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# Educating for Sustainable Development

Opportunities for Progress in the U.S.



Smithsonian  
*Science Education Center*



Smithsonian

NATIONAL  
MUSEUM *of*  
**NATURAL  
HISTORY**

✦ Smithsonian

## About the Smithsonian Institution

The Smithsonian Institution is the world's largest museum, education and research complex, with 21 museums, nine research centers, five education units and centers, and the National Zoo — shaping the future by preserving heritage, discovering new knowledge and sharing our resources with the world.

The Institution was founded in 1846 with funds from the Englishman James Smithson (1765-1829) according to his wishes “under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge.”

## About the Smithsonian Science Education Center

The Smithsonian Science Education Center is transforming K-12 Education Through Science in collaboration with communities across the globe. The Center is nationally and internationally recognized for the quality of its programs and its impact on K-12 science education. Visit the [Smithsonian Science Education Center](#) website and [Smithsonian Science for Global Goals](#) and follow the Smithsonian Science Education Center on [LinkedIn](#), [Instagram](#), [X](#) and [Facebook](#).

## About the National Museum of Natural History

The mission of the National Museum of Natural History is to promote understanding of the natural world and our place in it. The museum's collections tell the history of the planet and are a record of human interaction with the environment and one another and is dedicated to maintaining and preserving the world's most extensive collection of natural history specimens and cultural artifacts. It fosters significant scientific research and educational programs and exhibitions that present the work of its scientists to the public. The museum is regarded as a global leader in natural history collections, collections-based research, scientific discovery, and natural history exhibition.

## About Gallup

For over 85 years, Gallup has been researching topics that matter most to the world and helping shape the future of education. Gallup knows more about the attitudes and behaviors of employees, customers, students and citizens than any other organization in the world and is committed to improving high-quality educational experiences and student success.

The Assessing PreK-12 STEAM Educators' Needs for Smithsonian Tools and Resources to Teach About Life on a Sustainable Planet Planning Grant, which is responsible for this report, was funded in part by the Jeff Bezos gift to the National Air and Space Museum through Grant TWT-BEZOS-2023-PLN-101. Additional funding was provided by the Gordon and Betty Moore Foundation through Grant GBMF11240 to the Smithsonian Science Education Center.

**Recommended citation:** Smithsonian Institution. (2024). *Educating for sustainable development: Opportunities for progress in the U.S.* <https://ssec.si.edu/educating-for-sustainable-development-report>

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# A Letter From the Smithsonian

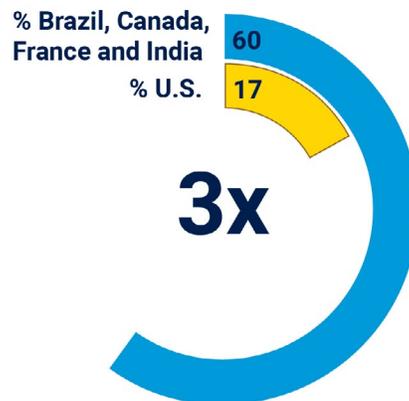
In spring 2023, the Smithsonian Science Education Center contracted with Gallup to conduct a study of U.S. K-12 teachers and school administrators, as well as teachers of students in comparable grade levels in four peer countries: Brazil, Canada, France and India. The goal was to gauge attitudes toward, and demand for, education and resources related to sustainable development. This study was an outgrowth of the Smithsonian Science Education Center's Smithsonian Science for Global Goals project, which aims to improve science, technology, engineering, arts and mathematics (STEAM) education for sustainable development for youth around the world.

## The study found three major results:

### 2023 KEY FINDING 1

Compared with teachers in Brazil, Canada, France and India, U.S. teachers report having less support, time and expertise to incorporate sustainable development into their curriculum.

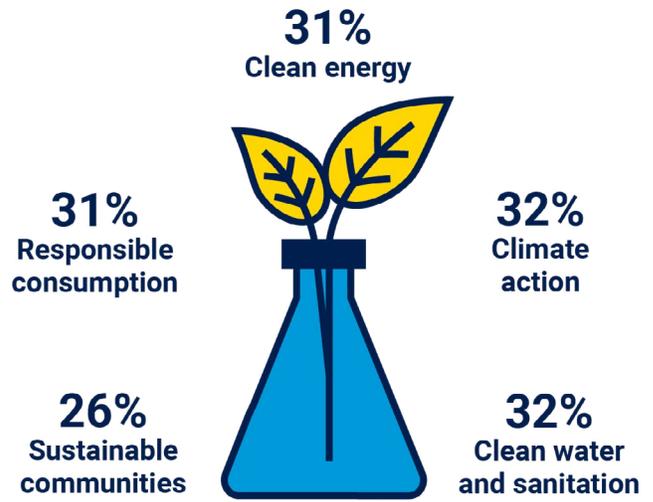
- On average, teachers in these four countries are more than three times as likely as U.S. teachers to say they have the necessary support to incorporate sustainable development topics into other subjects (60% vs. 17%).
- In the U.S., administrators perceive this support more positively than teachers; 36% agree there is sufficient support (compared with 17% of teachers).
- Ninety percent of U.S. teachers say a lack of time poses a great deal or some challenge, and more than seven in 10 say the same about a lack of instruction materials (76%) and expertise on the subject (74%).



**2023 KEY FINDING 2**

**Teachers say sustainable development — particularly socio-scientific topics — is largely missing from U.S. curriculum, especially compared with Brazil, Canada, France and India.**

- For example, 31% of U.S. teachers say clean energy is a dedicated part of the curriculum, compared with 78% of teachers in Brazil.
- Content with socio-scientific topics — such as sustainable communities (26%), responsible consumption (31%), clean energy (31%), climate action (32%), and clean water and sanitation (32%) — are among the sustainable development topics least likely to be found in U.S. curricula.
- Nearly half (49%) of U.S. teachers say these topics receive too little attention, on average.
- Most U.S. teachers (65%) say sustainability does not fit within the topics they teach, including a majority (59%) of those who teach science.



**2023 KEY FINDING 3**

**U.S. teachers and administrators believe teaching about sustainable development is important and want to incorporate it into their lessons.**

- Most teachers see the benefits of teaching about sustainability, such as having a positive impact on the world (83%) and local community (79%), making learning about science more accessible to students (73%), increasing students’ interest in STEM/STEAM topics (71%), increasing students’ interest in current events (73%) and supporting students’ personal resilience (67%).
- U.S. teachers say direct experiences — such as field trips (57%) and hands-on materials (56%) — and professional development on sustainability topics (69%) would be most helpful for teaching about sustainability.

**Sustainability Teaching Importance Across Countries**

Please indicate the extent to which you agree or disagree with each of the following statements:

*I believe teaching about sustainability is important.*

% Strongly agree or Somewhat agree, among teachers



As a follow-up to this report, the Smithsonian's STEAM Education Working Group (see our concluding thoughts at the end of this report) contracted with Gallup to dig more deeply into the U.S. results to better understand how science standards in the U.S. do (or do not) align with sustainable development topics. Gallup conducted a landscape analysis of U.S. standards, and then interviewed teachers, administrators, parents and students in the U.S. to better understand what they want and need from scientific, cultural and educational organizations like the Smithsonian to teach sustainability in schools. This report summarizes these findings.

Through the Smithsonian's Our Shared Future: Life on a Sustainable Planet initiative, the Smithsonian envisions a future where humanity lives in balance with the natural world. The Smithsonian activates our research, collections, partnerships, education and public outreach to foster sustainable communities, improve social justice, slow and reverse climate change and conserve Earth's ecosystems, biodiversity and benefits to humanity. In concert with our global partners, Life on a Sustainable Planet advances and inspires innovative science and discovery to further our collective understanding of how nature and human communities interact in pursuit of nature-based solutions to make Earth more sustainable for all.

Smithsonian STEAM educators bring these scientific efforts to K-12 teachers, administrators, parents and students by directly discussing climate change solutions with them and partnering with historically marginalized groups to make sustainability decisions that also promote equity. These are just a few ways Smithsonian scientists and STEAM educators collaborate to advance Life on a Sustainable Planet. We hope this survey provides a high-level assessment of the barriers and opportunities for resources to help you educate for sustainable development.



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# Introduction

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In 2023, the Smithsonian Science Education Center (SSEC) and Gallup released *Educating for Sustainable Development: Perspectives of U.S. and Global Educators*.<sup>1</sup> The report showed that teachers believe sustainable development topics (such as climate action, clean water and sanitation, clean energy, responsible consumption and sustainable communities) are largely missing from U.S. school curriculum, especially in comparison to select other countries. The report highlighted barriers to including sustainable development topics in the classroom but also showed that majorities of teachers in the countries studied – no matter where they live – believe teaching about sustainable development is important.

Following the release of the report, the Smithsonian Institution wanted to better understand to what extent learning standards in the U.S. include sustainable development topics. The Smithsonian also wanted to know what teachers, administrators, parents<sup>2</sup> and students need from educational, scientific and cultural organizations (like the Smithsonian) to help better teach these topics.

To answer these questions, the Smithsonian contracted with Gallup to undertake a qualitative study to better understand education for sustainable development in U.S. schools and, in particular, the barriers that hinder teachers from including more sustainable development topics in their lesson plans. The investigation started with a review of science content standards and the extent to which they include key sustainable development topics. The study then followed these topics as they make their way from standards to schools through qualitative interviews with teachers, administrators, parents and students.

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1 Smithsonian Science Education Center. (2023, June 15). *Educating for sustainable development: Perspectives of U.S. and global educators report*. <https://ssec.si.edu/educating-for-sustainable-development-report>

2 The term 'parent' is used to denote a child's caregiver and may also include their guardian(s).

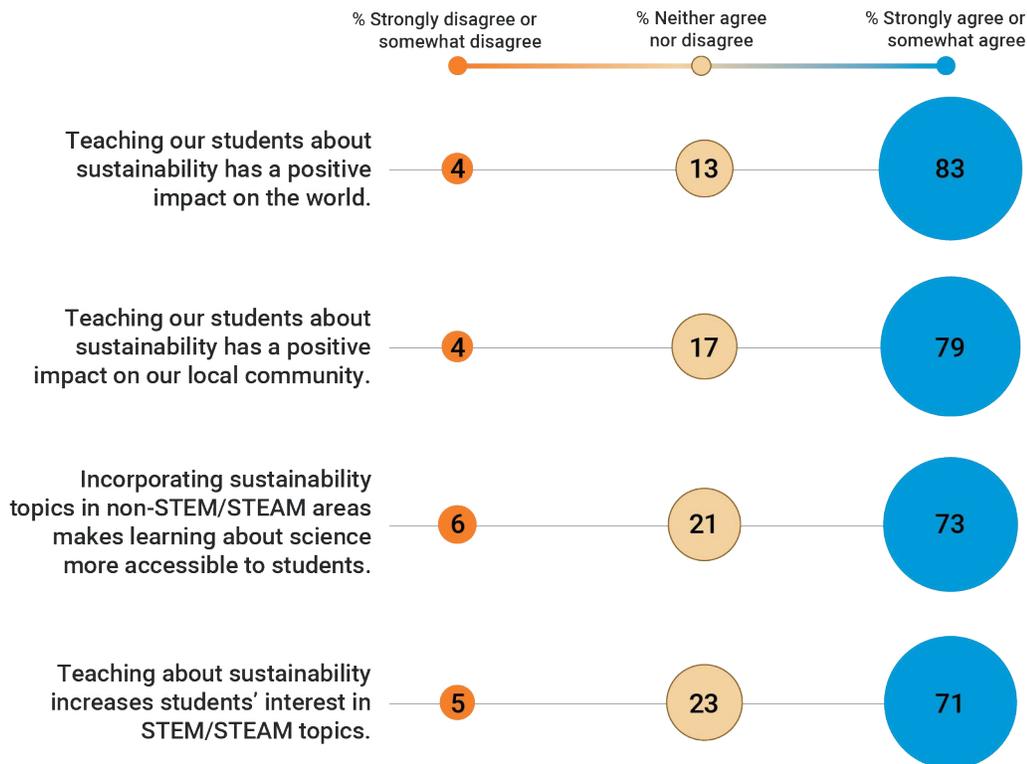
## Despite Teachers' Interest, Sustainable Development Is Missing From U.S. Curriculum

Prior research from the *Educating for Sustainable Development: Perspectives of U.S. and Global Educators* report revealed that U.S. teachers are interested in teaching about sustainable development and believe in its positive impact on the world and our local communities. They also believe it makes STEM/STEAM more accessible to students and increases students' interest in STEM/STEAM. U.S. administrators (school leaders such as principals or superintendents) express similar opinions.<sup>3</sup>

FIGURE 1

### U.S. Teachers' Views of the Impacts of Teaching About Sustainability

Please indicate the extent to which you agree or disagree with each of the following statements:



U.S. teachers are similar to their counterparts globally when it comes to their belief in the importance of teaching about sustainability: Majorities of teachers (at least 80%) agree that teaching about sustainability is important. However, U.S. teachers are much less likely to report that those topics are included in their curricula (see the full report<sup>4</sup> for details), leaving a wide gap between U.S. teachers' interest in sustainability and its inclusion in the classroom.

<sup>3</sup> Ibid., Smithsonian Science Education Center. (2023, June 15).

<sup>4</sup> Ibid.

## Multiphase Research Approach

The Smithsonian Institution and Gallup used a multiphase approach to better understand to what extent education for sustainable development is present in U.S. schools. The first phase consisted of a targeted review of science standards used in most U.S. classrooms to understand the learning objectives teachers use to guide their lessons. We then compared these standards to those found in the United Nations Educational, Scientific and Cultural Organization (UNESCO) publication, *Education for Sustainable Development Goals: Learning Objectives*.<sup>5</sup> Finally, we scanned three sets of state-specific science standards to dive deeper into the state-by-state variation in coverage of sustainable development topics.

The second phase of the project involved qualitative interviews with 22 teachers who shared their insights in separate 45-minute, in-depth one-on-one interviews conducted virtually. Teacher interviews were complemented with findings from an additional 10 parent-student dyad interviews and eight administrator qualitative interviews.

Teachers shared their perspectives regarding general issues like their school environment as well as more specific issues, including 10 sustainable development topics. Teachers answered questions about the extent to which their lessons include the 10 sustainable development topics (listed in Figure 2) and offered their thoughts on the value of those topics, barriers and opportunities for including them in their current classes and the resources they would find most helpful to educate their students about sustainable development.

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5 UNESCO. (2023, July 25). *Education for sustainable development goals: Learning objectives*. <https://www.unesco.org/en/articles/education-sustainable-development-goals-learning-objectives>

FIGURE 2

**Sustainable Development Topics Covered by This Report**



# 2024 Key Findings

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## KEY FINDING 1

**U.S. science standards concentrate on the natural sciences and the cognitive domain of learning, but they are mostly missing the social and behavioral domains of learning, which UNESCO sees as necessary to educate for sustainable development.**

- The U.S. natural sciences standards mostly focus on the cognitive domain of learning (knowledge and thinking skills), whereas UNESCO’s learning standards for sustainable development integrate the cognitive, socioemotional (social skills, values, attitudes) and behavioral (action-taking) domains of learning.
- States in the U.S. vary in how they incorporate sustainable development topics. In the three states reviewed in this study (California, Pennsylvania and Texas), science standards cover similar core scientific knowledge and skills but diverge in their implementation and topic coverage related to sustainable development.

## KEY FINDING 2

**Teachers say lack of time, materials and expertise are major challenges to incorporating sustainable development topics into their lesson plans.**

- New qualitative findings echo prior quantitative findings on the barriers educators face when teaching about sustainable development and emphasize the ways a lack of time, materials or expertise can compound with one another.
- High-quality materials are difficult to find and vet, and a lack of familiarity with sustainable development standards can make it harder for teachers to connect the topics to their existing lessons.

## KEY FINDING 3

**Teachers consider sustainable development topics to be valuable to students’ learning and their future.**

- Teachers see sustainable development as an opportunity for cross-disciplinary integration. Some teachers suggest sustainable development can also improve student engagement, a view supported by some parents and students in the study sample.
- To improve their capacity for teaching about sustainable development, teachers want more opportunities to collaborate with their colleagues and learn from experts in the field.

## KEY FINDING 4

**Many teachers want resources and expertise about sustainability from scientific, cultural and educational organizations.**

- Numerous teachers say high-quality materials that are aligned with their content standards are needed to more effectively incorporate more sustainable development topics.
- Teachers see knowledge related to sustainable development (with real-world examples) as part of their students’ futures, a view supported by some parents and students in the study sample. Scientific, cultural and educational organizations can help elevate the ways sustainable development is connected to necessary core skills (like reading and math).

# 1. How U.S. Science Standards Address Sustainable Development

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Teachers rely on science standards to help them plan lessons, select curriculum and decide what content should be in their lesson plans. This reliance makes the standards a valuable starting point to understand what is driving (or hindering) the condition of sustainable development education in U.S. schools.

The Smithsonian Institution and Gallup used UNESCO's *Education for Sustainable Development Goals: Learning Objectives* to define 10 sustainable development topics (listed in Figure 2) which are directly tied to the United Nations' 17 Sustainable Development Goals.<sup>6</sup> These 10 topics formed the basis for a search to determine the extent to which they are covered in the Next Generation Science Standards (NGSS).<sup>7</sup> Researchers then reviewed UNESCO and NGSS standards to evaluate how the two compare in their coverage of education for sustainable development. They followed a similar process to dive more deeply into state science standards.



6 *Overcoming the world's challenges.* (2024, June 15). The Global Goals. <https://www.globalgoals.org/>

7 NGSS Lead States. (2013). *Next generation science standards: For states, by states.* The National Academies Press.

While there is no single set of science standards in the U.S., the NGSS are a good representative, as they are the most ubiquitous set of science standards in use. The NGSS standards were released in 2013 after a multistate effort and have since been adopted or adapted in some form by many states across the U.S.

In general, education standards are a list of goals for what a student should be able to do or know. Curriculum developers use them to plan curricula, and teachers use them to plan units and lessons. For example, “Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.”<sup>8</sup>

The **NGSS standards** are a set of science standards – commonly used as a foundation for state science standards in the U.S. – that describe the science knowledge and practices necessary for school-age students in kindergarten through 12th grade to succeed in college and future careers. These are organized as disciplinary core ideas, science and engineering practices, and cross-cutting concepts.

The **UNESCO standards**, as referred to in this report, are a set of learning objectives defined by the U.N. to help learners of all ages and subject areas gain the competencies they need to support global achievement of the 17 U.N. Sustainable Development Goals.



8 ESS3D: Global climate change. (2015). In *Next generation science standards: For states, by states*. Nextgenscience.org. <https://www.nextgenscience.org/pe/k-ess3-3-earth-and-human-activity>

## Science Standards in the U.S. Concentrate on Natural Sciences, Cognitive Domain

Of the 10 sustainable development topics reviewed in this study, the NGSS had the highest overlap with UNESCO in coverage of three scientific topics: biodiversity, clean energy, and clean water and sanitation (Figure 3). These topics explicitly appear in NGSS standards across multiple grade levels within multiple themes. For example, biodiversity is addressed in 2nd grade, 3rd grade, middle school and high school standards in the NGSS, and in themes such as ‘Biodiversity and Humans’ and ‘Ecosystem Dynamics, Functioning and Resilience.’

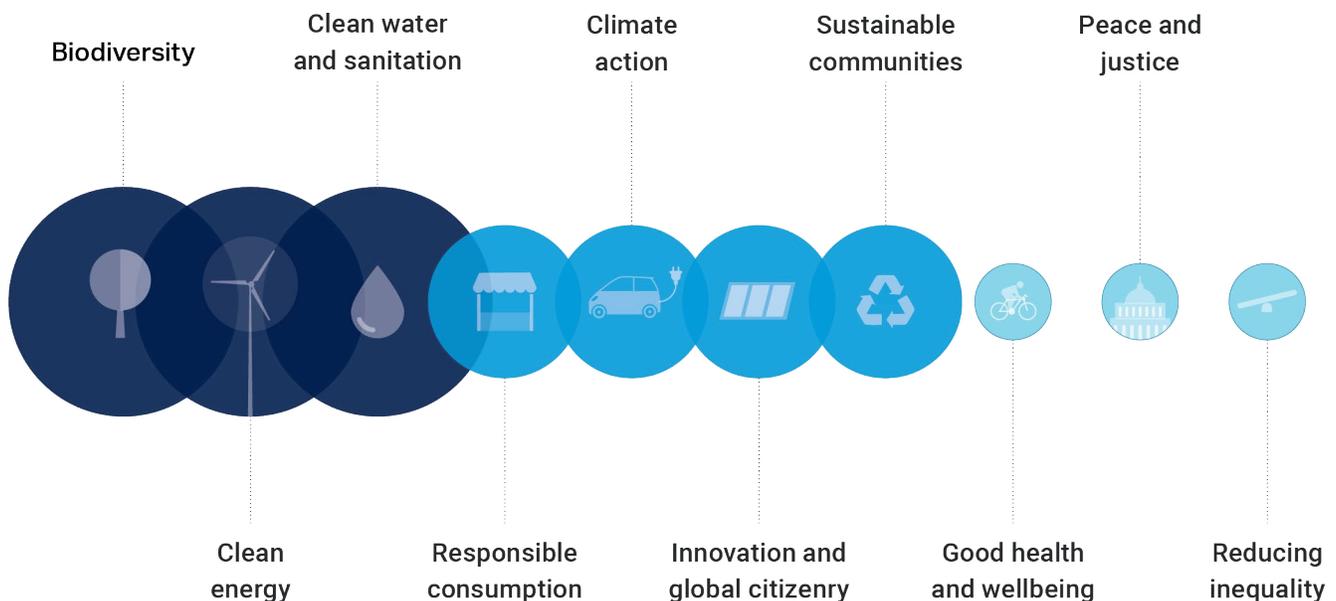
Other topics show partial alignment between UNESCO and the NGSS. These include responsible consumption, climate action, innovation and global citizenry, and sustainable communities. Though facets of the UNESCO standards align with the NGSS, depending on how a teacher implements the standards, students’ exposure to these topics is likely to vary. For example, sustainable communities is indirectly covered in a middle school standard that requires that students be able to “gather and make sense of information to describe that synthetic materials come from natural resources and impact society.” However, the extent to which an actual lesson focuses on sustainability and what makes communities sustainable (especially through local action) may vary in implementation.

Topics such as good health and wellbeing, peace and justice, and reducing inequality (which contain less natural science content) have minimal inclusion in the NGSS standards (however, see NGSS Appendix D, “All Standards, All Students”<sup>9</sup>) but are emphasized in the UNESCO standards.

**FIGURE 3**

### NGSS Coverage of the 10 Sustainable Development Topics

- **High inclusion** of 10 Sustainable Development Topics
- **Partial inclusion** of 10 Sustainable Development Topics
- **Minimal or none** of 10 Sustainable Development Topics



9 Appendix D – “All standards, all students”: Making the next generation science standards accessible to all students [Press Release]. Nextgenscience.org. <https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf>

## UNESCO Standards Concentrate on Three Domains of Learning

The UNESCO standards define three domains of learning that are essential to education for sustainable development:



**COGNITIVE**



**SOCIOEMOTIONAL**

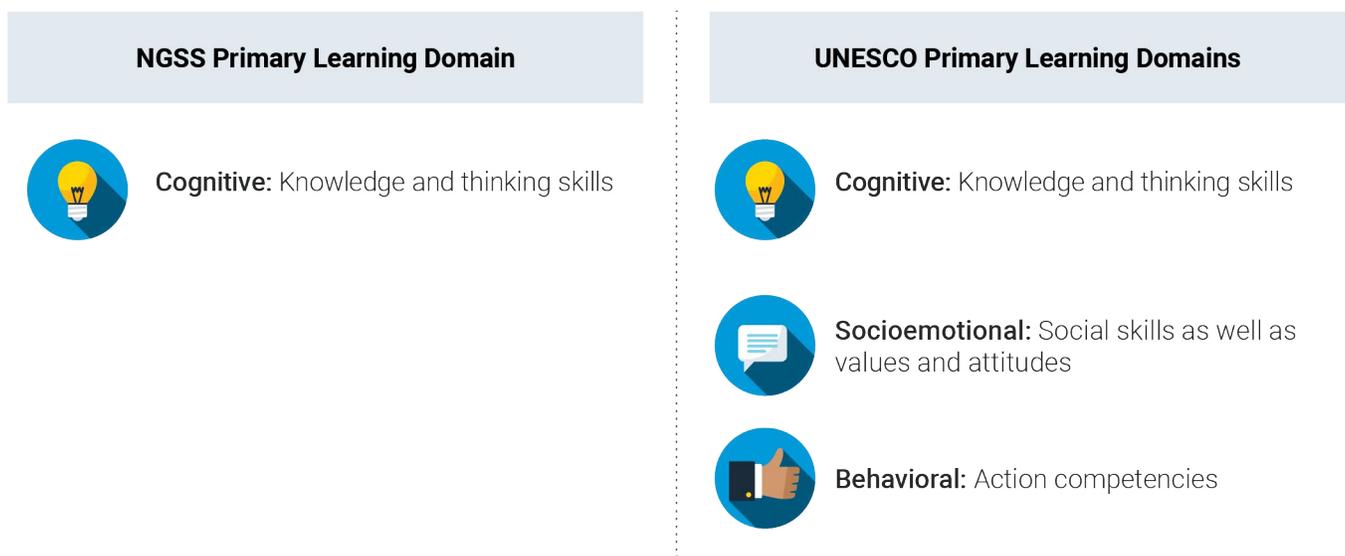


**BEHAVIORAL**

NGSS standards primarily focus on the cognitive domain by defining subject matter knowledge and critical-thinking skills students should be able to know and perform. Skills reach into the socioemotional or behavioral domains in some instances of NGSS standards (e.g., ‘Communicate Solutions’ or ‘Share Observations’) but are not inclusive of the wide range of socioemotional behavioral skills in the UNESCO standards (e.g., ‘Promote Sustainable Development Patterns’ or ‘Challenge Cultural and Societal Orientations’). This is especially true of the socioemotional domain of learning in UNESCO’s standards (e.g., ‘Show Sensitivity’ or ‘Develop a Personal Commitment’). Some NGSS standards could be considered behavioral if students were to apply them to local problems, but this application is not specified. Overall, the socioemotional and behavioral domains are largely missing from NGSS standards as they relate to UNESCO’s definition of education for sustainable development (Figure 4).

**FIGURE 4**

### Comparison of the Primary Learning Domains Covered in UNESCO and NGSS Standards<sup>10</sup>



<sup>10</sup> Domains are further defined here: <https://unesdoc.unesco.org/ark:/48223/pf0000247444>

## Using UNESCO Standards to Elevate Science Lessons: The Water Cycle

The socioemotional and behavioral domains of learning, which are part of the UNESCO standards for educating for sustainable development, can be seen as lifelong skills that bring science content to life. For teachers who want to bring sustainable development more fully into their science (or STEAM) classroom, the UNESCO framework provides a standards-based guideline. The three steps that a science or STEAM teacher could follow are outlined in an example topic below.

The water cycle is a common topic of study for science students of many ages. The following section provides an example of how UNESCO standards add socioemotional and behavioral domains of learning to the cognitive domains covered in the NGSS standards.

### 1. START WITH THE NGSS

The NGSS outlines specific disciplinary core ideas, science and engineering practices, and cross-cutting concepts that capture what middle school students should know ('The Cycling of Water') and be able to do ('Develop a Model'). These learning objectives fall into the cognitive domain of learning, as previously defined in Figure 4.



**NGSS:** *"Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity."*

Teachers in other STEAM areas, such as art or math, could use their own subject's standards in step 1 instead of the NGSS.

### 2. ADD A RELATED UNESCO COGNITIVE DOMAIN

Clean water and sanitation is also a topic area in the U.N. Sustainable Development Goals and is, therefore, included in UNESCO's standards for education for sustainable development. Much like the NGSS, UNESCO also has standards in the cognitive domain of learning. One of them reads:



**UNESCO Cognitive:** *"The learner understands that water is part of many different complex global interrelationships and systems."*

### 3. ADD UNESCO SOCIOEMOTIONAL AND BEHAVIORAL DOMAINS

UNESCO includes additional standards in the socioemotional and behavioral domains. These standards help students put cognitive objectives into practice.



**UNESCO Socioemotional:** *“The learner is able to communicate about water pollution, water access and water-saving measures and to create visibility about success stories.”*



**UNESCO Behavioral:** *“The learner is able to reduce their individual water footprint and to save water practicing their daily habits.”*

NGSS standards – especially engineering practices – could become part of UNESCO’s behavioral domain if applied to a real-world community problem. For example, a classroom might apply the NGSS standard of “generate and compare multiple solutions” to the design of a water treatment device in a local stream.

While the NGSS focuses on cognitive aspects of sustainable development, UNESCO standards include a cognitive domain *plus* socioemotional and behavioral domains (see an example in Figure 5). Appendix A contains additional examples of alignment between NGSS and UNESCO.

**FIGURE 5**

#### Comparison of the NGSS and UNESCO Standards Related to Clean Water and Sanitation

**Topics in the NGSS Standards** 

**Water Distribution**

Students understand that water is spread throughout the planet in a variety of forms. Not all of them are accessible for human consumption or use.

**Water Cycle**

Students learn that water is distributed through cyclical processes, where water changes forms and is redistributed. Disruptions to any part of the water cycle have consequences in later steps of the process.

**Human Activities**

Students understand that human activities have had effects on resources like water and human activities have the potential to address climate change.

**Topics in the UNESCO Standards**   

**Water Distribution Is Socially Unequal**

Students understand how freshwater and sanitation technologies are unequally distributed and the human impact this has on communities.

**Communicating Impacts to the Water Cycle**

Students can communicate how disruptions in the water cycle, such as pollution and production of goods, affect water accessibility and sustainability.

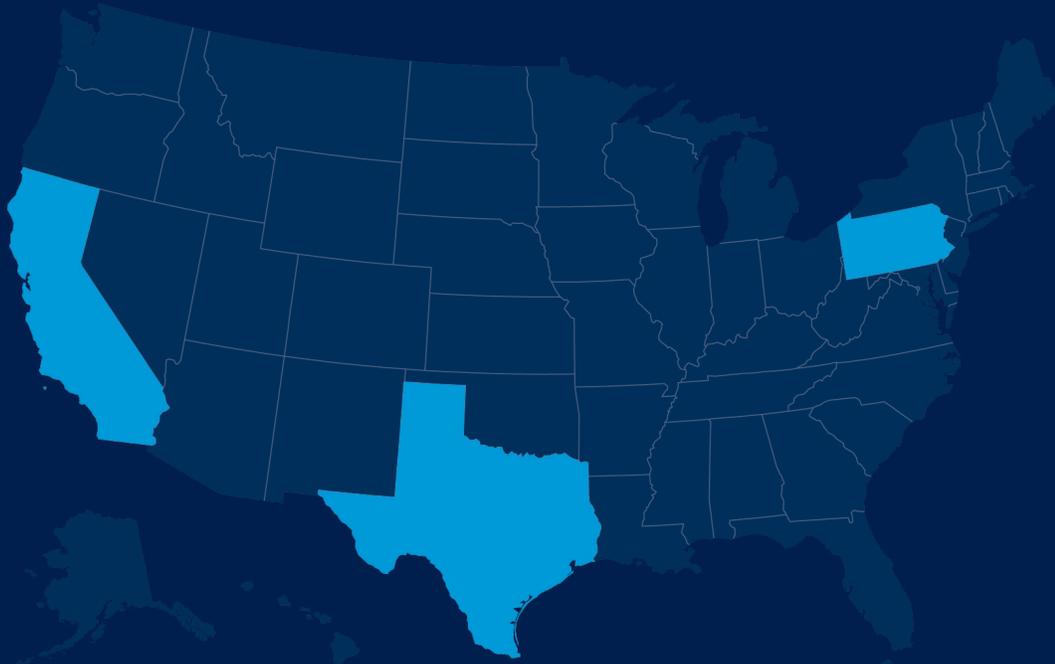
**Personal + Local Change to Activities**

Students are equipped to work towards sustainable water practices in their local communities *and* are knowledgeable about personal sustainable practices.

## State-Level Standards in the U.S.

While the NGSS depicts the national landscape of science standards, state-level standards are much more nuanced. Many states in the U.S. use an adaptation of the NGSS rather than the NGSS standards themselves, and others have developed their science standards independently of the NGSS. The Smithsonian Institution-Gallup study selected **three states** to review as exemplars of the variation in state science standards.

Important **commonalities** exist among the three states studied, Pennsylvania, California and Texas, ensuring that students in each state gain the core scientific knowledge and skills they need for success in college (or postsecondary education) and future careers. However, each set of standards also has **unique qualities** for implementation and topic coverage, especially regarding sustainable development topics.





## PENNSYLVANIA

**Pennsylvania** science standards (recently published in 2022) were developed in close consultation with the NGSS. The **STEELS standards** (Science, Technology and Engineering, Environmental Literacy and Sustainability) also include specific learning objectives for ‘Environmental Literacy and Sustainability,’ defined as the practices, ecological processes and systems that comprise the environment, including human social systems and influences. With this addition, Pennsylvania students have much more comprehensive exposure to the 10 sustainable development topics of this review. The standards also go beyond the cognitive domain to frequently include the socioemotional and behavioral domains of learning called for in the UNESCO standards. For example, the topic of reducing inequality is not directly addressed in the performance expectations of NGSS but is included in Pennsylvania state standards.

**Pennsylvania state science standard:** *“Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.”*

**Pennsylvania state science standard:** *“Examine ways you influence your local environment and community by collecting and displaying data.”*

Standards related to the socioemotional and behavioral domain are also incorporated, particularly in learning objectives that ask students to communicate their knowledge.

**Pennsylvania state science standard:** *“Obtain and communicate information to describe how best resource management practices and environmental laws are designed to achieve environmental sustainability.”*



## CALIFORNIA

**California** science standards mirror the NGSS, with the addition of a state-mandated focus on five ‘Environmental Principles and Concepts.’ This set of five principles and concepts functions like another set of standards (for both science and social studies) but is also accompanied by lesson plans that teachers can use to address the NGSS standards from an environmental lens. California reports that the Environmental Principles and Concepts were created because “a direct understanding of the connections between humans and the natural world prepares students to address the environmental challenges of today and of the future, to mitigate and prepare for natural hazards, and to interact in a responsible and sustainable manner with the natural systems that support all life.”<sup>11</sup> The instructional resources were also integrated into the state curriculum framework in 2016, “as a result, subsequent state textbook and curriculum adoptions will incorporate the Environmental Principles and Concepts.”<sup>12</sup>

These Environmental Principles and Concepts provide specific applications of the sustainable development-related science standards (as well as social studies). They are primarily within the cognitive domain of learning, as defined by the UNESCO framework.

**California state science standard (from Environmental Principles and Concepts):** *“The effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.”*

11 2016 Science framework for California public schools kindergarten through grade twelve. (2018). California Department of Education. <https://www.cde.ca.gov/ci/sc/cf/documents/scifwchapter1.pdf>

12 California Education and the Environment Initiative. (2021). *California’s environmental principles and concepts*. <https://www.californiaeei.org/epc/>



## TEXAS

**Texas** science standards were developed separately from the NGSS and adopted in 2021. The standards are specific and arranged into grade and/or course expectations. In the lower grades (kindergarten through 8th grade), the standards cover sustainable development topics to a similar extent as the NGSS.

**Texas state science standard:** *“Describe how biodiversity contributes to the sustainability of an ecosystem.”*

However, in grades 9 through 12, optional courses incorporate more of the 10 sustainable development topics than the NGSS alone, including ‘Responsible Consumption’ and ‘Innovation and Global Citizenry.’ For example, the standards accompanying an environmental course are listed as recommended for grades 10, 11 and 12 and are not found in the younger grades. The environmental course standards reference specific policies that students should be able to evaluate. This helps older Texas students to integrate social aspects into their science understanding.

**Texas state science standard:** *“Proper stewardship of Earth will prevent unnecessary degradation and destruction of Earth’s subsystems and diminish detrimental impacts to individuals and society.”*

**Texas state science standard:** *“Evaluate the goals and effectiveness of past and present international agreements such as the environmental Antarctic Treaty System, the Montreal Protocol, the Kyoto Protocol and the Paris Climate Accord.”*

In the three states reviewed, science standards varied widely from one another in content and application. For example, California includes state-created instructional materials for environmental sciences (which includes sustainable development), and Texas organizes its standards by grade and course, making them practical and instruction-oriented. While Texas standards include key environmental topics in optional courses for the older grades, Pennsylvania explicitly includes both environmental science and sustainability, integrates these concepts into more grade levels and lists them as required content. These examples are just a subset of the variations observed, and many more would be expected in a full review of all 50 states and the District of Columbia. Students’ experiences likely vary widely depending on the state in which they live. A full evaluation of U.S. standards related to sustainable development topics would require a state-by-state analysis, and findings are expected to change frequently, as state standards undergo review and adaptation.

## 2. Stakeholder Views of Sustainable Development

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The 2023 report *Educating for Sustainable Development: Perspectives of U.S. and Global Educators*<sup>13</sup> revealed that some sustainable development topics are less likely than others to feature in school lessons. Less than one-third of U.S. teachers said clean water and sanitation, climate action, clean energy, responsible consumption, and sustainable communities are either a stand-alone topic or incorporated into other subjects in their school or district curriculum. Yet, the Smithsonian Institution and Gallup’s 2024 standards review reveals that, for the most part, the cognitive aspects of these socio-scientific topics are at least partially included in U.S. science standards.

Qualitative interviews with teachers – as well as administrators, parents and students – describe how these topics are treated in the classroom.



13 Smithsonian Science Education Center. (2023, June 15). *Educating for sustainable development: Perspectives of U.S. and global educators report*. <https://ssec.si.edu/educating-for-sustainable-development-report>

## Challenges and Barriers

Previous Smithsonian-Gallup findings showed that lack of time was the one of the greatest barriers to incorporating sustainability-related topics. Out of a list of six barriers, instructional materials and lack of expertise also ranked highly. Qualitative results echoed these findings, with teachers sharing how lack of time, materials and expertise posed major barriers to integrating sustainability topics in the way they wanted.

### Lack of time and materials

Teachers raise the lack of time and materials as major challenges to including more sustainable development topics in lesson plans. Teachers say they feel limited in their ability to cover all the topics they wish to in each class period, and sustainable development topics are often deprioritized in comparison to other subjects — particularly, heavily tested subjects like reading and math.

*“Where do I fit sustainability into this curriculum when I’m supposed to be preparing students for this test, and part of my continued employment depends on students doing well on those tests right? So, I don’t want to, as much as I think it’s a great topic and I think it’s something that I could spend months diving into, I don’t have months to spend on it.” – Social studies teacher*



Relatedly, materials are difficult to source, especially with a recent move to ad hoc materials (sourced by teachers) instead of district-purchased curricular materials. Many teachers explain that pre-vetted and comprehensive materials are the most valuable, as it takes time to sort through low- versus high-quality materials. Piecing together many ad hoc materials is also time-consuming. This becomes even more complex as most teachers have to coordinate several sets of standards to match each lesson or unit.

*“We have to go seek these things out. It takes a lot of time. We don’t have any time. We have almost no planning.” – Social studies teacher*



*“Now, it is really hard to have any time to innovate with new curriculum because we are just stretched so thin. I used to spend more time looking for new and fun and interesting ways to do things, and now I’m just trying to survive.” – Science teacher*

### ADMINISTRATOR PERSPECTIVES

*“We’re cramming six different subjects into a 4½-hour day, so I agree that our teachers don’t have a lot of time to teach the sustainable curriculum that they need to teach and teach it in-depth. You know, we’re asking them to do small groups, and we’re asking them to teach ELD [English Language Development], if you’re a school that has a lot of English learners, then that becomes seven subjects in a day. So, I agree that we don’t leave a lot of time for that.”*

– Administrator

## Lack of expertise

Teachers emphasize that good materials need to be backed by expertise in order to be useful.

*“And the teacher guide would need to be more than just a script. It would need to include some background information on the topic and an overview, and not only a script for the curriculum but suggestions for the important ways of going off-script for differentiation and scaffolding and that sort of thing.” – English teacher*



The current Smithsonian-Gallup study also notes that materials would need to be standards-based to be useful to teachers. When non-science teachers describe integrating science and sustainability into their classes, they primarily do so by using their own general knowledge of topics, rather than referencing a set of standards. When asked about the materials he would use to teach a hypothetical lesson on a sustainability topic like biodiversity, climate action or clean energy, one social studies teacher said:

*“It would be me using the internet to ... find lesson plans.” – Social studies teacher*



One P.E. teacher also suggests that a lack of standards-based guidance explains why sustainable development topics are not often covered, saying “Yeah, I mean ... It’s kind of haphazard, it’s up to individual teachers more than it is any sort of push from administration or the district.”

A lack of familiarity with sustainable development standards can also lead to the misconception that they are only for teachers of certain topics.

*“I would say that’s probably valid for non-science teachers to say the sustainability doesn’t fit within their curriculum.” – Science teacher*

## Teachers' Hopes and Aspirations

Many teachers consider sustainable development topics as **valuable** and an opportunity for student engagement. Teachers also see an **opportunity for cross-disciplinary integration**, even though structural barriers like class schedules often prevent teachers from coordinating with one another to achieve this integration.

### Driving student engagement

Many teachers see sustainable development as a topic of commonality and part of a successful future for students. Teachers are optimistic that more coverage of sustainable development could benefit student engagement.

*"Sustainability affects all of us." – Social studies teacher*

*"I know for a fact that students are very concerned about the environment and the climate. So, it would speak to them, and we would already have a buy-in, because this is real-world pressing issue, and it affects everybody everywhere." – Art teacher*

*"When curriculum is local and is something that is relevant to kids, the natural conclusion is always going to be ... how do we make this better for our community, or ... what is this going to look like in the future?" – Science teacher*

Using the UNESCO standards to guide lesson planning may help teachers who want to equip and engage their students with the behavioral dimensions of sustainable development (like taking action).

#### STUDENT PERSPECTIVES

*"I think that's an important thing to talk about because there might be things that we don't know much about, and we try to fix them without realizing what it can do to us and those things around us."  
– 6th grade student*

*"I feel like [sustainability is] a 5 [out of 5 for importance]. Because ... everything that we would take into consideration with learning about sustainability ... we could ... use it in the real world, and then also use it to help our environment if we see fit that it has ... any problems ... it's facing, or ... any changes that we feel ... needs to be done."  
– 11th grade student*

*"We're learning about all these horrible things that people aren't doing ... I wish we were taught more about what we could actually do in our communities that could be impactful."  
– 12th grade student*

#### PARENT PERSPECTIVES

*"She really likes real-life examples and things she could talk about, things she could relate to. She'll get riled up about fiction stories, just anything she can have an opinion about."  
– Parent*

## Opportunities for cross-disciplinary integration

**Teachers emphasize the cross-disciplinary nature of sustainable development topics and note they don't fit neatly in one box.**

*"Sustainability, it doesn't have that home ... they might have one teacher who does it, but they are also involved in a bunch of other things." – Social studies teacher*

*"I couldn't possibly get all and/or even most of [the sustainable development topics] without getting cross-curricular, without getting the social studies teachers involved for justice and the history of why these people have so much and those people have less than nothing ... I couldn't even touch fracking without the backing of the geography teacher, the earth science teachers." – English teacher*



Cross-disciplinary materials could support educators as they interweave multiple sets of standards into cohesive and effective lesson plans. Standards-based guidance on how to integrate sustainable development into existing lessons would help teachers clearly define goals for their students and address time concerns. This equips teachers who want to integrate education for sustainable development while meeting state standards requirements.

*"I think if it [sustainable development] was intertwined into what we're already doing, people would be really happy, and I think they would feel motivated. If we were, for example, to incorporate this both in our facilities and in our curriculum and in our lessons, I think students could find it really ... relatable." – Art teacher*

Importantly, several teachers noted the importance of still having flexibility as an educator to use the instructional materials as they see fit.

*"I think that having curriculum [to scaffold our teaching about sustainable development] is, really good, but teachers need flexibility with how they interact with it." – P.E. and English teacher*



### ADMINISTRATOR PERSPECTIVES

*"[What we'd want is] a curriculum that lends itself to teaching multiple contents at once, because the one we have now is not good at all and something hands on."*

*– Administrator*

## Building professional connections

Although they identify serious time constraints as barriers to their instruction and development, teachers still wish they had more time for collaboration with one another. Teachers see their community of educators as a way to build expertise and provide students with rich and multi-faceted lessons. Teachers also want opportunities to learn from scientific and cultural experts.

*"I think that geometry, conceptually, has a lot of room for talking about, for example, design, innovation, biodiversity in terms of ... density. There are so many ways that you could work that in. There's just the curriculum doesn't make room for it, and I think that's probably the case for other teachers."* – **Math teacher**

*"As it is right now, we don't have access to experts on it. We don't have the time to get together and meet up, unless we decide to do it outside of school hours."*  
– **Art teacher**

### ADMINISTRATOR PERSPECTIVES

*"[Teachers] would need time, actually, to ... learn the [sustainable development] curriculum, to develop lessons associated with the curriculum, and the time would have to be ... consistently offered. And I think that's one thing that ... teachers struggle with often, is that when something is introduced, they're given time initially, but then that time kinda goes away."*

– **Administrator**

*"We would need training and professional development by any practitioner, I'm not going to say expert, but practitioner who could give our staff real, very practical ways in which they could put an influx of this topic into their lessons."*

– **Administrator**

### 3. Teachers' Request for Scientific, Cultural and Educational Organizations

As part of the 2023 report *Educating for Sustainable Development: Perspectives of U.S. and Global Educators*,<sup>14</sup> findings revealed that U.S. teachers have a clear preference for the materials they would most likely use to teach about sustainability: field trips, hands-on materials, guest speakers, digital simulations, online free resources, literacy stories and videos ranked highest out of a list of options (Figure 6). The 2024 report provides deeper insight into the materials – and other types of support – teachers request most.



14 Smithsonian Science Education Center. (2023, June 15). *Educating for sustainable development: Perspectives of U.S. and global educators report*. <https://ssec.si.edu/educating-for-sustainable-development-report>

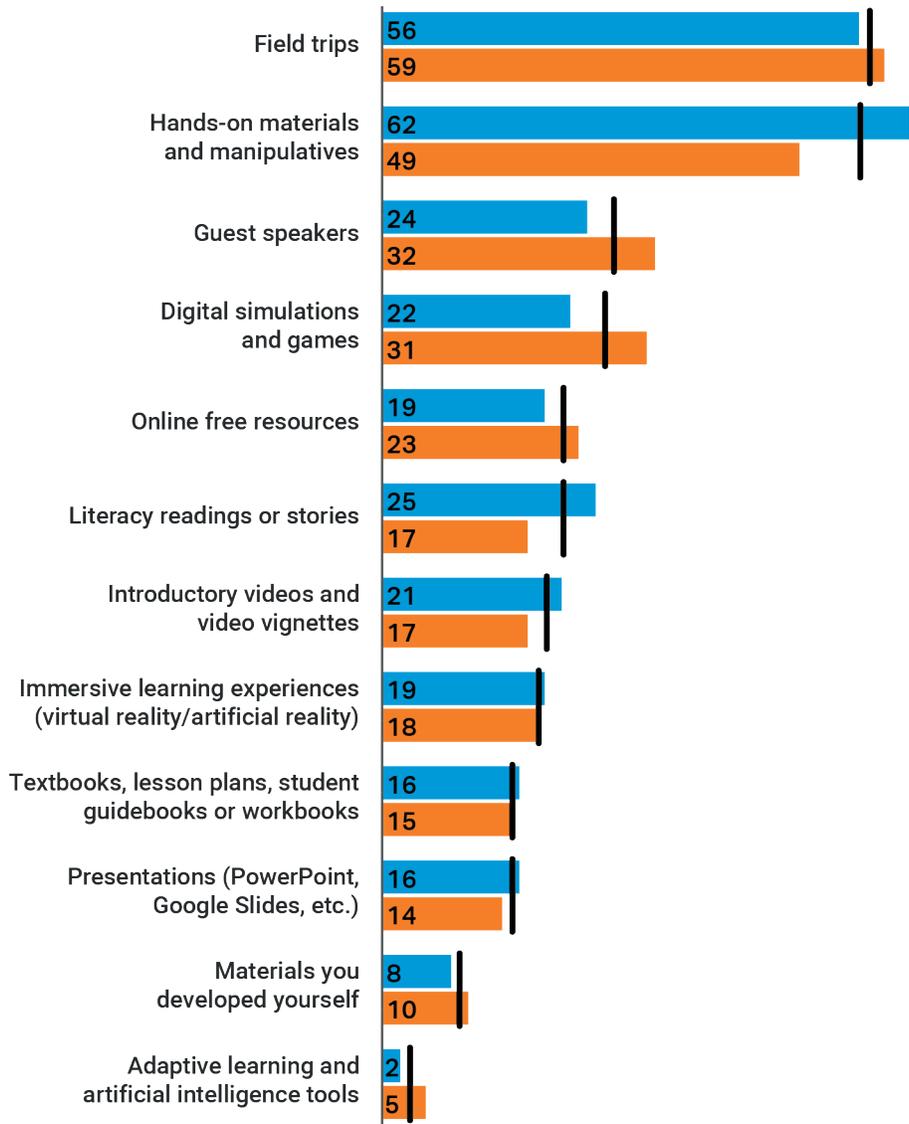
**FIGURE 6**

**Materials U.S. Teachers Most Prefer for Teaching About Sustainability**

Select the materials you would prefer to use to teach about sustainability. Select up to three.

% Selected

■ Teaches science ■ Does not teach science | All U.S. teachers



Reprinted from *Educating for Sustainable Development: Perspectives of U.S. and Global Educators* report.

In the 2024 study, teachers of multiple content areas say they value sustainable development topics as well as opportunities to make cross-disciplinary connections in their lessons. However, they also mention clear challenges to doing so. Results from this study provide scientific, cultural and educational organizations, like the Smithsonian Institution, with action items to support teachers who wish to incorporate more sustainable development topics. Stories from parents, students and administrators support these needs.

## Help Teachers Incorporate Cross-Disciplinary Topics Into Existing Classes

**To incorporate sustainable development topics, teachers say they must be clearly aligned with their content standards.**

Teachers are emphatic that finding the right materials — those that are high-quality, from trustworthy sources and align with their content standards — is a time-consuming process. Furthermore, if teachers do not recognize how sustainable development topics are related to the standards they already teach, the topic might seem out of reach. Scientific, cultural and educational organizations could help by providing trustworthy instructional materials that clearly show how the lessons address cross-disciplinary standards.

*“So, if it’s not part of a standard, then we’re not supposed to spend time on it.”*  
– **Social studies teacher**

*“I think [sustainable development topics] can ... be part of ... a history or social science class, but I don’t think it’s directly something that’s taught. I believe all those courses try to stick to more of the standards.”* – **Math teacher**

The most valuable instructional materials help connect teachers to background knowledge, whether through primary sources or cultural and scientific experts. Parents in the 2024 study’s sample also refer to the value of having real-world examples that come from such experts.

*“Something that’s always, I think, really impactful and powerful that I have never heard my daughter talk about them talking about at school is specific examples of young people who are making a difference ... So, yeah, you can make a difference, because here are some other kids that are making a difference. I think that’s always powerful.”* – **Parent**

*“Getting access to articles that are appropriate for students ... I think having that access to being able to apply that directly to your unit is going to make that easier for teachers to implement.”* – **Teacher**

With respect to young people making a difference as it relates to real-world examples, scientific, cultural and educational organizations likely have unique access to the type of role models parents might be looking for.

## Spread the Word About Sustainable Development as a Necessary Skill for the Future

**Teachers and parents in the sample speak about their children's future when they speak about sustainable development.**

Many teachers, parents and students see literacy on sustainable development as a relevant skill for their children's, or their own, future.

*"I do think sustainability is an important topic, where students go into their future and hopefully work on solving those problems for us."*

– **English language learning teacher**

*"Without it [sustainability topics], they won't have the things they need for their kids in the future if you don't pay attention to what's affecting it ... If you're overfishing, you're overharvesting plants ... then it's not going to be there later so, that balance of the need versus the people." – **Parent***

Parents in this study sample also recognize that their children need foundational skills in core content areas. Educational organizations can assist parents and teachers by shining a light on ways that goals for environmental literacy and math or reading literacy can mutually support one another.

*"It is important that they are cautious and responsible for the resources that they have now so that they'll be available in the future. But in a grand scheme of things, I still believe in those core curriculums that need to be learned." – **Parent***

*"I think [subjects] like history, science, English and math are a little more important, but sustainability is also very important." – **Student***

*"I'd ask each teacher who's a master or an expert in their own domain to think of a way to incorporate lessons around those topics. You know, whether it's in short stories that they're reading ... just ask them to make that a topic that they cover because it's something that is not going away." – **Administrator***

Targeted communication is still needed to help teachers, parents and administrators see the connection between sustainable development topics and foundational skills like reading and math.

## Elevate Parental Support and Build Connections

Teachers need and want to know their lessons are supported by their community.

Teachers' and administrators' perceptions of their community's support for sustainable development topics are mixed. However, some parents in the study sample voice positive support. Where that positive support exists in communities, scientific, cultural and educational organizations can help to elevate voices and let teachers and administrators know that those topics are welcome.

*"Our school board is not talking about sustainability. Our parents are not talking about sustainability. It is not a topic that gets brought up. And I don't know if it's not that it's, like, avoided by any means. It's just not something that, like, we have so many other things that we're talking about." – Administrator*

Educational organizations could elevate parents' support for sustainable development and empower parents who want to be involved – both in the classroom and outside of it. Extracurricular programming, such as after school programs or clubs, may be an underutilized vehicle.

*"I've got a lot of ideas when it comes to helping this world and the planet and stuff. And for our future, I just wish I had somewhere to share it. I don't know if they are working on it, but I sure would like to try." – Parent*



# Conclusion

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Teachers in the U.S. are interested in sustainable development topics and see them as valuable to incorporate in many content areas. Parents, students and administrators in the study sample support this interest and see them as benefiting student engagement. Why, then, is sustainable development a less prominent component of curricula in the U.S. than in other countries?

## Findings From the Standards

While the NGSS includes standards for some of the knowledge and skills related to sustainable development, they are mostly limited to the cognitive dimension. **UNESCO objectives go further to include socioemotional and behavioral domains of learning**, which they have identified as crucial aspects of proficiency in sustainable development. State-level science standards in the U.S. overlap in content but vary widely in their approach to teaching about sustainability. For teachers who wish to incorporate sustainable development topics, using the UNESCO standards — along with the NGSS standards — to guide their lessons could empower students to not just learn about science topics, but to engage with them in ways that are meaningful to their own lives.

## Findings From Teachers' Voices

The path to implementing science standards varies greatly across states and communities. **Constraints on time and quality materials** make it hard for science teachers to meet science standards in a way that elevates sustainability development topics. For non-science teachers as well as some science teachers, a **lack of expertise** in education for sustainable development means that efforts to include sustainable development topics are not always part of a standards-based curriculum. This makes it difficult for teachers to focus their efforts and measure progress, and some are not aware of how sustainable development learning objectives could align with their content. Many teachers, as well as some parents and students in the study sample, see sustainable development topics as **engaging for students**. Many teachers also see the topics as an opportunity for cross-disciplinary integration and wish they had more time for **professional networking to improve their expertise** in sustainable development.

## Findings for Cultural and Educational Organizations to Use

Scientific, educational and cultural organizations are well-positioned to offer the support teachers say they most want. Developing and distributing educational materials that have **standards with clear cross-disciplinary integration** could help teachers bring sustainable development into their goals for English, history or math lessons without losing instructional or planning time. Teachers (of all subjects) also want **high-quality and pre-vetted materials** to save them time and connect them to the background knowledge they need to teach about sustainability. Finally, connecting educational stakeholders with one another – and with community resources – could **leverage the power of shared interest** noted in this study. Where parents, students, administrators and teachers agree that sustainable development is important to study, educational organizations can help get them the resources they need to meet their goals.



# Closing Thoughts From Smithsonian STEAM Educators

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The [Smithsonian's Life on a Sustainable Planet Initiative](#) envisions a future where humanity lives in balance with the natural world. As you have learned from the results of this report, teachers are interested in teaching about sustainable development topics but face a range of challenges. Parents, students and administrators also support this interest and see learning about sustainability as beneficial and acknowledge the barriers and opportunities teachers face.

As the world tackles challenges brought on by a rapidly changing climate, it will be imperative that we all adapt and adopt solutions that will lead to the sustainable development and use of resources. Since our founding in 1846, the Smithsonian Institution's purpose has been to increase and diffuse knowledge. We are well positioned to inspire the next generation of critical thinkers, researchers and problem-solvers by leveraging our vast collections, museums, education and research.

**We understand that youth, caregivers, parents and teachers need tools to help them build trust in the scientific process and be good consumers of scientific knowledge that can improve their quality of life: from the theory of evolution, to landing a person on the moon, to the development of vaccines.**

We've heard the participants of this study loud and clear. As representatives of the world's largest museum, education and research complex, we intend to ensure that every educator and student has access to the educational tools necessary to encourage curiosity and develop knowledge, skills and values that will support sustainability **and empower learners to envision the possibilities of the future**. We will connect internal experts and engage external partners and audiences to develop resources and opportunities that help educators, parents, caregivers and students overcome barriers to implementing sustainability topics through the Smithsonian's Life on a Sustainable Planet initiative.

In addition, we will empower present and future generations, especially those from historically underserved and underrepresented communities, to use science, technology, engineering, arts and mathematics (STEAM), along with history and culture, to engage in reflective reasoning to solve complex sustainability problems that intersect across disciplines.

Teachers and students want to make a difference in the world. The Smithsonian is developing integrated, inquiry-based STEAM education programs and compelling storytelling that builds on all Smithsonian collections, scientific research and interdisciplinary expertise in art, design, history and culture to ensure that science is accessible to youth ages 0-18 and their families, caregivers and educators no matter where they are. Together, we can ensure a more transformative shared future.

Sincerely,

### Smithsonian Institution's STEAM Education Working Group

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# Methodology

Teacher and administrator participants were sampled from those who had previously completed the quantitative survey and indicated their consent for recontact. Gallup conducted 45-minute in-depth interviews with 22 teachers and eight administrators through a virtual platform. Interviews were also conducted with 10 parent-student dyads. The parent of each dyad was sampled from the Gallup Panel™ and provided consent for their student to also participate. All participants who completed the interview received a monetary incentive for volunteering their time.

Quantitative data were collected as part of the *Educating for Sustainable Development: Perspectives of U.S. and Global Educators* report. The margin of error (MOE) for the 1,237 U.S. teachers is  $\pm 3.3\%$  at the 95% confidence level, and for the 443 U.S. administrators it is  $\pm 4.9\%$ . Details can be found in full in the report.<sup>15</sup>



15 Smithsonian Science Education Center. (2023, June 15). *Educating for sustainable development: Perspectives of U.S. and global educators report*. <https://ssec.si.edu/educating-for-sustainable-development-report>

# Appendix

FIGURE 7

## Comparison of the NGSS and UNESCO Standards Related to Clean Energy

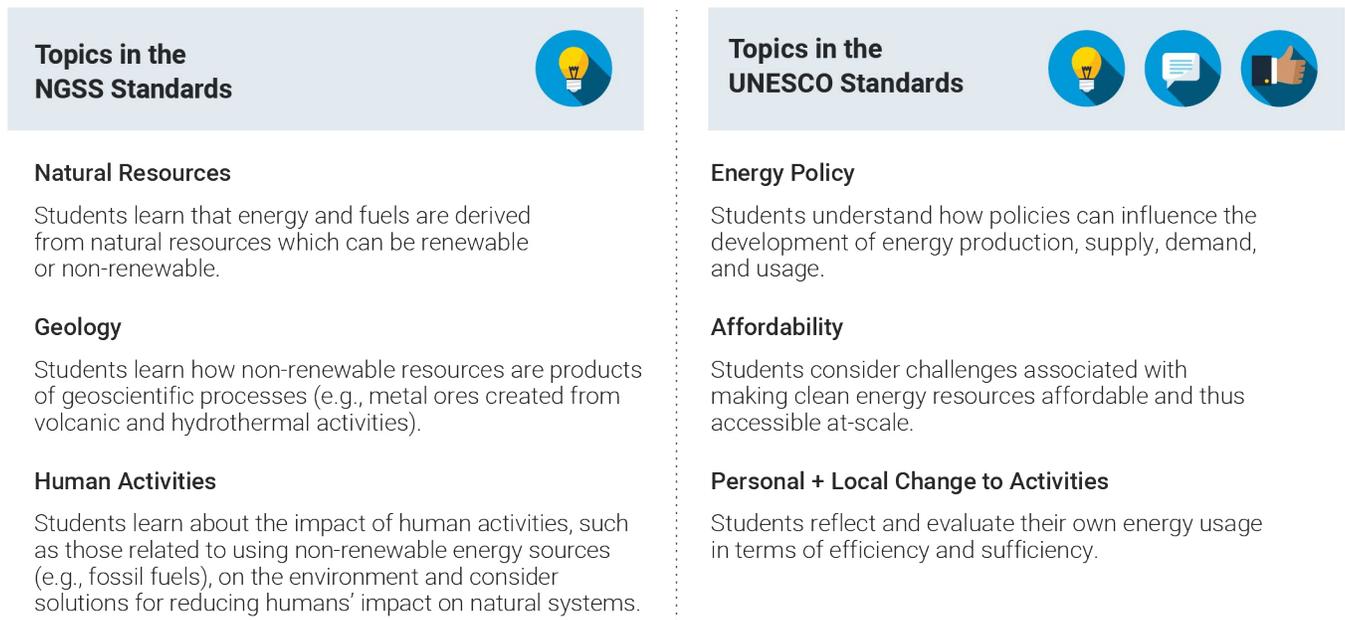


FIGURE 8

## Comparison of the NGSS and UNESCO Standards Related to Biodiversity

