The Lawrence Hall of Science
UNIVERSITY OF CALIFORNIA, BERKELEY

CALIFORNIA ENVIRONMENTAL LITERACY INITIATIVE

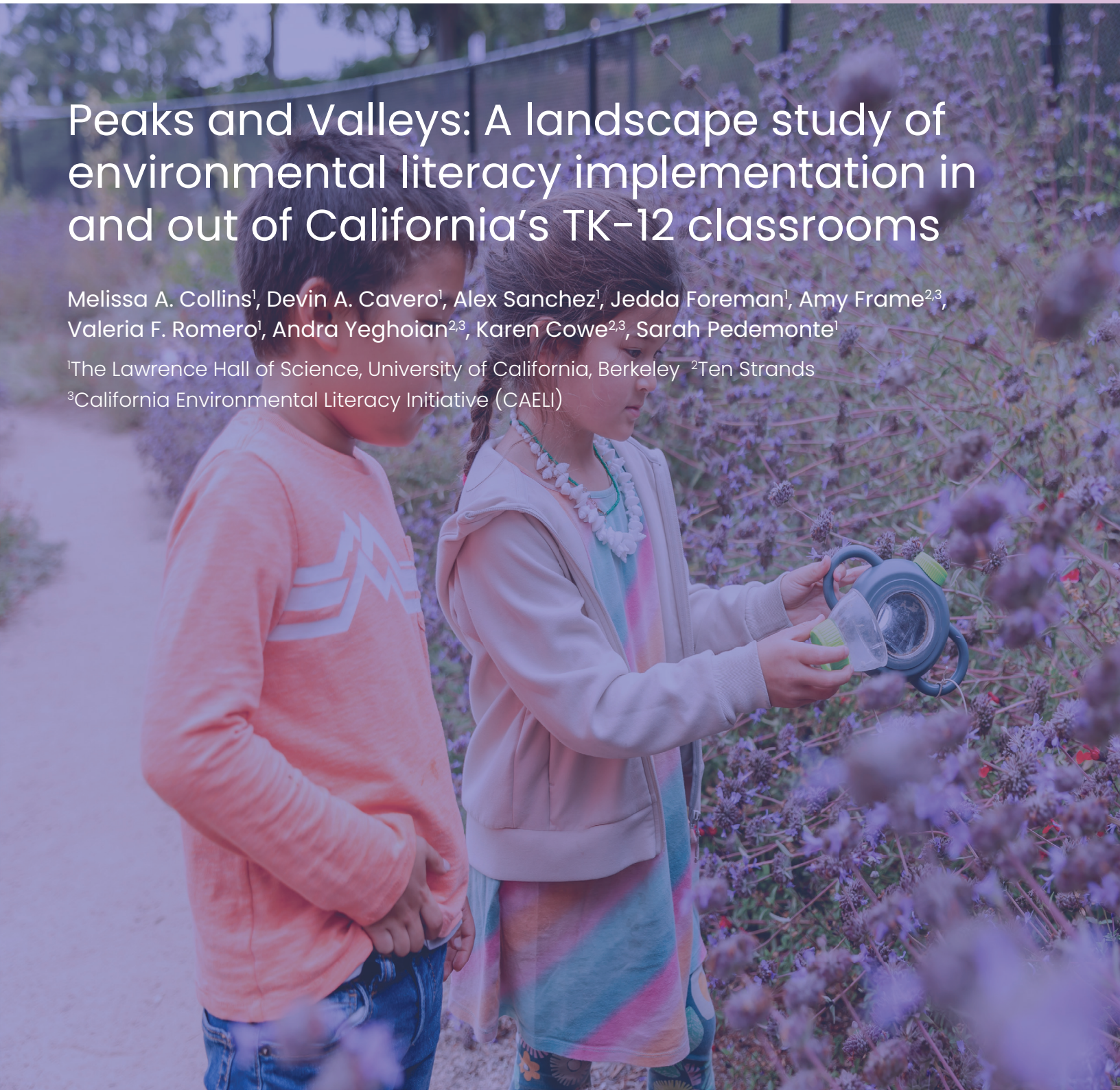
Ten Strands
Connecting Education, Environment, and Community

RESEARCH REPORT

Peaks and Valleys: A landscape study of environmental literacy implementation in and out of California's TK-12 classrooms

Melissa A. Collins[1], Devin A. Cavero[1], Alex Sanchez[1], Jedda Foreman[1], Amy Frame[2,3], Valeria F. Romero[1], Andra Yeghoian[2,3], Karen Cowe[2,3], Sarah Pedemonte[1]

[1]The Lawrence Hall of Science, University of California, Berkeley [2]Ten Strands
[3]California Environmental Literacy Initiative (CAELI)



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Executive Summary

For decades, Californians — like populations around the world — have been experiencing the ramifications of centuries-long environmental destruction. Children and youth across the state have demonstrated their deep concern and urgent desire for action through grassroots organization as well as advocacy for both environmental and climate justice and conservation. Yet it is unclear whether opportunities to develop the knowledge and skills to be environmentally literate, and then to take action to address environmental issues based on that literacy, are available to all children and youth across California – particularly in TK-12 formal schooling. This California Environmental Literacy Landscape Analysis study – initiated by CAELI and Ten Strands and carried out in partnership with The Lawrence Hall of Science – aims to determine the extent to which environmental literacy is being implemented both inside and outside classrooms across the state.

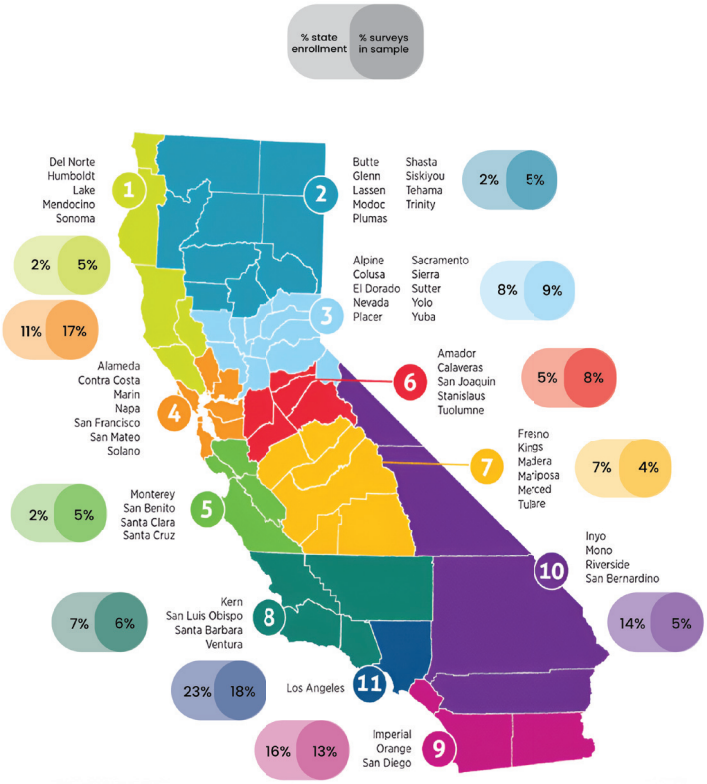
Methods

For this survey, we constructed a multifaceted definition of environmental literacy, based on key documents and frameworks in two sources: California: A Blueprint for Environmental Literacy, legislation and Education Code revisions (SB720), and the Green Ribbon Schools award program. Recruitment for participation in this landscape analysis occurred from October 2023 through January 2024 and leveraged the networks of the California Environmental Literacy Initiative (CAELI). The study aimed for a sample that was representative of the state of California. To do so, recruitment was stratified by region based on the California County Superintendents regions and cross-checked against the 2020 Census regions.

SAMPLE

We received 1,080 valid surveys from 909 educators and 171 administrators. The surveys were approximately representative of California in terms of region, school type, and educator characteristics. About two-thirds of responding educators teach science. There was a relatively even distribution of grades taught by responding educators (TK-12), with TK-2 slightly underrepresented. Educators responding to the survey teach approximately 80,000 students across California. The sample was skewed to individuals with a predisposition toward environmental awareness, so results may overestimate the level of implementation of environmental literacy learning experiences around the state.

Figure 1. Regional Enrollment and Survey Representation



Core Findings

The data reflect the extent of environmental literacy instruction across various dimensions of the TK-12 field, both revealing promising trends and indicating widespread engagement with environmental literacy initiatives throughout the state. However, they also point to areas where improvement is needed to ensure comprehensive and equitable instruction.

PROMISING TRENDS

- Momentum toward having a critical mass of educators with expertise in implementing environmental literacy has been building, and achieving such a mass is shown to be possible in all grade levels and subject areas. We now need to make better use of structures and forums to build capacity by sharing this expertise.
- Environmental nonprofits are a critical component of California's statewide infrastructure (with some notable exceptions). Therefore, we should invest in the capacity of both community-based partners and education systems to collaborate.
- School campus sustainability policies and initiatives provide real-world learning opportunities if schools can leverage them as a foundation for environmental literacy experiences for children and youth as well as for professional learning for adults.
- High school educators teach about climate change, but educators in the earlier grades need more support.

OPPORTUNITIES

- Students need more access to outdoor environmental literacy experiences.
- Educators need support to consider the intersections of race, culture, and environmental literacy.
- The formal education system needs to invest in meaningful partnerships with Native communities that enhance the capacity for relationship building with tribal communities and engage Native American leaders and educators in integrating Traditional Ecological Knowledge.
- Educators and administrators alike need additional curricula and instructional materials that integrate environmental literacy.
- Educators and administrators also require time to engage in professional learning experiences that build capacity for environmental literacy.

Conclusion

Given the range of statewide policy documents, various instructional materials requirements, and the demonstrated expertise of many educators and administrators, we believe there is a strong foundation for environmental literacy in California. However, to reach the vision set forth in the California Blueprint for Environmental Literacy, there must be a significant investment in broader implementation and scale. While there are many promising trends and room for growth in this dataset, perhaps the most promising of all is that 83% of educators and 84% of administrators want more environmental literacy! It is critical, for the health and well-being of our children, youth, communities, and California's vast ecosystems, that we, collectively, respond to this call and provide the resources that our state's schools need in order to integrate environmental literacy and sustainability across their communities.

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Introduction

For decades, Californians — like populations around the world — have been experiencing the ramifications of centuries-long environmental destruction. Youth across the state have demonstrated their deep concern and urgent desire for action through grassroots organization as well as advocacy for both environmental and climate justice and conservation. Yet it is unclear whether opportunities to develop the knowledge and skills to be environmentally literate, and then to take action to address environmental issues based on that literacy, are available to all children and youth across California – particularly in TK-12 formal schooling. This report provides a snapshot of the current status of environmental literacy education in TK-12 schooling across California by sharing the results of a statewide survey.

BACKGROUND

In 2003, Assembly Bill (AB) 1548 (Pavley)[1] called for the creation of California Environmental Principles and Concepts (EP&Cs)[2] and the Education and Environment Initiative (EEI)[3] model curriculum, which was designed to demonstrate how to integrate the EP&Cs into standards-based instruction in both science and social studies. The EP&Cs illustrate the interdependence of human social systems and natural systems. In 2005, Assembly Bill 1721[4] called for the EP&Cs to be included in the textbook adoption criteria for science, social science, mathematics, and English language arts. The 85 EEI model curriculum units have been used by over 33,000 teachers in the state.

In 2014, the State Superintendent of Public Instruction, Tom Torlakson, created the Environmental Literacy Task Force to create A Blueprint for Environmental Literacy.[5] This Blueprint lays out a vision of expanding environmental literacy based on a number of guiding principles: 1. Equity of Access; 2. Sustainability and Scalability of Systems; 3. Collaborative Solutions; 4. Commitment to Quality; 5. Cultural Relevance and Competence; and 6. Variety of Learning Experiences. In January 2016, the environmental organization Ten Strands launched the Environmental Literacy Steering Committee (ELSC) to implement the ideas in the Blueprint. In 2019, when the State Superintendent of Public Instruction was termed out, the effort was relaunched as a public-private collective action network called the California Environmental Literacy Initiative (CAELI).

Finally, in 2018, Senate Bill (SB) 720 (Allen)[6] stated that the EP&Cs were "fundamental to the definition of environmental literacy in California." The bill updated Education Code Section 51227.3 to state that the EP&Cs should be "integrated into the content standards and curriculum frameworks in the subjects of English-

language arts, science, history-social science, health, and, to the extent practicable, mathematics" and further should be included in the criteria developed for textbook adoption in those subjects. Since 2016, the EP&Cs have been integrated into content frameworks in science, history-social science, health, arts, world languages, and mathematics.

Most recently, California passed AB285 (2023)[7], which amends Sections 51210 and 51220 Ed Codes for grades 1-6 as well as grades 7-12, to require that science courses study shall include "material on the causes and effects of climate change and methods to mitigate and adapt to climate change" beginning in the 2024-25 school year. While California adopted science standards based on the Next Generation Science Standards (NGSS) in 2013, implementation has been slow. The state's adopted curriculum list for K-8 was not released until 2018, and many districts' adoption processes were stifled by COVID in 2020 and remain somewhat limited. Because science was added to the state's school accountability dashboard only this year (2024), there is likely to be a renewed emphasis on professional learning around the adopted curriculum.[8]

Due to advocacy and legislation led by the nonprofit sector, the integration of environmental literacy into K-12 professional learning and student education has certainly improved since the early 2000s. From 2014 to 2020, the NGSS Early Implementers Initiative partnered with 8 California school districts to provide professional learning around Next Generation Science Standards instruction.[9] The Initiative frequently used environmental issues during the teachers' professional learning sessions and institutes, and encouraged both teacher-leaders as well as teachers themselves to use environmental phenomena while implementing NGSS. Of the teacher-leaders who made up the core cohort (i.e., participated the most in the initiative), 86% reported "fairly" or "thoroughly" understanding how to address environmental literacy in science instruction.

Alongside environmental literacy, the movement toward sustainability in school facilities has also gained momentum. The Green Ribbon Schools Award program, a federal program, recognizes schools that "achieve excellence in resource efficiency, health and wellness, and environmental and sustainability education".[10] From 2014 to 2024, the number of California awardees increased, as did with the proportion of Gold and Green

Achiever honorees – the Gold ranking indicates "full integration" of its three pillars while the Green ranking indicates exemplary full integration.[11] In this period, 163 public schools and school districts received an award.[12] The number of districts expressing formal interest has tripled in the past four years alone. The environmental education movement has also been improved, along with another national program, the Bay Watershed Education and Training (B-WET) Program, which in 2002 received the first-ever federal funding to provide environmental education opportunities for students and professional learning for teachers.[13]

Despite these improvements, the quality as well as the consistency of environmental literacy instruction across California is still relatively unknown. Across the United States, studies on teachers, students, and academic materials suggest that success in implementing environmental literacy education varies greatly. Pre-service programs generally do not incorporate environmental literacy; therefore, teachers in those programs must rely on the services of environmental education organizations to gain the hands-on experiences integral to building their capacity in teaching environmental literacy.[14] This is a significant issue, since the state has mandated that EP&Cs be integrated into K-12 curricula, yet pre-service teachers are not consistently receiving the training needed to successfully integrate these topics. A new California initiative, the Environmental Climate Change Literacy Projects

(ECCLPs), is beginning to address this gap through the schools of education in the University of California (UC) and California State University (CSU) systems.[15] Once teachers are in classrooms, they have limited time to acquire professional learning in environmental literacy integration and instruction.[16] The quality of textbooks can also serve as a barrier to accurate, high-quality environmental literacy instruction. In a study of middle school science and high school history textbooks in California, researchers found that publishers used language that reflected uncertainty around the causes and impacts of climate change, or that their books sometimes contained little coverage of climate change.[17, 18] While as of 2018 new textbooks on the California instructional material adoption list are required to include the EP&Cs, many outdated textbooks may still be used today around the state, due to financial barriers or other district factors.[19]

With the onslaught of the COVID-19 pandemic, hands-on experiential learning that bridged classroom instruction with the outdoors was severely reduced as schooling turned virtual and many outdoor education programs shut down. With that, other avenues for professional learning for teachers and engaging learning experiences for children and youth were lost.[20] While the Association for Environmental & Outdoor Education (AEOE) and CAELI have both made strong progress with community-based partners in rebuilding the network of environmental education partner organizations,[21] there is still a need to continue building out the field of high-quality environmental education opportunities with community-based partners across California.

STUDY OVERVIEW

With the various state legislative changes and the historic upheaval from COVID-19, this California Environmental Literacy Landscape Analysis study aims to determine the extent to which California's stated vision of environmental literacy is being implemented inside and outside classrooms across the state. Our team — composed of members of Ten Strands, the California Environmental Literacy Initiative (CAELI), and the Lawrence Hall of Science's Center for Environmental Learning — decided to focus on those professionals working directly on school campuses. These include teachers, principals, teacher-leaders, instructional coaches, and other school personnel in educational roles (e.g., paraeducators and librarians). Through this survey, our goal was to identify areas of strong achievement and then to determine which students and educators might currently lack access to environment-based learning experiences. We intend for this information to be used by school districts as well as county offices of education to make equity-focused decisions regarding support for student programs, professional learning, and other resources.

Methods

DEFINING ENVIRONMENTAL LITERACY

For this survey, we constructed a multifaceted definition of environmental literacy based on key documents and frameworks in California: A Blueprint for Environmental Literacy, legislation and Education Code revisions (SB720), and documentation in the Green Ribbon Schools award program. Because we wanted to discover which aspects of this context are most robustly implemented, this study examined various indicators, among them environmental literacy content, pedagogy, and school system policies.

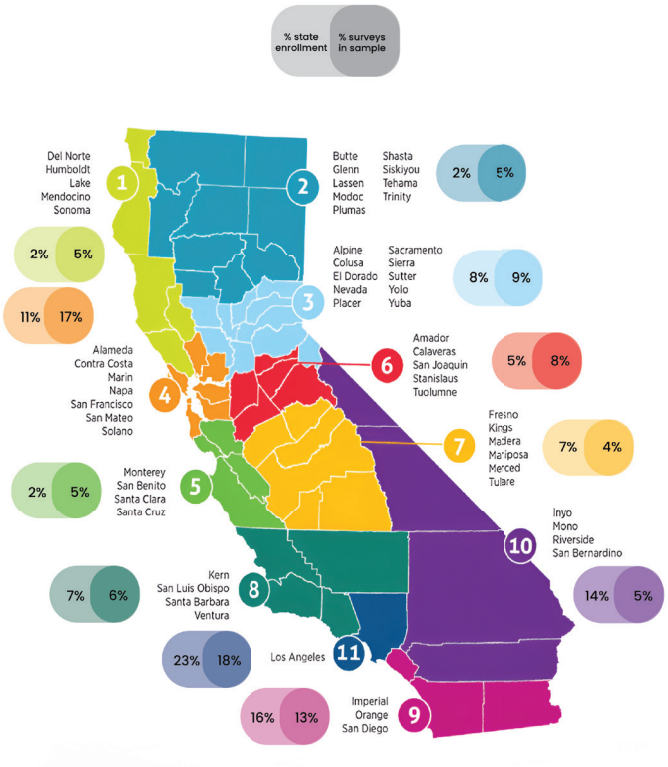
A Blueprint for Environmental Literacy provided a guiding framework for what students should learn and how this content could be taught. Environmental literacy content was further defined in this study by the Environmental Principles and Concepts (EP&Cs) and accompanying topics as codified in the Ed Code by SB720. We also asked educators about their implementation of content frameworks (which include the EP&Cs for most subjects), content standards (which include the EP&Cs for science), and instructional materials (which are currently required to include the integration of the EP&Cs as adoption criteria for English language arts, science, history-social science, health, and mathematics if practical). The study also incorporates content and instructional strategies from the Green Ribbon Schools application. For example, topics include sustainability in waste, water and energy use, and instructional strategies such as civic engagement and outdoor education.

Each question in the survey was designed to address one or more elements of these guiding documents and frameworks. We provided participants with this definition of environmental learning experiences: "Learning experiences through which students explore environmental issues, engage in problem-solving, and/or take action to improve the environment. These experiences may be in or outside the classroom, including outdoor and informal education experiences on or off-site. For this survey, we [only asked] about school-affiliated activities during the school year (i.e., not family trips, summer camps, etc.)."

RECRUITMENT

Participants were recruited from October 2023 through January 2024, leveraging the networks of the California Environmental Literacy Initiative (CAELI). Members of CAELI reached out to district representatives and county offices across the state to ensure the wide distribution of the survey. They also disseminated the survey through representatives at various education-based associations and organizations, such as the Association of California School Administrators, the Center for Ecoliteracy, the Exploratorium, and Ten Strands. Team members' professional networks and media sources (e.g., EdSource and the Sacramento Bee) were also used to disseminate the survey.

Figure 1. Regional Enrollment and Survey Representation



The study aimed for a sample that was representative of California. To achieve that, recruitment was stratified by region based on the California County Superintendents regions[22] and was cross-checked against the 2020 Census regions.[23] Using enrollment data for each county within each region,[24] we calculated regional TK-12 enrollment as a percentage of statewide enrollment and aimed for our sample to proportionally reflect regional enrollment — that is, our goal was simply to be able to say that "Region [X] is X% of state enrollment, and is X% of our sample." This strategy allowed CAELI to shift recruitment strategies when regions were underrepresented or overrepresented in the data — for example, by increasing and improving communication with underrepresented regions.

SAMPLE

We received 1,632 surveys. After removing bot-generated surveys and surveys with fewer than 30% of the questions completed, our final sample of 1,080 included

Table 1. Respondents' Personal Characteristics

Gender Identity	% of surveys	% of CA educators[a]
Woman/Female	65%	73%
Man/Male	14%	27%
Nonbinary	1%	–[b]
Prefer not to share or Missing	21%	–
Highest Degree	**% of surveys**	**% of CA educators[a]**
Less than a Bachelor's	2%	0%
Bachelor's	34%	51%
Graduate Degree	51%	48%
Prefer not to share or Missing	19%	1%
Racial/Ethnic Identity	**% of surveys[c]**	**% of CA educators[a]**
American Indian or Alaska Native	4%	1%
Black or African American	3%	4%
East Asian/Asian American	5%	6%[d]
Latino/a/é/x	14%	21%
Southwest Asian or North African	1%	–[d]
Native Hawaiian/Pacific Islander	1%	1%
South Asian/Asian American	1%	–[d]
Southeast Asian/Asian American	2%	2%[e]
White/Caucasian	54%	61%
Self-describe	2%	–
Prefer not to share	4%	5%

a. 2018-2019.
b. Nonbinary was not included in statewide data.
c. Respondents could select more than one identity.
d. Statewide ethnicity data included an umbrella category of "Asian."
e. "Filipino" percentage in statewide data.

Figure 2. Subjects Taught by Educators

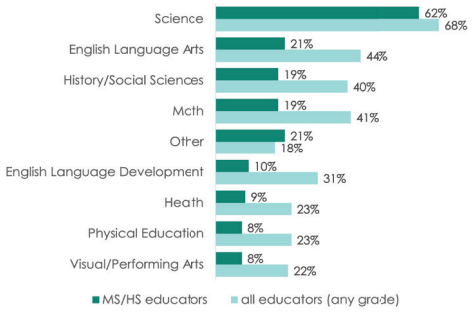


Table 2. Grades Taught by Educators

Grade(s) Taught	% of educators
TK-2	23%
3-5	33%
6-8	32%
9-12	33%

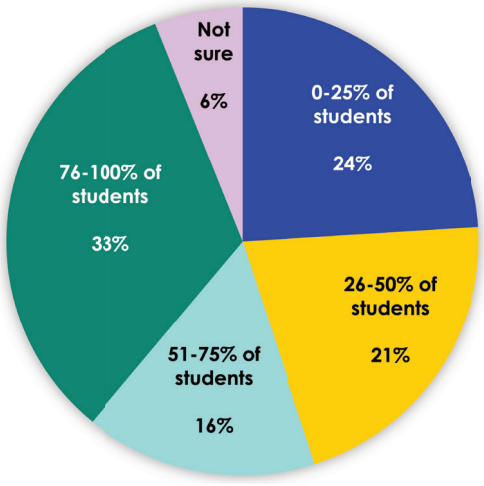
*Respondents could select more than one grade band.

909 educators (84% of surveys; composed of 74% classroom teachers, 6% site-level teachers, and 4% student teachers/paraprofessionals/expanded learning educators) and 171 administrators (16% of surveys; composed of 9% principals and 7% other school-based positions). This sample size is comparable to or larger than other statewide educator surveys in California and lies within the range of sample sizes included in typical state and national polling studies.[25, 26, 27] Approximating California's proportions of public and private enrollment (92% vs. 9%, respectively[28]), the surveys came primarily from public/public charter schools (96%), with 4% from private schools.

REGIONAL REPRESENTATIVENESS

We received surveys from all 58 counties in California, with the Bay Area and Central Coast regions (Regions 4 and 5) overrepresented compared to enrollment numbers per region. This overrepresentation likely indicates higher levels of interest in, implementation of, and networking around environmental literacy efforts, since the Bay Area has a long history of environmental organizing and for years has hosted the state's earliest county-level environmental literacy coordinators. Despite extensive recruitment efforts, some counties in Southern California (Regions 10 and 11) were moderately underrepresented. Notably, these regions have high proportions of Latino/a/é/x and Native American populations.

Figure 3. Administrators' Perceptions of Access to Environmental Literacy Experiences



PERSONAL CHARACTERISTICS

The majority of respondents identified as women (65%), identified as White (54%), and held graduate degrees or higher (51%). These data were roughly proportional to the general statewide teacher population. In 2018-2019, the most recent year statewide data were available, 73% identified as female, 61% identified as White,[29] and 48% had graduate degrees or higher.[30]

Both educators and administrators who completed the survey expressed highly positive attitudes toward the environment (e.g., "I always think about how my actions affect the environment." 1 = Strongly Disagree, 5 = Strongly Agree; Educator mean = 4.26; Administrator mean = 4.38 across five items). These means were much higher than seen in previous studies, using the scale from which these items were adapted. Nisbet & Zelenski, 2018, found a mean of 3.00 on the original scale administered with 184 adults. This indicates that the sample is skewed toward individuals with a predisposition toward environmental awareness. Thus, the following results may overestimate the level of implementation of environmental literacy learning experiences across California.

EDUCATOR ROLES AND AREAS OF FOCUS

The majority of survey responses came from educators (around 900), while 150 were from administrators. The majority — about two-thirds — of responding educators teach science. There was a relatively even distribution of grades taught by educators who completed the survey, with TK-2 slightly underrepresented. Educators reported directly teaching an average of 92.92 students, with a median number of 60 students. **In total, educators responding to the survey teach approximately 80,000 students across California.**

Results

STUDENT EXPERIENCES

Administrators reported a range of participation in environmental literacy experiences at their schools. While a third (32%) reported that 76-100% of students participated in environmental literacy experiences, a quarter (23%) said 0-25% of students participated.

On-site and off-site experiences. In terms of on-site learning experiences, educators reported that more students have access to environmental literacy

experiences in the classroom regularly/often (48%) than they regularly/often have access to learning experiences either outdoors (30%) or in extracurricular clubs or expanded learning (29%). Off-site experiences were less common overall than on-site ones. While bus field trips were happening at some frequency for 78% of respondents' students, only 42% of educators reported that students at their school had access to residential outdoor science programs. These experiences are relatively rare even for grades 3-8, in which residential science programs are most typically offered: 51% of grade 3-5 educators and 47% of grade 6-8 educators reported that their students never attend these programs.

Figure 4. Frequency of On-Site Environmental Literacy Experiences

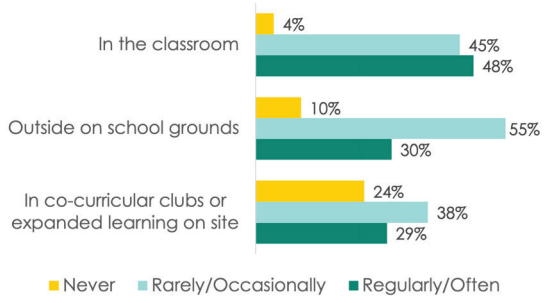


Figure 5. Frequency of Off-Site Environmental Literacy Experiences

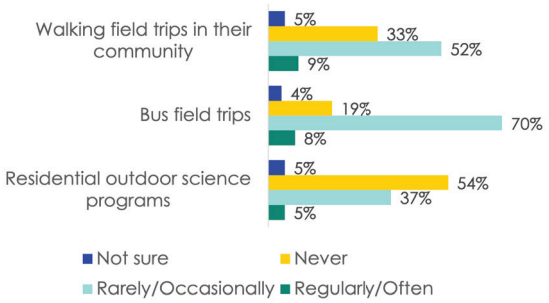
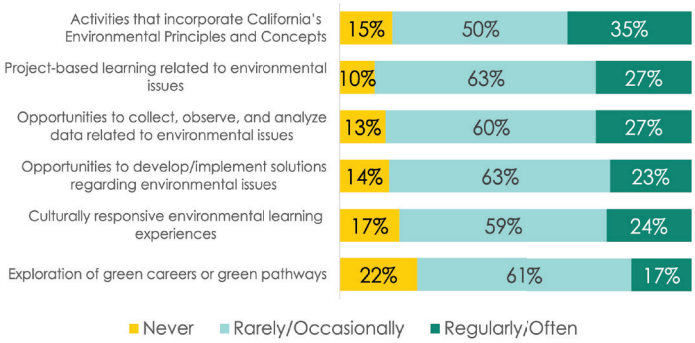


Figure 6. Frequency of Types of Environmental Literacy Instructional Approaches



Instructional Approaches. In considering various kinds of instructional approaches, incorporation of the EP&Cs was the most common, with 35% of educators addressing them regularly and 85% addressing them at least rarely. Educators reported that students were least likely to experience exploration of "green career" pathways. Green career pathway exploration was slightly more common in grades 9-12, with 84% of grade 9-12 educators reporting that students had access to these activities at least rarely (compared with 66% in other grades).

CURRICULUM & INSTRUCTION

Because we wanted to understand the implementation of the topics included in our official definition of "environmental literacy," we asked educators about the official topics listed in the EP&Cs. A limitation of this approach was that educators may have had to translate common terms such as "biodiversity" into topics such as "fish and wildlife resources." In terms of which topics they cover, educators were most likely to teach about resource conservation/waste reduction/recycling (93% major, minor, or indirect focus) and about water (92% major, minor, or indirect focus), and are least likely to teach about integrated pest management (with 55% major, minor, or indirect focus). Across all responding educators, 65% reported

Figure 7. Extent to which Educators Teach Environmental Topics

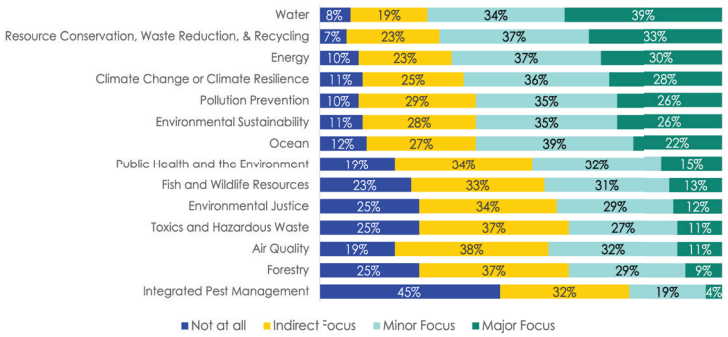
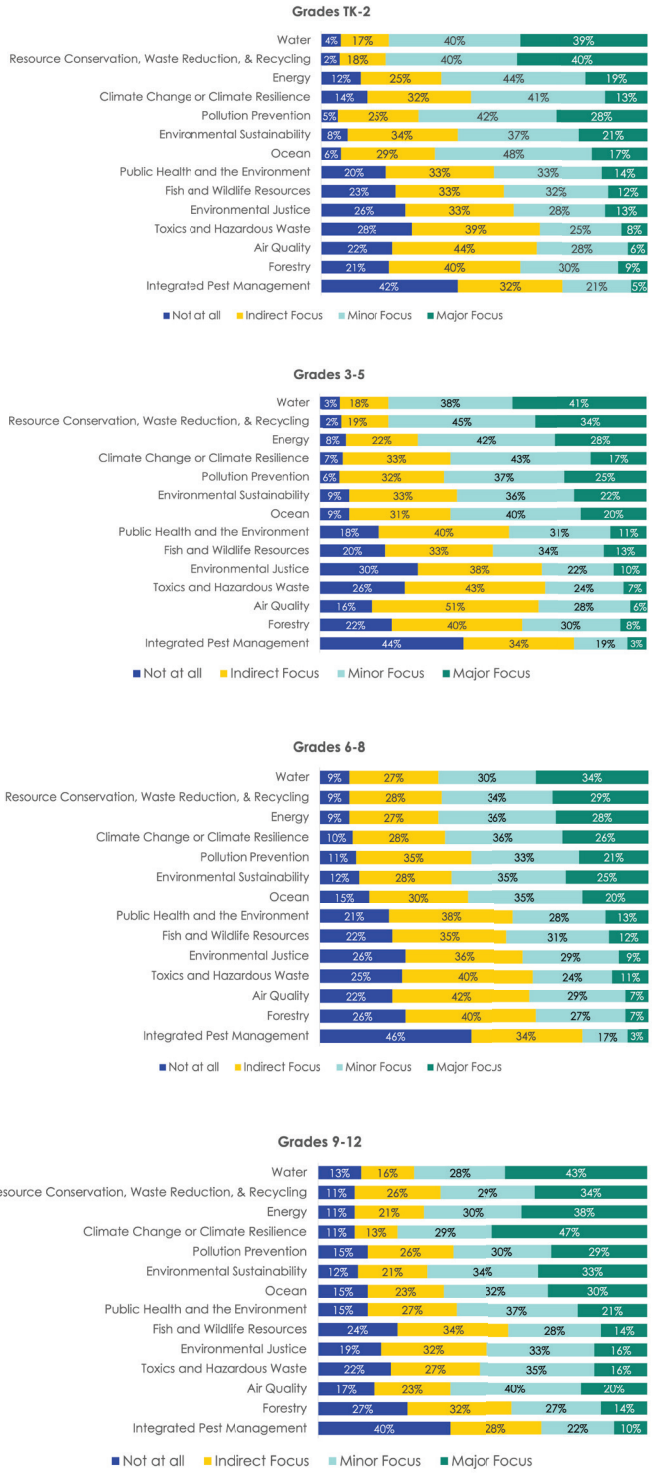


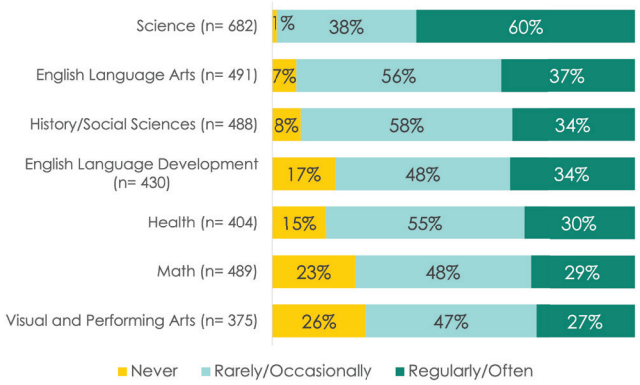
Figure 8a-8d. Extent to which Educators Teach Environmental Topics by Grade



teaching at least 1 of the 14 topics with a major focus. Educators, on average, taught 2.76 of the 14 topics with a major focus and about 7.25 of the 14 topics with a major or minor focus. About 9% reported teaching all 14 topics with a major or minor focus. Less than 1% reported teaching all 14 topics with a major focus.

Some topics varied widely by grade band, however. Climate change and resilience, in particular, were much more likely to be covered by high school educators with a major (47%) or minor (29%) focus than other grade levels.

Figure 9. Environmental Literacy Integration into Each Subject



We next asked educators whether they integrate environmental literacy into the subject(s) they teach. "Integration" was self-defined. Environmental literacy was incorporated by educators in all subjects, to some extent. It was most often incorporated into science and least often incorporated into art. Almost everyone who teaches science said they integrate environmental literacy, at least now and then. This high percentage likely reflects, at least in part, the fact that (1) science curricula are required to incorporate EP&Cs to be on the state list for K-8 adoption, and (2) there are Next Generation Science Standards (NGSS) specifically related to the environment and human impact.

When looking at variability across grade bands, the most notable difference was in the percentage of high school educators in certain subjects who integrate environmental literacy into their instruction, compared with educators of other grades. In particular, high school science educators were markedly more likely

Figure 10a-10d. Environmental Literacy Integration into Each Subject by Grade

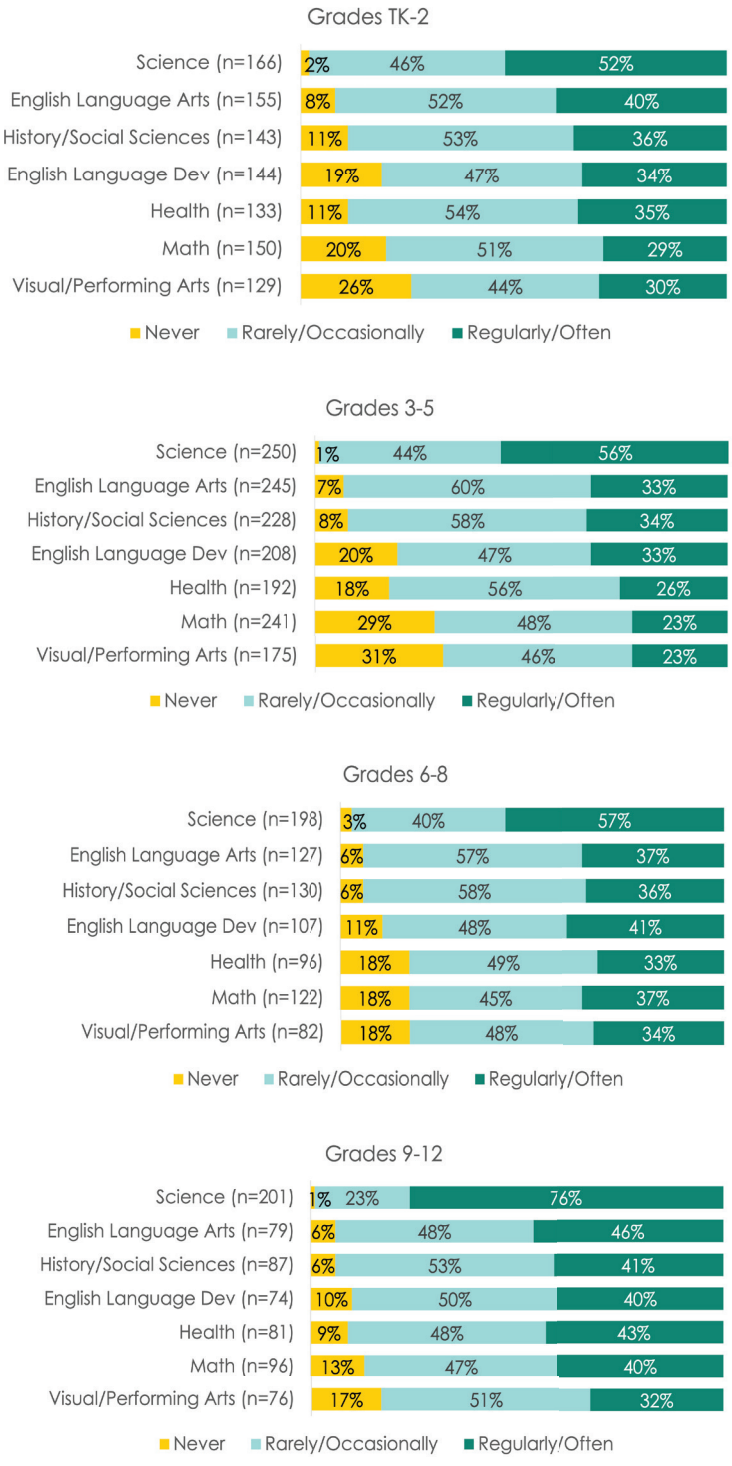


Figure 11. Is Environmental Literacy Adequately Covered in Educators' Curriculum?

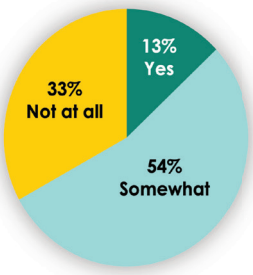
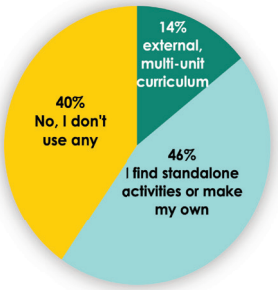


Figure 12. Do Educators Use a Specific Curriculum to Teach about the Environment?



to integrate environmental literacy regularly/often (76% of high school educators) than were TK-2 educators (52%), grade 3-5 educators (56%), or grade 6-8 educators (57%). To a lesser extent, high school English Language Arts, History/Social Science, and Health educators were also more likely to integrate environmental literacy than educators of these subjects in other grades.

When asked if environmental literacy was adequately covered in their existing curricula, over half of the educators selected "somewhat," but 33% selected "not at all," and only 13% said, "Yes, it provides everything I need." These proportions were relatively consistent across grade bands. Science educators were more likely to say "somewhat" than other educators. Most educators reported that they either don't use any curricular materials or find their own stand-alone activities. Just 14% use an externally developed, multi-lesson curriculum. TK-8 educators were more likely to report they don't use any curricular materials (42%-44%) than grade 9-12 educators (30%). Non-science educators are more likely to not use any curricular materials (58%) compared with science educators (29%).

Figure 13. Community Partnerships that Provide Environmental Professional Learning for Educators (Reported by Administrators)

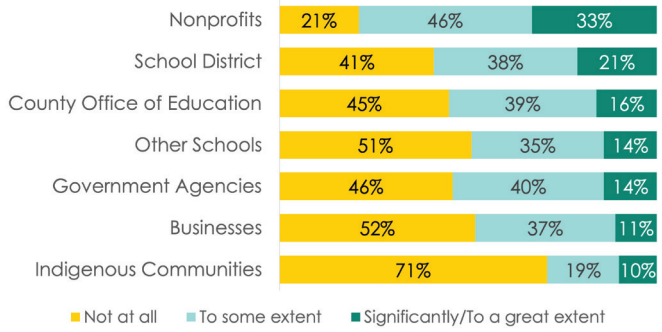
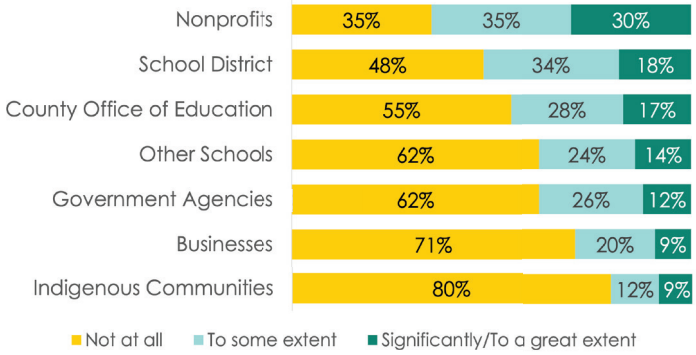


Figure 14. Community Partnerships that Provide Environmental Literacy Learning Experiences for Students (Reported by Educators)



COMMUNITY PARTNERSHIPS

The most common partners reported by educators and administrators were nonprofit organizations: 79% of administrators say their school partners with a nonprofit to support environmental professional learning, while 65% of educators say they partner with a nonprofit to support student learning experiences. Across the other potential partners listed in the survey, there are relatively low levels of community partnerships. Partnerships with Indigenous communities were least common for professional and student learning experiences, with 71% of administrators and 80% of educators reporting no such partnerships.

EDUCATOR PREPAREDNESS AND SUPPORT

When asked to rate their confidence in various teaching approaches and topics, educators are most confident in problem- or project-based learning and inquiry or investigation-oriented teaching. They are least confident in incorporating Indigenous perspectives or Traditional Ecological Knowledge, and in teaching about environmental justice.

Figure 15. Educators' Confidence Levels in Each of the Following Teaching Practices

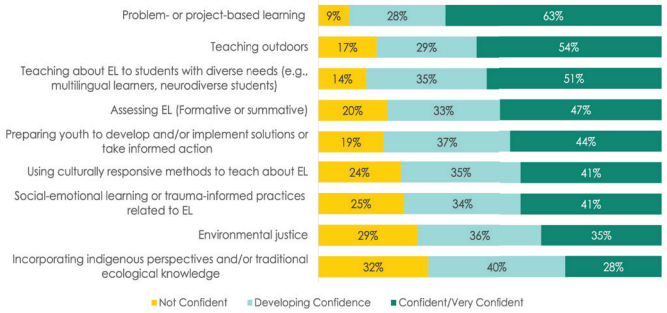
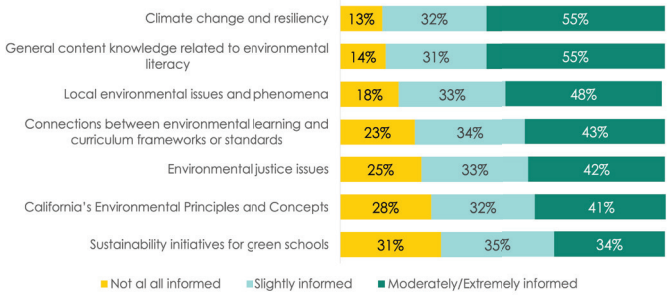


Figure 16. Extent to Which Educators Feel Informed Along Each of the Following Dimensions of Environmental Literacy Instruction



Educators and administrators feel most informed about climate change, resiliency, and general content knowledge related to environmental literacy. They feel least informed about California's Environmental Principles and Concepts (administrators) and sustainability initiatives for green schools (educators).

However, there was considerable variability in how informed educators in different grade bands felt. Grade TK-2 educators, grade 3-5 educators, and grade 6-8 educators reported relatively similar levels of being informed, yet high school educators reported being much more informed, particularly about climate change, about which 71% of high school educators reported feeling moderately to extremely informed. Over a quarter of respondents (27%, n=250) have received 0 hours of professional learning from any provider, and another quarter (26%, n=242) have received fewer than 8 hours (<1 day) total over the past five years. A third (35%, n=316) received more than 16 hours (>two days). Professional learning was most often offered/accessed through community-based partners and least often through the school or district.

Figure 17a-17d. Extent to Which Educators of Different Grade Bands Feel Informed Along Each of the Following Dimensions of Environmental Literacy Instruction

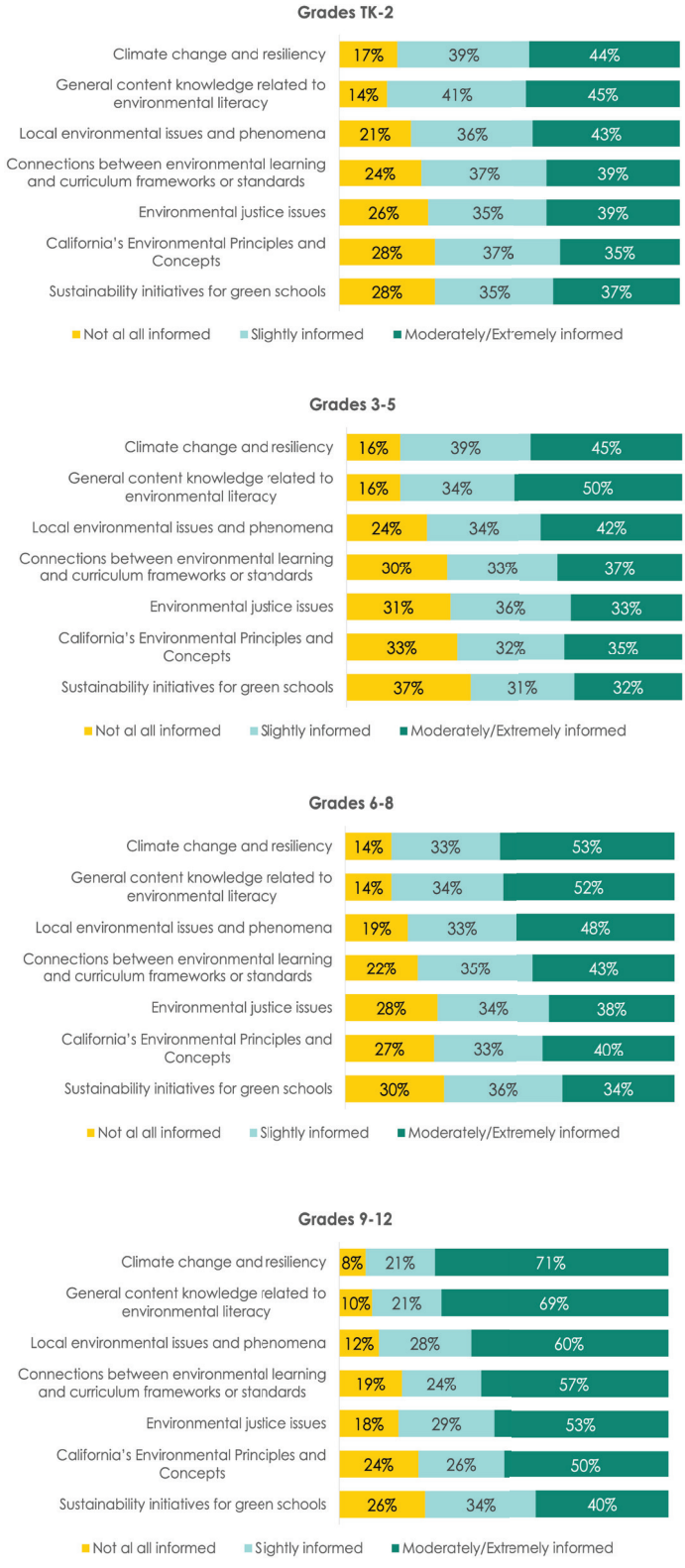


Figure 18. Percent of Educators Receiving Environmental Literacy Professional Learning From Different Providers

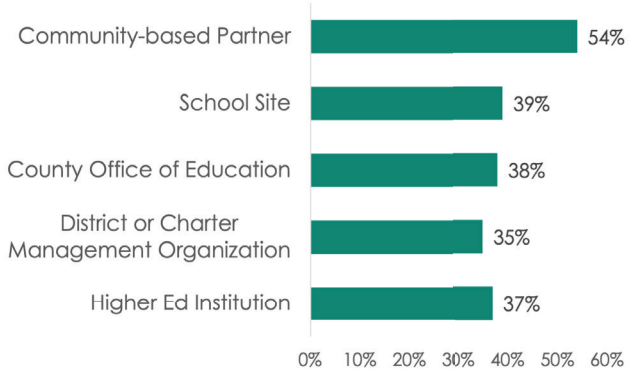
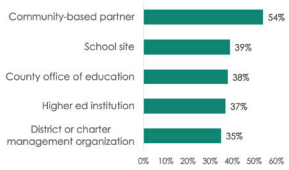


Figure 19. Amount of Educators' and Adminstrators' Environmental Literacy Professional Learning Over the Last 5 Years



Regarding supports or structures in place to support environmental literacy instruction, respondents were most likely to say their school had existing spaces for outdoor learning on school grounds (58%). Respondents were least likely to report that their school had an environmental literacy coordinator or financial support for environmental literacy (17%). There were also relatively few schools with "green career" awareness programs or pathways (17% overall). While green career awareness programs or pathways were more commonly reported by grade 9-12 educators, they were still relatively uncommon (26%).

AWARENESS OF SUSTAINABILITY POLICIES

According to respondents, sustainability initiatives or policies were common, but there was variability in which policies were in place and at what level.

Figure 20. Availability of Environmental Literacy Supports (EL = Environmental Literacy)

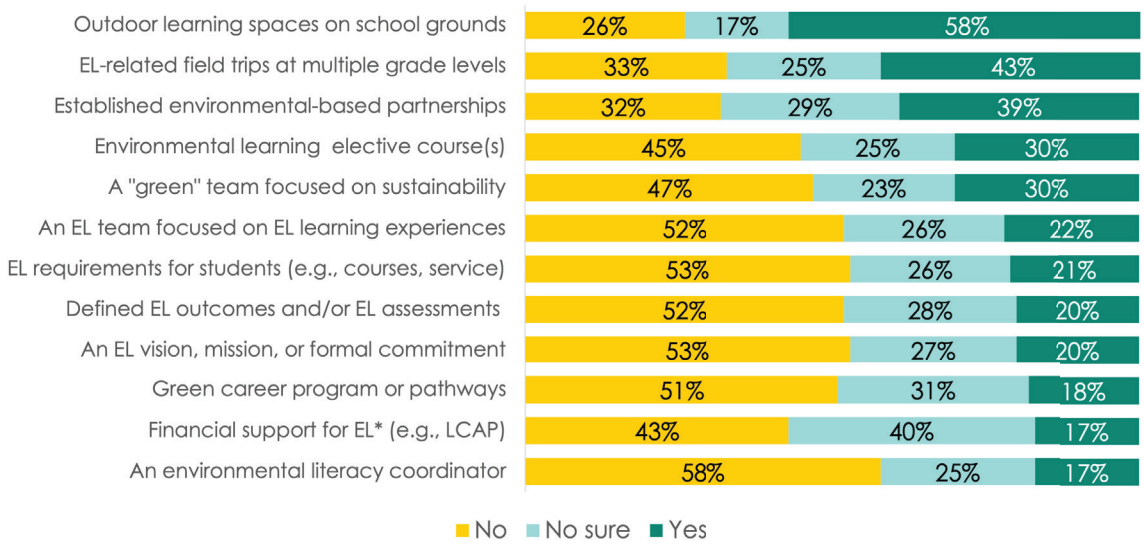


Figure 21. Educator Awareness of School Policies or Programs in Place to Address the Following Sustainability Issues

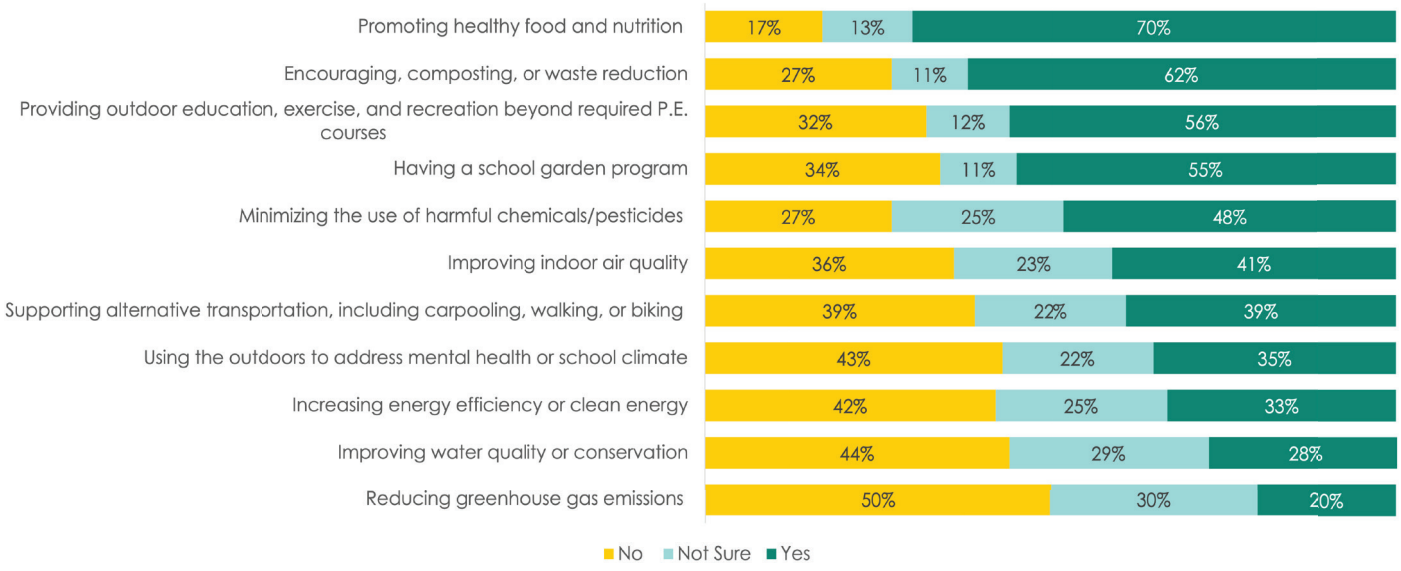
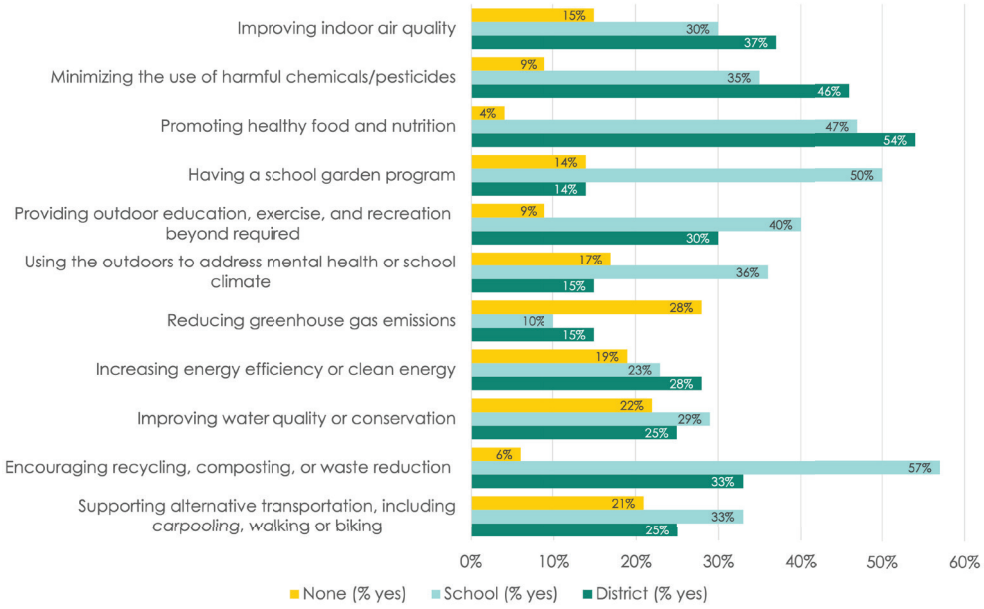


Figure 22. Adminstrators' Report of Level(s) at Which Policies or Programs in Place to Address the Following Sustainability Issues



Most educators reported that their school had policies to promote healthy food and nutrition (70%) and also to encourage composting or waste reduction (62%). Administrators reported that policies were more likely to be in place at the school level (mean=3.33 policies out of 11) than at the district level (mean=2.88 policies). Administrators said there was no policy in place or were unsure if there was in fact a policy for an average of 3.05 of the 11 sustainability policy types.

The least common sustainability policy reported by educators and administrators alike was that related to reducing greenhouse gas emissions: 50% of educators and 28% of administrators reported there was no such policy in place.

EDUCATOR NEEDS AND PRIORITIES

An overwhelming majority of educators (83%) wished they could teach more lessons about environmental literacy. Most administrators (84%) also reported wishing educators at their school could teach more about environmental literacy.

A majority of educators reported feeling moderately or highly supported by their principal (55%) in their environmental literacy instruction, while 40% felt moderately or highly supported by their district or

Figure 23. Educators' Satisfaction with the Current Amount of Environmental Literacy Instruction

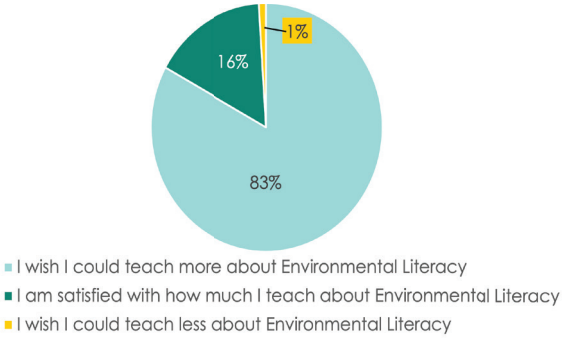


Figure 24. Administrators' Satisfaction with the Current Amount of Environmental Literacy Instruction

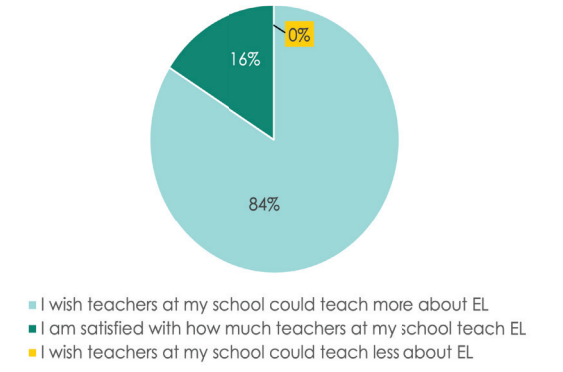
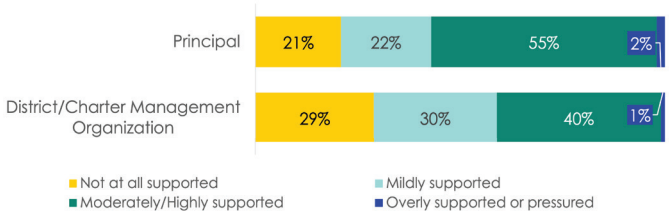


Figure 25. To What Extent Do Educators Feel Supported in Their Environmental Literacy Instruction by Administrators?



charter management organization (CMO). In contrast, 21% felt not at all supported by their principal and 29% felt not at all supported by their district or CMO.

Almost all educators (93%) and administrators (97%) said additional support, information, training, or resources would help them teach more environmental learning. Educators and administrators alike reported that adequate time to prepare, lesson-plan, and collaborate, as well as having adequate instructional materials and resources, were among their highest needs for increasing or improving environmental literacy instruction. Educators and administrators were relatively similar in their priorities. However, educators were more likely to report a higher need related to administrative support for field trips and a greater need for time for planning (though administrators also recognized this as a significant need). By contrast, administrators were more likely to prioritize partnerships with local organizations, exposure to environmental literacy in pre-service training, and professional learning. See Supplementary Figure S3 in Appendix A for more comparisons between educators and administrators.

Core Findings

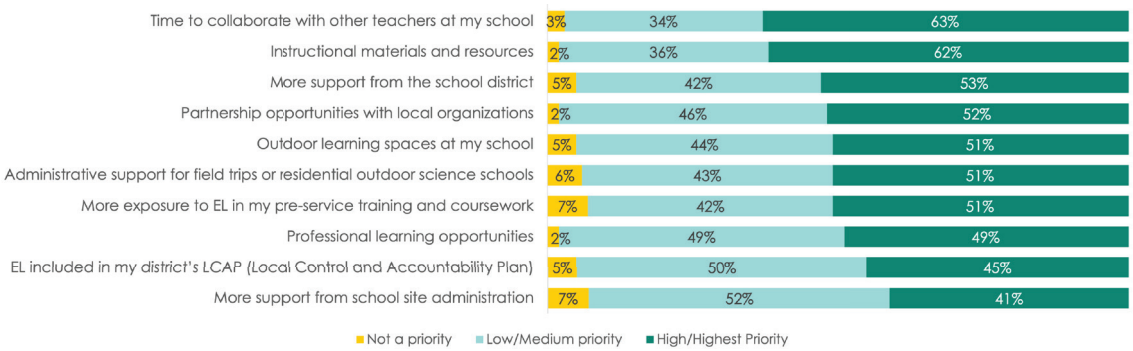
The data reflect the extent of environmental literacy instruction across various dimensions of the TK-12 field, revealing promising trends and indicating widespread engagement with environmental literacy initiatives throughout the state. Of course, the data also underscore areas where improvement is needed to ensure comprehensive and equitable instruction. These findings are essential both in understanding the current reality of environmental literacy implementation across California and in identifying how we educators can collectively get closer to the vision set forth by the California Blueprint for Environmental Literacy.

PROMISING TRENDS

1. Educators have the expertise to scale Environmental Literacy learning broadly–but the infrastructure to scale is needed.

Many educators are including environmental literacy topics, as identified in California's Environmental Principles and Concepts, in their instruction. The majority (90%) teach at least one environmental literacy topic (Figure 7, Page 9), and, on average, educators include about 7 of the 14 named environmental literacy topics with a major or minor focus. Across all responding educators, 65% reported teaching at least 1 of the 14 topics with a major focus. On average, educators taught nearly 3 of the 14 topics with a major focus. In addition, at least 25% of educators in every subject area reported that they regularly or often incorporate environmental literacy into their curriculum, with English language arts, in

Figure 26. Educators' and Administrators' Prioritization of Needs to Improve or Increase Environmental Instruction



particular, emerging as a bright spot for integration at every grade level (Figure 9, Page 10). Finally, at least 15% of educators report regularly or often incorporating each of the instructional approaches to environmental literacy (Figure 6, Page 9), including project-based learning, working with data, and engaging in environmental learning experiences that are culturally responsive—meaning that there is incredible breadth in the way some educators have figured out how to approach teaching environmental literacy.

This finding is critical—it means that it is possible to integrate environmental literacy often or regularly into students' learning experiences in every grade level and every subject area. It also means that the expertise exists within every subject area and within multiple instructional approaches to regularly and often integrate environmental literacy into students' learning experiences. That is an incredible glimpse into the specific expertise that already exists across the state. While a majority of educators are not integrating environmental literacy into instruction regularly, this finding means that rather than invent new approaches, what we need is to better use structures (e.g., planning and collaboration time, cultivating environmental literacy teacher-leaders, among other things) and forums (e.g., communities of practice, professional learning communities, and so on) to share the existing expertise more broadly. The work ahead, then, is about building the confidence and skills of all educators in every grade level and subject area so that they can regularly integrate environmental literacy into their teaching practice.

2. Environmental nonprofits are a critical component of California's statewide infrastructure–some more than others.

Educators and administrators alike report relying on nonprofits for both professional learning for educators and direct learning experiences for students (Figures 13 and 14, Page 12). And to a lesser extent, each of the other community-based partners named in the survey was relied on by at least some educators and administrators. It is clear, therefore, that some educators and administrators across the state have expertise in finding, connecting with, and implementing environmental literacy resources, and that those connections are essential for giving them the resources needed to implement environmental literacy instruction. Again, this demonstrates incredible existing expertise across the state and provides schools and districts the opportunity to promote environmental literacy opportunities internally by relying on the leadership and experiences of teacher-leaders who are familiar with external resources. Additionally, this data indicates the need to continually invest in the quality and dissemination of partner organization resources.

As the section below on opportunities indicates, not all community-based partners are getting equal attention from educators and administrators, particularly local Native communities. Collectively, these data also point to the need to invest in the capacity of both community-based partners and education systems to partner with one another–since beginning, building,

and sustaining these kinds of partnerships can be quite challenging and require essential knowledge (about district structures, limitations, funding, and academic standards) as well as effective approaches to partnership.

3. School campus sustainability policies and initiatives provide students with real-world learning opportunities, but they need to be better communicated and connected.

The majority of educators said their schools have sustainability policies or practices in place, including 70% with healthy food initiatives, 62% with recycling or waste reduction efforts, and 55% with school gardens (Figure 21, Page 14). These sustainability policies and initiatives may reflect state resource laws, such as California Senate Bill 1383 (which was established in 2016 and went into effect in 2022), a statewide effort to reduce emissions. They may also reflect coordinated district efforts, such as board commitments–an estimated 83% of districts have an environmental-related board commitment.[31] These district-level actions have the potential to be incorporated into real-world learning sequences at any grade level, which will help align administrative support for teachers wanting to use their campuses as laboratories for learning.

However, substantial gaps exist in what educators are teaching, their awareness of sustainability initiatives for their school or district, and which policies their own school districts have. For example, while water was the most commonly taught environmental topic across the grades (with 73% of educators including it as a major or minor focus) (Figure 7, Page 9), only 28% of educators were aware of policies related to water conservation (Figure 21, Page 14). In reality, 65% of California school districts have passed Board Policy 3511 on Energy and Water Management.[32] Relatedly, while educators feel relatively well informed about climate change (55% moderately to extremely informed; Figure 16, Page 12), and 89% of them teach about it to some extent, reducing greenhouse gas emissions scored lowest on the list of sustainable school policies that they are aware of. Only a measly 0.4% (42 of 936) of California school districts have board resolutions related to climate action, climate emergencies, or climate literacy.[33] These kinds of policies — and the sustainability practices they promote — can serve as a foundation on which to build environmental literacy experiences for children and youth as well as professional learning for adults by helping learners tangibly connect with sustainability topics that impact their health and immediate surroundings. This can only be done if educator professionals within a given district are working to ensure that more green policies exist, and to connect the dots so that these policies drive meaningful practices. Further, there is an opportunity to connect these sustainability policies to real-world environmental and social justice issues, such as water dams or where a school's water comes from, as well as the modern implications that these historical practices and policies have had on local communities–indigenous communities, in particular.

4. High school educators teach about climate change, but educators in the earlier grades need more support.

High school educators are informed about and focus on climate change in their instruction. Some 71% of high school educators feel moderately or extremely informed about climate change and resiliency (compared to an average of 47% of TK-8 educators; Figures 17a-17d, Page 13), while 47% of high school educators also reported that climate change and resiliency are major focuses of instruction (compared to an average of 18% of TK-8 educators; Figures 8a-8d, Page 10). High school educators seem underprepared, however, in addressing environmental injustice—a critical component of understanding the full picture of climate change (Figure 17d, Page 13).

Despite the promise at the high school level, there is room to grow in earlier grades. California Assembly Bill 285 requires that adopted science courses in 1st through 12th grade include "the causes and effects of climate change and methods to mitigate and adapt to climate change. . .no later than the 2024–25 school year."[34] Learning progressions, built off the Next Generation Science Standards, outline building block concepts in NGSS that are introduced in elementary school.[35] Still, it is likely that educators, particularly in 1st through 8th grades, will require additional professional learning and instructional materials to integrate climate change successfully. These resources must address age-appropriate concept development, climate anxiety, the use of trauma-informed approaches, and intersections with climate and social justice.

OPPORTUNITIES

1. Students need more outdoor environmental literacy experiences.

The research is clear that time outdoors has numerous physical and mental health benefits, such as reduced stress and loneliness, increased physical activity and resilience, as well as academic benefits such as learning quickly and demonstrating better attention and longer retention of skills.[36, 37] Despite these benefits, findings point to limited opportunities for environmental literacy learning outside the classroom. For instance, 65% of educators reported that students never or rarely/occasionally have environmental literacy learning experiences outside on school grounds (Figure 4, Page 9); 85% of educators reported that students never or rarely/occasionally go on walking field trips within their school community; and 54% of educators reported that students never have a multi-day outdoor school experience (Figure 5, Page 9). These data are notable, despite findings that 53% of educators feel confident/very confident when teaching outdoors (Figure 15, Page 12), 58% of educators and administrators report that their school has an existing space for outdoor learning (Figure 20, Page 14), and 56% of educators and administrators say they have a policy or program to provide outdoor education, exercise, and recreation beyond physical education (Figure 21, Page 14 and Figure 22, Page 15). The discrepancy in these findings may indicate systemic problems within school sites or districts, such as significant hurdles for educators to allow time for outdoor environmental literacy learning in existing schedules, or lack of community-based partnerships, or issues obtaining permission forms, or even a perceived lack of available outdoor instructional materials. For off-site and outdoor experiences, of course, there may also be neighborhood safety issues or systematic transportation issues, such as districts' needing more buses or drivers. Administrators need to consider systemic solutions to these challenges. For example, sites can develop a school-wide approach to offering walking field trips, while districts can support equitable outdoor environmental literacy experiences by identifying seminal experiences at multiple grades (such as the Newark Unified School district does in its Environmental Literacy Initiative).[38,39]

Working with community-based partners, like those named in the California Association of Outdoor and Environmental Education's (AEOE) dashboard of environmental education providers, may be one mechanism to increase outdoor time.[40, 41] Ongoing network-building and capacity-building are needed to ensure that students and educators have sufficient access to these community-based organizations' offerings. An investment in dedicated staff at the county, district, or school level is likely necessary to overcome these hurdles and ensure equitable access.

2. Educators need support to consider the intersections of race, culture, and environmental literacy.

While many educators are thinking about how to connect environmental literacy to real-world environmental issues (for example, instructional approaches that center on designing solutions and analyzing data), educators struggle to make authentic connections to race, culture, and environmental justice. Most educators report rarely or occasionally using culturally responsive learning experiences. Only 24% of educators regularly or often incorporate culturally responsive practices into teaching environmental literacy (Figure 15, Page 12). A majority of educators report that they do not feel confident or are only developing confidence in using culturally responsive methods, trauma-informed practices, and environmental justice measures as they relate to environmental literacy (Figure 15, Page 12). When considering that climate change has a greater and disproportionate impact on communities of color,[42] it is clear that there is a need for investment in professional learning that supports educators in their use of culturally responsive teaching and trauma-informed practices and that also supports teacher and schools as they strive to build relationships with communities and families alike, so that learning environments elevate the experiences and knowledge that young people hold. These investments will move the field of environmental learning toward a future in which children and youth from communities that have experienced ongoing marginalization and harm — including children and youth of color — feel seen, affirmed, and valued.[43, 44] Further, they can see themselves — and their community knowledge, including Traditional Ecological Knowledge — as change agents, not just capable of mitigating negative impacts from climate change but necessary to do so.[45, 46, 47] Finally, these teaching practices provide opportunities to affirm how environmental literacy comprises the knowledge, skills, know-how, attitudes, values, and beliefs held by communities in unique and powerful ways.[48]

3. The formal education system needs to invest in meaningful partnerships with Native communities that enhance the capacity for relationship building with tribal communities and that engage Native American leaders and educators in integrating Traditional Ecological Knowledge.

There is growing recognition and evidence that Indigenous science methodologies and knowledge are critical to understanding and addressing current ecological and societal issues and challenges, making clear the need to elevate Traditional Ecological Knowledge in TK-12 teaching and learning broadly, and environmental literacy experiences in particular.[49, 50, 51] Despite California AB 1703, the California Indian Education Act (Ramos, 2022),[52] educators in this study expressed the least confidence in incorporating California Native perspectives and/or Traditional Ecological Knowledge into their teaching (Figure 15, Page 12). At the same time, administrators in this study reported that Native communities were the least-common partner for providing professional learning to educators (Figure 13, Page 12), while educators reported that Native communities were also the least common partner for directly providing environmental literacy experiences to students (Figure 14, Page 12). These data are further evidence that students are not seeing tribal perspectives in their curriculum.

Currently, in the U.S., most efforts at recognizing and including Native communities are centered in history-social science, economics, government, and other non-STEM subject areas, thus rendering invisible the expertise and STEM contributions of Native communities. This marginalization of Native sciences creates an environment in which both Native and non-Native students miss out on important ecological understandings and ways of knowing, and are therefore increasingly likely to continue holding common misconceptions about Native knowledge and expertise. As California seeks to scale teaching about environmental literacy, there is an unprecedented opportunity to integrate Native Ways of Knowing and

Traditional Ecological Knowledge into environmental literacy experiences in authentic partnership with local Native communities. Administrators and educators alike will need support (including professional learning and toolkits) to approach this work in ways that center Native perspectives, create space for Native people to take the lead, and integrate place-based Traditional Ecological Knowledge, along with a commitment to reciprocity and approaches that avoid perpetuating practices of extraction and exploitation. Integrating and addressing Traditional Ecological Knowledge and Native Ways of Knowing also need to include the historical narrative, highlighting the injustice of why these elements were removed from the current educational landscape to begin with.

4. Educators and administrators alike need more curricula and additional instructional materials that integrate environmental literacy.

Only 14% of educators reported using a supplemental, multi-unit curriculum to teach about environmental literacy (Figure 12, Page 11). Some 87% of educators reported that environmental literacy is not at all or only somewhat adequately covered by existing curriculum in any subject (Figure 11, Page 11). Educators identified a lack or paucity of instructional materials and resources as among the most pressing needs so that they can teach more about environmental literacy. It is therefore pertinent that school districts invest in the dissemination of existing materials as well as the development of materials that may be missing. There may be a benefit from conducting a thorough national search and assembly of available stand-alone activities supporting environmental literacy, including Native-authored instructional materials. There would need to be a process, however, to determine the applicability and appropriateness of such material to the California/regional context. Given the findings of this study, as well as research on how people learn, high-quality environmental literacy materials need to (a) be multidisciplinary so as to address climate change from disciplines outside of science; (b) emphasize local community priorities and resources; (c) address environmental issues and solutions, including climate change and resilience, in developmentally appropriate ways across all grade levels; (d) be culturally responsive and sustaining; and (e) integrate Traditional Ecological Knowledge.

5. Educators and administrators also require time for professional learning experiences that build capacity for environmental literacy.

Over half of educators and administrators reported receiving zero to 8 hours of environmental literacy-related professional learning in the last five years (Figure 19, Page 13), with districts and schools cited as the least common source of such experiences (Figure 18, Page 13). Both educators and administrators named time to plan, prepare, and collaborate with other educators at their schools as their top need (Figure 26, Page 16). This is backed by a recent Pew study that showed that 84% of teachers nationally say there is not enough time during work hours to perform the tasks expected of them.[53] Therefore, when school systems or partners plan professional learning experiences, they should prioritize structures that bake in time as well as funding for colleagues to work together on designing learning experiences. Extant professional learning experiences should use environmental literacy and environmental issues as catalysts for teaching educators additional pedagogy, skills, and content; this would encourage a more organic integration while lessening the mental burden on educators. Such structures and opportunities for expertise-sharing will support teacher-leaders who possess both experience and expertise in their efforts to share more broadly.

Beyond collaboration time, targeted professional learning for educators should focus on content and pedagogical practices related to environmental justice, Traditional Ecological Knowledge, and integrating environmental literacy across a wide range of subjects and grade levels. Finally, there is a need for professional learning among county, district, and site administrators that builds district and/or site-wide capacity for achieving environmental literacy. This would include creating a vision for how environmental literacy is regularly incorporated, tools for administrators to understand the current reality of environmental literacy across their schools and districts, and strategies and resources for connecting to external partners that bring specialized knowledge, resources, and experiences. Such a systems and capacity approach to environmental literacy will help ensure that implementation reaches all students.

LIMITATIONS

While these data are important both for informing statewide decision-making and for understanding the current status of environmental literacy across a wide sample of California classrooms, It is important to recognize four limitations. First, the sample is skewed to individuals with a predisposition toward environmental awareness, potentially leading to an overestimation of overall environmental literacy implementation. This is a reflection of recruitment, which largely leveraged networks with connections to CAELI, as well as the nature of the survey and the high likelihood that self-selection occurred, with those educators who care about environmental literacy opting to complete the survey more often than those who don't. Future recruitment could also emphasize including teachers of particular subjects, such as Ethnic Studies teachers, or in particular contexts, such as Title VI program teachers. A second limitation is that, despite extensive recruitment efforts, some regions were underrepresented. These regions are likely the same ones that may have less political will and/or infrastructure to support environmental literacy instruction, giving the overall impression that there is more support statewide for environmental literacy than actually exists. The regions underrepresented in this study are also those with higher proportions of Latiné and Native American populations, potentially obscuring the experiences of these populations. A third limitation is the reliance on quantitative measures with closed-ended responses, lacking the qualitative data to understand the breadth and depth of experiences. In the future, focus groups, interviews, and other qualitative methods would add significant nuance to the findings. In particular, more clarity on how teachers are approaching "culturally responsive" teaching would be helpful, as the term is very broad. In addition, understanding culturally responsive teaching and approaches for Native people should include understanding the nuance in approaches that invoke not just cultural sensitivity but actual environmental knowledge systems. And fourth and last, this paper was intended only as an initial overview of environmental literacy implementation across California. Thus, results were shared for the full sample, with some subgroup analysis by grade bands. Though an important first step, this approach likely obscured variability among subgroups. Future efforts at analyzing these data could include more subgroup comparisons to see the extent to which there is variability by region, educator characteristics (e.g., experience), and socio/political/economic contexts.

CONCLUSIONS

Given the range of statewide policy documents, various instructional materials requirements, and the demonstrated expertise of many educators and administrators, we believe there is a strong foundation for environmental literacy in California. However, to reach the vision set forth in the California Blueprint for Environmental Literacy, there must be a significant investment in broader implementation and scale. While there are many promising trends and room for growth in this dataset, perhaps the most promising of all is that 83% of educators and 84% of administrators want more environmental literacy! It is critical, for the health and well-being of our youth, communities, and California's vast ecosystems, that we, collectively, respond to this call and provide the resources that our state's schools need.

ACKNOWLEDGMENTS

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Ten Strands
Connecting Education, Environment, and Community

CALIFORNIA ENVIRONMENTAL LITERACY INITIATIVE

Our Mission: Discover. Engage. Innovate.

To inspire and foster learning of science and mathematics for all, especially those who have limited access to science.

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Notes

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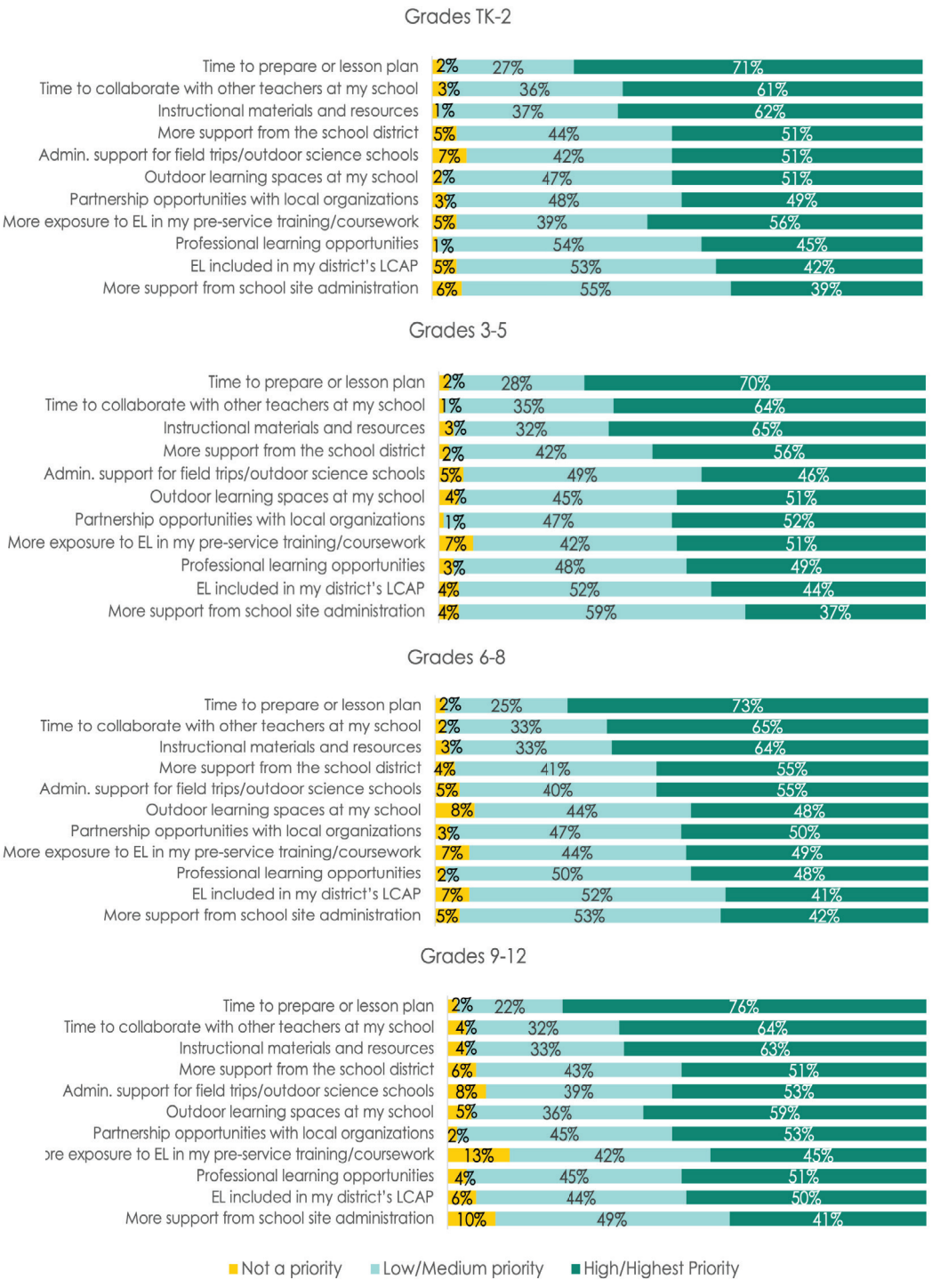
Appendix A. Supplementary Analysis

EDUCATOR NEEDS BY GRADE BAND

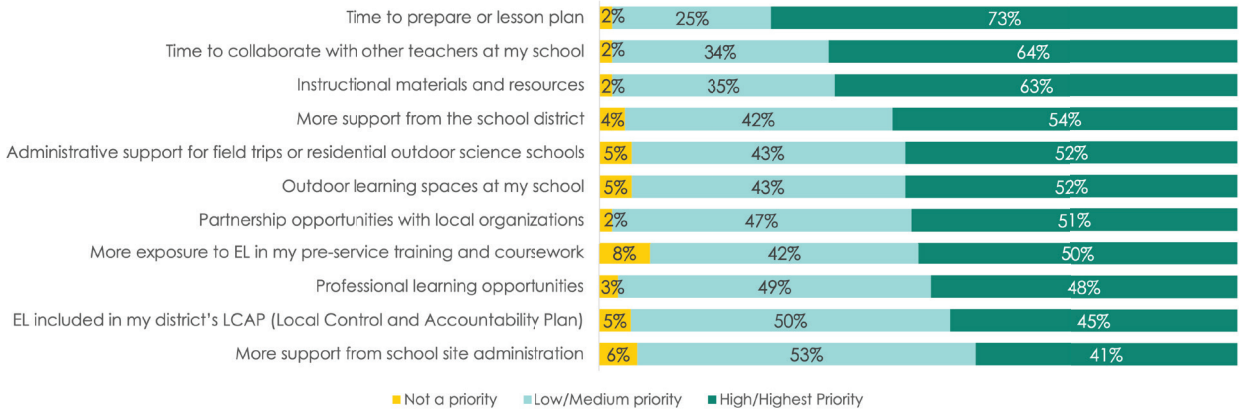
When broken down by grade band, the need for adequate time to prepare or lesson-plan was identified as the most critical need across grades, and it was particularly pronounced among high school educators. High school educators were more likely to raise the need for outdoor learning spaces than educators at other grade levels. Early educators (TK-2) were more likely to cite a need for exposure to environmental literacy in their pre-service training.

Figure S1a-S1d. Educator Needs by Grade Band



EDUCATOR NEEDS ACCORDING TO EDUCATORS ONLY

Figure S2. Prioritization of Educator Needs to Improve or Increase Environmental Instruction (Educators Only)



COMPARING PRIORITIZATION OF EDUCATOR NEEDS BY EDUCATORS AND ADMINISTRATORS

Figure S3. Prioritization of Educator and Administrator Needs to Improve or Increase Environmental Instruction