey's Climate Change Education Thought Leader Committee model. It is therefore critical to discuss potential funding mechanisms, such as budget provisos, public-private partnerships, a climate education bond, and the polluter pays principle, for such a mandate.

New York budget provisos

Washington's ClimeTime initiative was initially funded through a \$4 million budget proviso, a line in the state budget usually inserted by individual legislators, usually the Governor, that gives temporary authorization for the use of state money. The Washington proviso, inserted by Governor Jay Inslee, was a successful method for securing preliminary funds for the program. In general, provisos are effective at allocating temporary funds when a specific budget allocation is not possible; however, it relies on an individual like the governor to make such a change. New York Governor Kathy Hochul has already demonstrated her commitment to addressing climate change with the "Clean Water, Clean Air, and Green Jobs Bond Act," which passed in

November 2022 and will provide \$4.2 billion for environmental initiatives. Encouraging Governor Hochul to insert a proviso in the state's annual budget to support the equitable funding of climate education could be one method of securing funds for state climate education initiatives. If New York were to model Washington's funding method, the state would require approximately \$9.45 million for the initial roll-out, and an additional \$118.2 - \$165.5 million annually for a fully funded program serving all of New York's 2.5 million K-12 public school students.⁷ This high estimate is less than 1% of New York State's Fiscal Year 2023 (FY23) executive budget of \$220.5 billion [OSC 2022].

Public-private partnerships

Additional funding from public-private partnerships (PPPs) could support the state's contribution and shield an Office of Climate Literacy from sudden and often politically motivated budget cuts. PPPs are contractual arrangements between governments and private sector companies, often lasting decades, that allow private financing of public projects, especially when states may lack funds. Private investment in education can be controversial because investors have tended to apply market frameworks to what is a human right and a social good that should be freely available to all (Vergier and Mauro 2017). However, both businesses and governments have a vested interest in increasing the quality and content of the education that schools provide, to ensure that they are preparing students for the high-skilled jobs that companies need to fill, and to maintain global competitiveness. A recent example of an educational PPP is the STEMM Opportunity Alliance. Launched in 2022 by the White House's Office of Science and Technology Policy, the American Association for the Advancement of Science, and the Doris Duke

Charitable Foundation, the Alliance aims to expand access to science, technology, engineering, math and medicine education and will include more than 90 institutional partners, committing over \$1.2 billion toward STEMM initiatives. While PPPs should be explored with caution, to avoid misapplying market policies, they are one potential method of securing funds that should be considered (Philanthropy News Digest 2022).

A bond act for climate education

The Clean Water, Clean Air, and Green Jobs Environmental Bond Act, was unanimously approved by 68% of New Yorkers via a referendum in November 2022. The Bond Act authorizes the state to borrow \$4.2 billion in the coming years to pay for flood risk mitigation, clean water infrastructure, land conservation, emissions reduction, and other climate initiatives. A portion of those funds could be allocated to climate education initiatives in the state. The return on such an investment would be a skilled workforce for New York, capable of helping the state meet its decarbonization goals under the Climate Act. An alternate idea, given that a majority of teachers and parents support the teaching of climate change, would be to propose a gubernatorial referendum for a bond act to allocate funds specifically for climate education.

Polluter Pays Principle

The polluter-pays principle - wherein polluters pay financial settlements to compensate states or communities for environmental harm - could be used as a mechanism to finance state climate education initiatives. In 2010, Exxon Mobil agreed to pay \$25 million to settle a decades old oil spill in Brooklyn; \$19.5 million of which were used for environmental improvements in the community (Navarro 2010). In December 2022, Governor Kathy Hochul signed a law that would force polluters to pay for contaminating drinking water in the state (New York State 2022). A percentage of monies collected through the passage of this law could be allocated to climate education. Similarly, New York Senator, Liz Krueger, introduced legislation (S.2129)

⁷ These numbers are derived based on the ratio of Washington's funding per student scaled up to New York. Based on Washington's initial funding of \$4 million, the equivalent for New York would be \$9.45 million. Washington's estimate of a fully funded program is \$50-\$70 million, the equivalent of \$45.45-\$63.64 per student. To scale this amount up to serve New York's student population of 2.6 million students, the state would need \$118.2-\$165.5 million for a fully funded program.

in the 2023-24 legislative session that would require companies that significantly contributed to climate-warming greenhouse gasses to pay into a climate adaptation fund (NY State Senate 2023). She cites research estimating the potential economic costs of climate change to be \$10 billion annually in the state by mid-century (Dinowitz and Kreuger 2022). Should her legislation pass, a portion of those funds could be allocated to state climate education initiatives each year.

An alternative method of utilizing the polluter pays method, could be to collect on the staggering \$3.3 trillion in uncollected taxes, the majority of which are owed by the wealthiest Americans. A report by the Institute on Taxation and Economic Policy found that 55 corporations paid no taxes on their 2020 profits, amounting to \$12 billion in lost taxes. Proposals to raise property or sales taxes to increase funding for education should not be considered until corporate and uncollected taxes are claimed (Burns 2022).

Federal and State Departments of Health and Human Services (HHS)

New York's sex education policy can provide some insight into the potential use of federal funding. Typically, the federal government does not have significant power in determining curriculum taught in schools, but it does have some influence through the allocation of funding. This is done primarily through the federal Department of Education (USDE); however, state and local sex education programs are funded through the HHS. Curricula that meet federal or state guidelines receive this funding, encouraging schools to teach comprehensive and scientifically accurate sex education. Climate change is an imminently dangerous public health crisis and is a "threat multiplier" particularly for environmental justice communities (Hollis 2019). Climate change can affect health in the U.S. through temperature-related morbidity and mortality, air-pollution, water- and foodborne diseases, vector and rodent-borne diseases, and extreme weather events (Patz et al.

2000). By leveraging climate education as a means of addressing public health, climate education programs could explore the HHS and New York State's Department of Health as potential sources of funding, which would allow the state to monitor and standardize content in these programs. Additional lessons that can be learned from New York's sex education policy are outlined in Appendix D.

iv. Professional learning for teachers

The final critical component of a successful climate education program is providing support for the educators tasked with implementing new content. As one of the key needs for a robust climate education policy, high quality professional learning for educators, administrators, as well as pre-service teachers (those studying to become educators) must be supported. Darling-Hammond, Hyland, and Gardner reviewed 35 methodologically rigorous studies to develop suggestions for effective professional learning and found that most, if not all, successful efforts include seven essential elements: content focused, active learning, supports collaborations, models effective practice, provides coaching and expert support, offers feedback and time for reflection, and is of sustained duration (Darling-Hammond et al. 2017).

Both Washington and New Jersey's climate education programs highlight the importance of supporting educators through professional learning. Washington's ClimeTime program works with educational non-profits and universities to establish "STEM seminars," where public school teachers are given the opportunity to meet with scientists, discuss climate education practices with other teachers, and find new strategies to teach their students. The majority of educators who have attended such seminars reported feeling more ready to teach students about climate issues (McGinn 2020). Additionally, the NJSBA 2022 report identified professional support for teachers as a critical need. The report notes that funding must also be equitably allocated for professional learning and that teachers should have input into what

modalities are used (Madden 2022). A successful climate education program in New York must then include robust professional learning opportunities and sustained access to resources for educators, and mandatory training for pre-service teachers.

VI. Conclusion and recommendations

i. The future of climate education in New York

Climate education is a critical component of addressing the climate crisis, yet most states lack a comprehensive climate literacy program. New Jersey is the only state to mandate interdisciplinary K-12 climate education in public schools, and while New York has taken some steps to include climate education in science standards and introduced bills on the subject, this action is insufficient. To empower young New Yorkers as informed, responsible, and environmentally aware citizens and deliver the education content that students, teachers, and parents want, the New York state legislature and Board of Regents must take swift and decisive action to implement a K-12 climate education mandate that prioritizes:

1. the establishment of a state Office of Climate Literacy;
2. the creation of a comprehensive, interdisciplinary justice-centered curriculum;
3. equitable funding for the initiative and a task force to guide its implementation; and,
4. support for professional learning for teachers.

Anything less diminishes the importance of the climate crisis and the role it already plays and will continue to play in the lives of young New Yorkers.

ii. Recommendations for Office of Climate Literacy

1. The Office of Climate Literacy could be housed within either NYSED or the Board of Regents and would be charged with carrying out the other three elements, and overall coordination.
2. A task force housed within the office should be created to facilitate the development of

curriculum, secure funding, and support professional learning.

3. The Office should support interagency and external communications across sectors.

ii. Recommendations for curriculum

1. A statewide landscape analysis should be conducted to identify gaps and needs across K-12 curriculum and CTE programs.
2. Existing resources should be curated alongside the creation of new standardized resources, to fill the identified gaps. Curriculum focusing on climate justice should include lessons on the causes, disparate impacts (both local and global), and ongoing climate solutions. Climate-based Career and Technical Education (CTE) programs should be established for grades 9-12.
3. Curricula should also include development of often neglected life skills that will support climate adaptation and resilience including: information management, systems thinking, critical thinking, action, interaction, future thinking, and personal mental resilience (Chalk 2022).

iii. Recommendations for funding

1. Funding for climate education should be an annual priority in the state education budget.
2. Funding should be allocated equitably and should provide additional support to historically disenfranchised and under-resourced districts and populations.⁸ The prioritization of schools and districts should be determined by a coordinating task force in partnership with the Governor's office.

A top down approach should portion out funds to each school based on factors such

⁸ These funds should be distributed equitably across New York public schools. One way could be through targeted funds to provide additional resources to schools with fewer resources. This would help reduce the opportunity gap between student populations, and would support New York's just transition to a clean energy economy, as outlined in the CLCPA.

as: student population, district size, demographics, need, and existing resources, as determined by the task force in partnership with the Governor's office.

A voluntary grant program approach should only be considered if support is given to historically disenfranchised districts and populations. Additionally, allocation of funds for selected schools should be done equitably.⁹

3. Innovative funding approaches for climate education, such as public-private partnerships, endowments, and collaborations with higher education institutions, to supplement state contributions, could be coordinated out of a new Office of Climate Literacy.

impacts, climate justice, and solutions, is developed with input from teachers and students, and is taught, appropriately and through both local and global lenses at every grade level. Every teacher has the knowledge, resources, and training necessary to teach the next generations of citizens about the world they will inherit. Every student emerges from the public education system with the information necessary to confront the systemic realities and impacts of climate change—not only in their everyday lives but also at local, state, national, and global scales; and New York's high schools and CTE programs have prepared students to pursue green careers. The energy, power, and drive of today's youth to imagine a better future is unparalleled. New York must support its students in confronting the climate crisis.

iv. Recommendations for professional learning

1. A resource hub should be created for New York State teachers, modeled after New Jersey's Climate Change Education Hub, which curates existing K-12 interdisciplinary climate education curricula and learning resources, including existing lesson plans, categorized by grade level and content area.
2. Regionally appropriate professional learning modules should be developed and deployed across the state within a discreet timeline to ensure teacher preparation and comfort. Teachers should be given the opportunity to weigh in on these modules (Alsubaie 2016).

v. Conclusion

New York has positioned itself as a climate leader, but to remain so it must address its glaring lack of climate education policy. The vision for New York K-12 climate education should be one in which an interdisciplinary climate education curriculum focused on anthropogenic climate change, climate

⁹ Grant programs tend to be complex to navigate, inaccessible to the most vulnerable communities, and often result in the inequitable distribution of resources. This is in large part due to an overcomplicated and lengthy application process, long processing times, and exclusion through invitation-only programs.

Appendix A: New York State Climate Education Bills in 2021-2022 Legislative Session

Introduced State Senate (and Companion Assembly) Bill	Comprehensive (K-12)	Interdisciplinary	Funding Mechanism	Professional Learning
“Model” Environmental Curriculum (S1081 & A2325)	✓	✓		
Climate Change Instruction within Science Standards (S654)	✓			
Climate Science Recommendations from the Commissioner of Education (S596)				
Climate Change Instruction in Certain Classes (S4781)		✓		
The New York Climate Change Education Act (S4683 & A00617A)			✓	✓
Climate Change and Sustainability Education in Elementary and High Schools (A03468)	✓	✓		

Table 1: Evaluation of Critical Components of the Proposed State Bills.

Bill Number	Bill Summary	Sponsor
S.1081 & A2325	Establishes a model environmental curriculum in all public elementary and secondary schools.	Senator Andrew Gournardes
S.654	Requires climate change instruction within established science curriculum in grades 1-12.	Senator James Sanders Jr.
S.596	Requires the commissioner of education to make recommendations to the board of regents relating to the adoption of instruction in climate science in senior high schools.	Senator Rachel May
S.4781	Requires the commissioner of education to make recommendations to the board of regents relating to adjusting curricula for certain classes to include climate change education.	Senator Rachel May
S.4683 & A00617A	Establishes a climate change education grant program that would provide funding for students and or teacher training and development.	Senator Todd Kaminsky
A.03468	Requires climate change and sustainability education in elementary and high schools.	Assemblywoman Linda Rosenthal

Table 2: Summary of the Basic Components of the Proposed State Bills.

Appendix B: Federal Climate Education Policies

The Climate Change Education Act. The Climate Change Education Act, spearheaded by Senator Ed Markey, was originally introduced in 2016 and was reintroduced into Congress in the 117th legislative cycle. The bill would require the National Oceanic and Atmospheric Administration (NOAA) to establish a Climate Change Education Program with the goals of increasing climate literacy across the U.S., applying the latest scientific and technological discoveries, and helping people understand and promote implementation of new technologies, programs, and incentives related to climate change, climate adaptation and mitigation, climate resilience, climate justice, and environmental justice (Markey 2021, p. 1). The bill would also require NOAA to establish a grant program for climate education and would allocate \$20 million annually through 2025 to NOAA to distribute to states “to encourage and support plans and programs for kindergarten through grade 12 formal and informal climate change education.” A companion bill was originally introduced in the House of Representatives in 2019. The Climate Change Education Act would be a significant step in creating a national climate education effort; federal grants to state and local programs are one of the most effective and efficient funding mechanisms, particularly given the United States’ decentralized education system.

House Resolution 29: Supporting the teaching of climate change in schools. The Resolution, written by high school students supporting the teaching of climate change in schools (H.Res.29) was originally introduced by Representative Barbara Lee (CA-13) in 2019 to urge more climate education in schools (Congresswoman Barbara Lee, 2019). It was reintroduced into the House in the 117th Congressional Cycle at the time of this writing (Lee 2021). The resolution acknowledges climate change as a potential threat to the psychological and social development of children and therefore supports the teaching of climate change in public and private schools at all grade levels; encourages the government at all levels to teach climate change with the goal of increasing public knowledge on the impacts that humans have on the climate; and, encourages school districts to provide robust resources for teachers and students to learn about climate change (Lee 2021). Although this resolution advocates for the introduction of climate change education at all levels and for the allocation of appropriate resources to support teachers and students, it includes no funding mechanism and no implementation plan. At the time of this writing, a revision of the bill is being spearheaded by the California-based advocacy group, Schools for Climate Action.

Appendix C: Additional State Climate Education Policies

California. California was one of the first states to include environmental education in its K-12 schools. In 2003, California passed a groundbreaking environmental education bill that created the most thoroughly scoped and sequenced environmental curriculum developed by a state government. The state has since invested over \$12 million in this program (The Campaign for Climate Literacy n.d.). Additionally, in 2010 California instituted the California Education and Environment Initiative (EEI), a statewide program created by CalRecycle’s Office of Education and Environment and adopted by the Department of Education to incorporate environmental lessons in K-12 instruction, build statewide environmental literacy, and offer teacher training (California Department of Education n.d.). The curriculum provides a comprehensive and interdisciplinary model for incorporating climate education into existing standards, including the NGSS. Additionally, the California legislature introduced a bill in 2020 that would require science courses to emphasize the causes and effects of climate change for grades 1-6 and would require the inclusion of climate change in one of the two prerequisite science courses for grades 7-12 (Rivas n.d.). Unfortunately, the bill died in November 2020 and has not been reintroduced. However, in July 2021 Governor Gavin Newsom signed legislation to appropriate \$6 million from the State’s General Fund to create free, standards-aligned and

culturally relevant educational resources on climate change and environmental justice for all K-12 students across the state. The program is being administered by the San Mateo County Education Office which has contracted with the climate literacy focused NGO, Ten Strands, to create the resources. Ten Strands gathered the support of 165 NGOs, teachers, school districts, offices of education and others to request the appropriation which was championed by Senator Ben Allen (Ten Strands 2021).

Maine. In May 2022, the Maine legislature passed LD 1902, a bill requiring the Commissioner of Education to establish the Climate Education Professional Development Pilot Program - via a voluntary grant program similar to Washington State's - to "provide teacher training in Next Generation Science Standards and interdisciplinary climate education" in Maine public schools for a period of three years. The bill received over \$2 million in funding from the Maine Appropriations & Financial Affairs Committee and will also provide close to \$95,000 to fund a coordinator within the Department of Education. This staffer will help districts apply for funds and support teacher professional development as well as partnerships between schools and providers and must "prioritize schools and communities historically underserved by climate science education." The bill was a result of years of organizing by an intergenerational group of students, educators and organizations across the State.

Appendix D: New York Sex Education Case Study

New York's sex education policy holds additional solutions to the obstacles climate education faces beyond funding. Despite the United States' decentralized education system, the methods used to implement sex education could have some of the answers for overcoming public concern. State governments have the most authority in determining if sex education is taught, and what content is covered, and state education departments distribute state and federal funds to local school districts, giving state administrators power to monitor the programs and the allocation of funds. To address public concern for the controversial topic, some districts create special advisory committees that give teachers, students, and other community members the opportunity to give input into what content is covered in sex education courses in public schools. This may be a valuable strategy to model for climate education, as student and teacher driven policies are often the most effective. Finally, many states that require sex education require parental consent and allow parents to opt-out for their children (NCSL 2020). Allowing families to opt-out of climate change education may reduce opposition to comprehensive climate change education policy. Together, advisory committees and opt-out policies could help build support for climate education curriculum.

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