Educator Competencies for Education for Sustainable Development in California Teacher Preparation Programs

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[**Abstract]** The world faces pressing sustainable challenges such as environmental degradation, climate change, injustice, and economic inequality. In response, researchers have emphasized the need for changes in human behavior, particularly greater recognition of the environmental and social consequences of human decisions. This awareness has elevated the importance of Education for Sustainable Development (ESD), which represents a paradigm shift in teacher preparation. Therefore, teacher educators are increasingly called upon to equip future teachers with the knowledge, skills, and dispositions necessary to implement classroom practices that position community at the center of learning. Within the 2030 Sustainable Development Agenda, ESD has been identified as central, with Goal 4: Quality Education highlighting the role of teachers in advancing sustainable development. However, a critical challenge is that limited studies have examined educator competencies that meaningfully integrate the Sustainable Development Goals (SDGs) in context of Californian teacher preparation programs.

The objective of this study is to identify key educator competencies for ESD for teacher preparation programs in California. Four data sources were analyzed for the study: UNESCO ESD Framework documents, California Teaching Performance Expectations, California Standards for the Teaching Profession, and Teacher Preparation Program documents. Qualitative Document Interpretative Analysis was used for data analysis. The findings suggest that California TPPs demonstrate strong structural and philosophical alignment with ESD, particularly in areas such as equity-centered pedagogy, inquiry-based learning, and ethical and democratic professional commitments. However, ESD and sustainability are framed implicitly rather than explicitly. The study offers some recommendations for teacher preparation programs.

[Keywords] Education for Sustainable Development (ESD), educator competencies, teacher preparation programs (TPPs), Teaching Performance Expectations (TPEs) and California Standards for the Teaching Profession (CSTPs)

Introduction

California faces intensifying climate-related disruptions that pose "a real, immediate, and growing threat to California's future" (Office of Environmental Health Hazard Assessment [OEHHA], 2018, p. 4). Extreme heat, wildfires, prolonged drought, flooding, sea-level rise, and air pollution increasingly affect the state's communities, economy, public health, and educational systems (Jerrett et al., 2024; Petek, 2022). These conditions are projected to worsen over the coming decades, generating profound social and economic consequences (Franklin & MacDonald, 2024). Recent estimates suggest that climate-driven disasters, particularly wildfires, cost the United States

tens to hundreds of billions of dollars annually, with California bearing a disproportionate share of these losses (UC Berkeley Center for Law, Energy, & the Environment, 2025).

Within this context, education systems, and teacher preparation programs (TPPs) in particular, are increasingly called upon to prepare educators capable of addressing the complex, systemic challenges posed by climate change. Education for Sustainable Development (ESD) has emerged as a prominent international framework for responding to such challenges. UNESCO defines ESD as a transformative learning process that empowers learners to take informed and responsible action for environmental integrity, economic viability, and social justice across generations (UNESCO, 2021). ESD emphasizes the development of competencies that enable learners to engage with interconnected environmental, social, and economic issues and to contribute to more just and sustainable futures (UNESCO, 2030).

A growing body of scholarship underscores the central role of teachers in advancing ESD, arguing that sustainability-oriented education depends not only on curricular content but on the competencies that educators bring to their instructional decision-making (Burgener & Barth, 2017; Buckler & Creech, 2014; Nousheen et al., 2019). Teacher educators and TPPs, therefore, function as key sites for cultivating the knowledge, skills, and dispositions necessary for sustainability-oriented teaching (Shumba, 2018; UNESCO, 2018). Yet, despite increasing global consensus around the importance of ESD, comparatively little empirical and conceptual work has examined how internationally articulated ESD competencies translate into the structures, pedagogies, and expectations of TPPs, particularly within specific state contexts.

Recent scholarship in teacher education has emphasized the need for educator competencies so that practitioners develop competencies that support systems thinking, collaborative problem-solving, and action-oriented learning in response to complex societal challenges (Burgener & Barth, 2017; Cebrián, Junyent & Mulà, 2020; Rieckmann & Barth, 2022). Educator competencies is used in this study to refer to the integrated knowledge, skills, and professional judgment that enable educators to design, implement, and assess learning experiences that prepare students to engage with sustainability challenges in equitable in ways that foster transformative understanding and action in support of sustainable, equitable, and resilient communities (Freguson, et al 2022; Rieckmann, 2019; Santone et al., 2014). Such competencies extend beyond environmental awareness to include attention to social justice, economic resilience, and the ethical dimensions of teaching and learning in contexts of environmental change.

Scholars have argued that teacher education programs must move beyond fragmented or additive approaches to sustainability toward more integrated frameworks that emphasize the interdependence of ecological, social, and economic systems (Chikunda, 2018; Shumba, 2018). Grounded in interdisciplinary inquiry and civic engagement, ESD offers a conceptual lens for positioning teacher education as a transformative enterprise—one that prepares educators to engage students in meaningful learning about sustainability while attending to equity and justice. California provides a particularly important context for examining these issues. The state has long been recognized as a national leader in environmental policy and innovation, and its education system has advanced multiple initiatives related to environmental literacy, climate literacy, and environmental justice education (Collins et al., 2024; Grossman, et al 2009). However, despite these efforts, research suggests that sustainability-related competencies remain unevenly and inconsistently embedded within TPPs. Educators report limited opportunities to engage deeply

with sustainability pedagogy, particularly with respect to integrating environmental issues with considerations of race, culture, and social justice (Collins et al., 2024). Moreover, gaps persist between global ESD frameworks and the policy-driven competencies that currently structure teacher preparation and professional standards in California.

Taking together, these conditions point to a critical need for teacher education scholarship that examines how ESD competencies can be meaningfully conceptualized, contextualized, and integrated within TPPs. Such work is essential for strengthening coherence between international sustainability frameworks and the everyday practices of teacher education.

Purpose of the Study

The purpose of this study is to identify and examine key educator competency domains aligned with UNESCO's ESD competencies and to analyze their relevance for TPPs in California. The study seeks to define and contextualize educator competencies for ESD within the California teacher education landscape and to examine how these competencies are reflected in teacher preparation and professional learning.

Guided by this purpose, the study addresses the following research questions:

1. What educator competencies are essential for effective implementation of ESD in California?
2. How are the competencies reflected within TPPs and professional learning opportunities?

Significance of the Study

This study contributes to teacher education scholarships by addressing a critical gap between international sustainability frameworks and the competencies emphasized in TPPs. While UNESCO's ESD competencies have been widely cited, limited research has examined their alignment with state-level teacher preparation structures and professional standards. By articulating educator competency domains grounded in ESD and situated within California's policy and educational context, this study provides a conceptual framework for advancing sustainability-oriented teacher education.

For TPPs, the findings offer a coherent, competency-based approach to integrating ESD across coursework, clinical practice, and candidate assessment. Rather than treating sustainability as an isolated topic, this framework supports a more systematic and transformative approach to preparing educators for complex, real-world challenges.

At the policy level, this study offers evidence to inform alignment between UNESCO's ESD competencies and California's professional standards, including the Teaching Performance Expectations (TPEs) and the California Standards for the Teaching Profession (CSTPs). By foregrounding competencies related to systems thinking, strategic action, and integrated problem-solving, the study contributes to ongoing conversations about the purposes of teacher education in an era of climate uncertainty and social inequity. In doing so, it positions teacher education as a central lever for advancing sustainability, equity, and democratic engagement.

Contextual Framework: Educator Competencies for ESD in California

This study is grounded in a contextual framework that conceptualizes educator competencies for

ESD as practice-based, equity-oriented, and socially situated capacities developed through teacher education. Drawing on UNESCO's ESD competency framework and foundational scholarship in teacher education, the framework positions educator competencies at the intersection of global sustainability imperatives, CA's policy and standards environment, and the practices of TPPs.

The framework aligns with traditions that conceptualize teaching as a form of professional practice shaped by moral, political, and social responsibility (Cochran-Smith et al., 2016; Zeichner, 2010). While UNESCO identifies core ESD competencies such as systems thinking, anticipatory and normative competence, strategic action, collaboration, and integrated problem-solving, this study conceptualizes these competencies as practices-in-use, enacted through professional judgment within specific institutional and sociopolitical contexts.

In California, where climate change and environmental degradation disproportionately affect historically marginalized communities, educator competencies for ESD necessarily involve connecting sustainability to issues of equity, justice, and civic responsibility. This framing reflects Cochran-Smith's emphasis on preparing teachers who can work toward educational and social transformation in contexts marked by systemic inequality.

The framework also draws on Zeichner's conception of teacher education as democratic and civic practice, positioning ESD as integral to the public purposes of schooling. Competencies such as systems thinking and collaboration support educators in facilitating critical, evidence-based engagement with complex sustainability challenges rather than predetermined solutions.

Finally, informed by Grossman's scholarship on core practices, the framework emphasizes that ESD competencies are developed through identifiable practices embedded in coursework, clinical experiences, and guided reflection. Taken together, this framework positions California as a mediating context where global ESD principles are interpreted and enacted through socially responsive teacher preparation.

Conceptual and Theoretical Framework

This study is guided by a conceptual and theoretical framework that conceptualizes educator competencies for ESD as integrated, practice-based, and equity-centered capacities developed through teacher preparation. The framework synthesizes UNESCO's ESD Roadmap and Sustainable Development Goal (SDG) 4.7 with competency-based approaches to educator preparation, theories of transformative and systems-based learning, and culturally sustaining and justice-centered pedagogies. Together, these perspectives position educator competencies as contextually situated and enacted within California's teacher preparation system.

UNESCO's ESD Roadmap and SDG 4.7 provide the global foundation for this framework by emphasizing education's role in advancing sustainability, global citizenship, human rights, and social justice (UNESCO, 2021). UNESCO identifies core ESD competencies, including systems thinking, anticipatory and normative competence, strategic action, collaboration, critical thinking, self-awareness, and integrated problem-solving. In this study, these competencies serve as conceptual anchors rather than prescriptive outcomes, acknowledging that ESD must be adapted to California educational contexts. California's vulnerability to climate change and its history of environmental injustice heighten the importance of such contextualization.

The framework draws on competency-based educator preparation models that conceptualize competencies as integrated combinations of knowledge, skills, dispositions, and

professional practices (Cochran-Smith, 2016) From this perspective, educator competencies for ESD are enacted through instructional decision-making, reflective practice, and professional judgment rather than as discrete skills. This orientation aligns with practice-based approaches to teacher education that emphasize coherence across coursework, clinical practice, and candidate assessment. Applied to ESD, educator competencies include sustainability-related content knowledge, pedagogical skills for inquiry and action, ethical responsibility, and professional practices that support interdisciplinary and community-engaged learning.

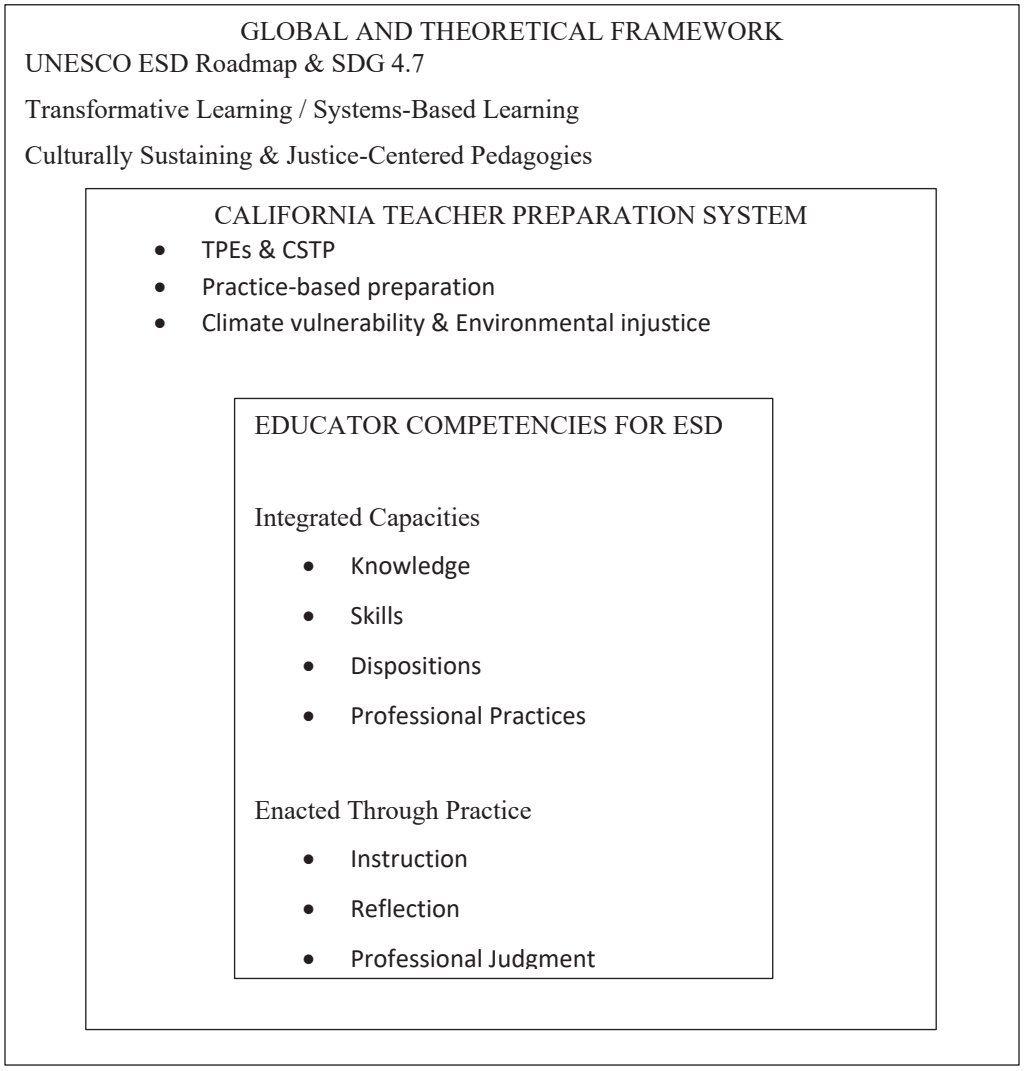
Transformative and systems-based learning theories further inform the framework by emphasizing educators' capacity to engage learners with complexity and interconnected systems. Systems-based learning highlights the interdependence of environmental, social, economic, and political systems, while transformative learning emphasizes shifts in perspectives and values. Within this framework, educator competencies for ESD include designing learning experiences that foster systems thinking and integrated problem-solving.

The framework is also grounded in culturally sustaining and justice-centered pedagogies that position sustainability as an equity issue rather than a neutral topic. Environmental challenges disproportionately affect historically marginalized communities, particularly in California. Educator competencies for ESD therefore include connecting sustainability content to students' lived experiences, drawing on community knowledge, and fostering critical awareness of environmental injustice. This justice-centered orientation aligns ESD with the broader purposes of public education and teacher preparation.

Finally, California's teacher education preparation system serves as the mediating context for this framework. State professional standards, including the Teaching Performance Expectations and the CSTPs, emphasize equity and reflective practice but do not explicitly name sustainability. This framework conceptualizes educator competencies as mediating constructs that bridge UNESCO's global ESD priorities with California's professional standards and teacher preparation practices, guiding the identification and analysis of ESD-aligned competency domains.

The graphic below shows the visual graphic representations that position educator competencies as situated within nested systems. The graphics show educator competencies in ESD as inherently contextual and justice situated as well as in alignment with ecological systems, and equity frameworks. The graphics visually reinforce California as a mediating environment.

Figure 1
Educator Competencies Nested Within CA Policy, and Teacher Preparation Practices



Review of Literature

Research on ESD emphasizes educators' central role in translating sustainability goals into classroom practice. International frameworks, particularly UNESCO's ESD Roadmap and Sustainable Development Goal (SDG) 4.7, conceptualize educator competencies as integrated combinations of knowledge, skills, dispositions, and professional judgment rather than discrete content mastery (UNESCO, 2020, 2021; Rieckmann, 2018). Within teacher education scholarship, practice-based approaches argue that such competencies develop through sustained engagement in authentic instructional practices, clinical experiences, and guided reflection (Grossman et al.,

2009). Scholars further emphasize that teacher preparation must attend to the ethical and civic responsibilities of teaching, especially in contexts marked by inequity and environmental risk (Cochran-Smith et al., 2016; Zeichner, 2010).

In California, efforts to incorporate ESD into teacher preparation and professional development have increased but remain uneven. Pre-service programs commonly integrate environmental or climate-related topics through methods coursework, interdisciplinary projects, and place-based clinical experiences, while in-service learning is often delivered through short-term workshops or curriculum-focused initiatives (Collins et al., 2024; California Environmental Literacy Initiative [CAELI], 2024). Empirical analyses of statewide professional learning indicate that although many educators have access to environmental literacy resources, fewer experience sustained, practice-embedded professional development that supports the development of systems thinking, anticipatory reasoning, and action-oriented pedagogy—competencies central to ESD (Collins et al., 2024). Research on place-based and community-engaged learning further suggests that educator competence deepens when sustainability is coherently embedded within preparation programs and supported by ongoing professional learning.

A growing body of California-focused research documents environmental education and sustainability initiatives across K–12 and higher education. Statewide landscape studies, including the *Peaks and Valleys* report (Collins et al., 2024) and CAELI analyses (2024), identify promising practices such as school–community partnerships, interdisciplinary curricula, and outdoor learning, while also revealing significant variability in implementation across districts and regions. State initiatives, including the Education and the Environment Initiative (EEI) and the CDE/CREEC network, provide curricular resources and professional networks; however, evaluations suggest these supports are often optional and inconsistently integrated into TPPs.

Contextual research further underscores the urgency of ESD in California. Climate assessments document the state's disproportionate exposure to wildfires, extreme heat, drought, and flooding (Office of Environmental Health Hazard Assessment [OEHHA], 2018), while economic analyses estimate substantial and increasing costs associated with climate impacts (UC Berkeley Center for Law, Energy, & the Environment, 2025). These findings frame sustainability education as a public responsibility rather than a curricular enrichment.

Despite growing attention to environmental literacy, significant gaps remain. Few empirical studies explicitly examine how UNESCO-aligned educator competencies are interpreted within California credential programs, aligned with state professional standards (TPEs and CSTPs), or enacted through coursework and clinical practice. Much of the existing literature is descriptive, with limited analysis of competency development or translation into classroom practice. These gaps point to the need for systematic research linking educator competencies, policy frameworks, and teacher preparation practice in California.

Methodology of the Study

Research Design

This study employs a Qualitative Document Interpretive Analysis Methodology (2016) to examine key educator competencies for Education for Sustainable Development within California TPPs. Grounded in document analysis and informed by foundational teacher education scholarship, the study analyzes how ESD-aligned educator competencies are articulated, interpreted, and

constructed at the intersection of global frameworks, environment, state policy and teacher professional standards. This approach allows for a nuanced examination of competencies as contextually situated, practice-based, and equity-oriented constructs rather than decontextualized technical skills. Therefore, the design supports the study's research objective of identifying ESD-aligned competency domains relevant to TPPs in California and examining how global sustainability competencies are mediated through California policies, environmental factors and TPP institutional documents.

Document Selection Criteria

Documents for the study were selected using the following criteria:

- Relevance to California teacher preparation or the teaching professional practice.
- Explicit or implicit reference to ESD, environmental literacy, equity and social justice, civic responsibility and democratic participation, system thinking, ESD competencies for educators, and interdisciplinary learning or related words or phrases.
- Currency (most recent version of the document).
- Public availability and accessibility.

The document selection approach ensured transparency and replicability for researchers while maintaining analytic focus of the study.

Data Sources

Four categories of data were analyzed to identify the multiple layers of mediation on educator competency development:

1. **UNESCO ESD Framework Documents**
   The documents include the UNESCO *Education for Sustainable Development Roadmap* and related competency-oriented publications (UNESCO 2018a & b, 2021) that provide global conceptual foundation for ESD.
2. **California Teaching Performance Expectations (TPEs)**
   The TPEs define the knowledge, skills, and abilities that beginning general education teachers must learn in the state-approved TPPs in California.
3. **California Standards for the Teaching Profession (CSTP)**
   The CSTP articulates six broad, interdependent standards that incorporate California's vision for "teaching in an effective, equitable learning system" (2024 California Standards for the Teaching Profession, pp. 7).
4. **Teacher Preparation Program Documents**
   Publicly available program materials, such as course syllabi, program handbooks, and the California Teaching Performance Assessment (CalTPA) rubrics were collected from websites. CalTPA is a performance-based assessment for candidates to earn a preliminary Multiple or Single Subject credential.

Data Analytic Method and Procedures

The study employed an iterative, multi-phase process informed by qualitative content analysis and thematic analysis (Saldana, 2016; Cresswell, 2013; and Cresswell, 2009). The documents were analyzed in three phases. Firstly, all documents were carefully read multiple times to develop

familiarity with language, structure, and emphasis. Initial open coding focused on reading and taking notes and summarizing ideas and identifying codes that make references to knowledge, abilities, skills, dispositions, and practices related to ESD, collaboration, equity, systems thinking, civic engagement, and professional judgment. Secondly, the theoretical and conceptual coding involved refining the initial codes using concepts drawn from (a) UNESCO ESD competencies, (b) practice-based teacher education scholarship (Cochran-Smith et al., 2016; Grossman et al., 2009), and democratic and justice-centered perspectives on teacher education (Zeichner, 2010). This phase emphasized how competencies were framed as practices enacted rather than discrete outcomes. Thirdly, the researcher examines discursive patterns and themes for identifying and synthesizing group of ideas to broader educator competency domains with attention to convergence, divergence, and absence of competencies across document types. To enhance the credibility of the analysis, the study used triangulation of data across multiple document sources.

Data Analysis and Interpretation

Using Qualitative Document Interpretative Analysis (QDIA), coding for analysis of UNESCO ESD framework (2018a & b and 2021) focused on sentences, phrases, ideas, and concepts explicitly and implicitly make references to ESD, equity and social justice, civic responsibility and democratic participation, system thinking and interdisciplinary learning. As the researcher read each page, relevant ideas and concepts were highlighted. The researcher also used word-search (Computer Control + F) to search for words and phrases. Similar ideas were organized according to specific themes. Finally, the ideas were read and studied again to identify and categorize emerging themes in the document. The following emerging themes were identified:

Professional Expectations for Educators

UNESCO 2018a Framework position educators as agents of transformation, not merely curriculum deliverers. The document states that "Educators across the world have the opportunities to develop capacities to foster transformation for a sustainable future" (pp. 23). The document states further that "Educators remain key actors in facilitating learners' transition to sustainable ways of life" (pp. 30). The Framework expects educators to develop pedagogical approaches that help educators to teach their students to make connections with their education and their societies.

Building Capacities for Educators

UNESCO (2018a & b, 2021) Framework underscores educator's role in creating transformational learning environment for students. The documents note that educators play a critical role in encouraging learners to become change agents who acquire the knowledge, skills, dispositions and courage to take transformative actions for sustainable development. The document notes that: "Education policy-makers should create enabling environments for educators to integrate the whole-institution approach on ESD" (pp. 28). UNESCO (2018a) suggest that "there need to be more opportunities for them [educators] to increase their capacities to empower learners" and argues that educators should be "facilitators of learning that guide the learners through the transformation as well as expert transmitters of knowledge (pp. 61).

Education for Sustainable Development

UNESCO 2018a Framework suggests that ESD framework is vitally important for society, educators, and educational institutions to equip students with knowledge, skills and dispositions to transform society. UNESCO 2018a states that "Education for Sustainable Development can provide the knowledge, awareness and action that empower people to transform themselves and transform societies" (pp. 2). The document notes the crucial value of ESD in providing students with transformative education that empowers citizens to develop the skills and knowledge to make informed decisions and take actions for environmental integrity and a just society. UNESCO 2018a, b & 2021 documents promote prosperity of humanity, socio-emotional learning, empathy, solidarity, and lifelong learning.

ESD Educator Competencies

UNESCO 2018b describes and clarifies the principles of ESD for teacher educators and how they can draw on their knowledge and creativity to center ESD in their day-to-day professional practices and in teacher education preparation programs. Because of the critical of teacher educators and teacher education institutions, UNESCO 2018b notes that "Education systems expect teacher educators to inculcate in student teachers a view of teaching that encourages questioning, interaction, and the consideration of several alternative hypothesis" (pp. 66). UNESCO 2018b suggests that TPPs should develop rubrics that assess teacher candidates' competencies and skills in four broad areas: (a) **Learning to know**, which allows candidates to integrate thinking and practice and transformative approaches to education; (b) **Learning to do**, that is, candidates to employ integrative thinking and practice; (c) **Learning to live together**, which prepares teacher candidates to develop the skills to engage different groups of people across generations, cultures, geographical locations, perspectives and disciplines; and (d) **Learning to be**, in which candidates develop the abilities to be inclusive of different perspectives, disciplines, cultures, and worldviews.

California Teaching Performance Expectations (TPEs)

California TPEs document was analyzed with a focused thematic analysis of words, sentences, and phrases that make explicit and implicit references to specific ideas and concepts including ESD, equity and social justice.

Equity and Social Justice

The California TPE document makes strong and explicit references to the need to create inclusive and enabling environments for student learning. The document makes explicit language including the need for educators to teach students "restorative practices" (pp. 7), create environment where "each student is treated fairly and respectfully" (pp. 7); "foster a caring community" (pp. 7); establish and maintain "inclusive learning environments that are physically, mentally, intellectually, and emotionally healthy and safe to enable all students to learn" (pp. 7); and "recognize and appropriately address instances of intolerance and harassment among students, such as bullying, racism and sexism" (pp. 7). The document provides structural equity mechanism that aligns with students who have Individualized Education Plans (IEPs) (pp. 7), Individualized Family Service Plans (IFSPs) (pp. 7), and 504 (legal document that provides students with disabilities accommodations for equal access to education) (pp. 7). Educators are asked to train

teacher candidates to use diverse instructional strategies, including Universal Design for Learning (UDL) (pp. 9), Multi-Tiered System of Supports (MTSS) (pp. 10), and culturally responsive pedagogy (CRP). The document further asks educators to recognize systemic barriers and access resources to support students who have "experienced trauma, homelessness, foster care, incarceration, and/or are medically fragile" (pp. 7).

The document aligns with ESD framework that recognizes equity and social justice are foundational to student learning and creation of a better society. The TPEs reflect a **transformative justice orientation**, particularly through restorative practices, bias recognition and mitigation, and attention to historically marginalized learners This aligns strongly with ESD's commitment to **inclusive, just, and peaceful societies**.

Civic Responsibility and Democratic Participation

The discussion of civic responsibility and democratic participation is implicit but meaningful in the California TPEs document. While the use of explicit civic language is limited in the document, reference to democratic participation is embedded implicitly through practice. Key indicators of references to civic responsibility and democratic participation in the document include the need of educators to "incorporate student input" (TPE 2), "encourage students to share and examine a variety of points of view" (TPE 2), "promote digital citizenship" (TPE 3), "participate in a digital society and economy" (TPE 3), and engagement with **families and communities** in decision-making and planning (TPEs 2, 4, 6). In relation to professional civic responsibility, TPE 6 explicitly references "school governance" (pp. 7), "public education systems" (pp. 7), and "school fiancé" (pp. 7). The document encourages dialogue, shared decision-making and multiple perspectives. Hence, the document positions educators as important actors with democratic institutions with the responsibility of preparing teacher educators for informed participation in civic and institutional systems.

Educator Competencies in California

TPEs document strongly support several components of the UNESCO ESD competencies, including **normative competency** such as ethics, fairness, justice, and responsibility (TPE 6) and addressing bias, racism, sexism, and inequity throughout the document. In addition, California TPEs document addresses interpersonal competency through references such as "consultation and collaboration with other educators and the larger school community" (TPE 3) and emphasis on communication, peer learning, and collective responsibility.

Critical Thinking Competency

The TPEs document emphasizes the need to improve students' conceptual understanding, cultivate critical thinking, and promote creative learning. TPEs promote the concepts of diversity, multiple perspectives, and inclusive learning environments in TPPs. The TPEs also encourage teacher candidates to teach their students how to analyze bias in assessment to inform and improve instructional design and pedagogical practices. TPEs expect candidates to teach students to reflect on historical and structural inequities in education by critically analyzing "how the context, structure, and history of public education in California affects and influences state, district, and school governance as well as state and local education finance" (pp. 14).

While the TPEs do not explicitly name ESD, they provide a strong structural and philosophical foundation for integrating Education for Sustainable Development, particularly through equity, systems thinking, interdisciplinary learning, and democratic participation. With minor reframing or supplementation, these standards could readily support an explicit ESD orientation in teacher preparation. For example, the TPEs reflect ESD's goal of preparing learners to navigate complex, evolving social systems and contribute to sustainable futures, even though sustainability is framed indirectly through well-being, access, and societal participation.

California Standards for the Teaching Profession (CSTP)

Equity and Social Justice

CSTP provides explicit and pervasive references to the theme of equity and social justice throughout the document. Such explicit references include "equity," "equitable outcomes," "equitable access" (repeated across all CSTPs). There are other references such as "historically and persistently underserved students," "anti-bias," "implicit and explicit bias," "systemic biases," "achievement and opportunity gaps," "restorative justice" (2B–5) and "eradicate barriers" (6F). Similarly, the themes of **"**diversity and equity" (1D) and "activating access and equity" (6F) are structurally embedded throughout the CSTP document. "Equity" is embedded across Curriculum (3A–3E), and Professional ethics and advocacy (6E, 6F). The authors of the CSTP documents the critical role of equity and social justice in TPPs position equity not as an add-on but as a core professional responsibility, aligning closely with social justice–oriented teaching and transformative education frameworks.

Civic Responsibility and Democratic Participation

CSTP gives prominence to civic responsibility and democratic participation in TPPs in California. The language of CSTP implicitly but consistently uses words that relate to civic responsibility and democratic participation including key language and practices as *"student voice"* (1B–3, 5C), *"agency," "leadership capacities," "responsibility for one another's learning"* (2A–5, 2B–4), *"Collaborative problem-solving"* (3D–5), *"Respectful feedback and opinions"* (2D–4), *"Digital citizenship"* (3B–5) and *"Ethical conduct," "legal responsibilities," "advocacy"* (6E, 6F). In addition, CSTP also emphasizes democratic norms and makes references to language such as "participation," "dialogue," "shared responsibility," "ethical decision-making," and "accountability to communities" throughout the document. While CSTP does not explicitly name "democracy" or "civic education," it cultivates democratic dispositions through implicit references to ideas such as student voice and agency, ethical reasoning, collective responsibility, and community engagement (6D).

ESD Competencies for Educators

Data analysis of the CSTP document shows that there is a strong alignment with widely cited ESD educator competencies (e.g., UNESCO, 2017; Wiek, Withycombe and Redman, 2011. The CSTP document aligns with the k**ey** competencies that reflect critical reflection (6A) (reflection on bias, ethics, impact); equity-oriented pedagogy (1D, 6F); Collaborative action (6C, 6D); ethical and values-based decision-making (6E); learner-centered facilitation (1A, 4C); data literacy and

evidence-informed practice (5A–5D); and well-being and sustainability of the educator (6G). From the analysis, CSTP defines the teacher as a change agent, closely matching ESD's view of educators as reflective practitioners, ethical professionals, and advocates for equity and long-term social good.

Reference to ESD

Throughout the CSTP document, there is no explicit reference to ESD or sustainability as a formal construct. However, there is a strong implicit alignment with ESD principles, especially the UNESCO framing of ESD (equity, systems thinking, real-world problem solving, future-oriented competencies). The CSTP repeatedly use key ESD-aligned language and concepts throughout the document including *"*real-world applications" (3B); "identify issues, explore proposed solutions, and examine relevant, complex subject matter" (3D); "prepare students for college, career success, and civic life" (implicit across 3B, 3D, 6D); well-being," "collective and individual growth," "long-term student outcomes," and equitable access, opportunities, resources, and outcomes." CSTP document functions as an ESD-compatible professional framework, even without explicit sustainability language. The document emphasizes learners as agents in their learning, education as connected to social, economic, and community contexts, and teaching as preparation for responsible participation in society.

Teacher Preparation Program Documents

The analysis of CalTPA and syllabuses show the following themes:

Education for Sustainable Development

A thorough reading and search of the CalTPA rubrics and syllabuses showed that there was no direct mention of ESD, sustainability, or the UN SDGs. However, several core ESD-aligned principles are embedded implicitly, especially at Levels 3–5. Such implicit ESD language includes "higher-order thinking," "making connections between prior content learning and the lesson," "inclusive learning environment," and "students' assets and learning needs." Other principles are "affirm and validate students' cultural backgrounds" and "Universal Design for Learning (UDL)." Similarly, science syllabuses make explicit references to connections between science, society, technology, and the environment, such as the language that teacher candidates make "connections between science, society, technology, and the environment.*"* In addition, the Next Generation Science Standards (NGSS) places emphasis on crosscutting concepts, engineering practices, and real-world problem solving.

Though the syllabuses do not make explicit reference to ESD, they have strong emphasis on real-life contexts (TPE 1.3) inquiry-based learning, critical thinking and reflection, community-based and culturally relevant instruction. These are core pedagogical pillars of ESD, especially when learners are positioned as problem-solvers in complex and real-world systems.

Environmental Literacy

The CalTPA makes no reference to important ideas and concepts in California discussion of climate change such as environmental systems, human–environment relationships, sustainability concepts, and ecological literacy or stewardship. The implication of the analysis is that

environmental literacy is not addressed directly or indirectly. However, there are explicit references in science methods courses to environmental literacy, including: NGSS-based instruction, Earth Science standards, and experimentation. On the other hand, ELA syllabuses do not make implicit mention of environmental literacy. The analysis suggests that content-specific environmental outcomes are not named in the in other syllabuses such as ELA course.

Equity and Social Justice

CalTPA rubric and syllabuses strongly and explicitly articulate ESD-related theme of equity and social justice especially Levels 3–5. Key equity-oriented language includes "respond to the diverse needs of learners," "affirm and validate students' cultural backgrounds," "students' assets and learning needs." Other examples in the rubric are "inclusive learning environment," "equal access to content," "safe learning environment," "focus students" and individualized supports, and "English learners, heritage language speakers, multilingual learners." Across the syllabuses, the key explicit language includes educational equity, cultural and linguistic responsiveness, social justice and human rights, restorative justice, and inclusive learning environments. Other mentions include asset-based pedagogies, culturally and linguistically affirming and sustaining practices, and funds of knowledge. The syllabuses further implicitly reinforce concepts such as differentiation, UDL, MTSS, and ELD and frame them as equity tools rather than remediation.

The concept of equity and social justice is the most explicit and consistent theme across the CalTPA and syllabuses. More importantly, Equity and social justice are core, explicit, and foundational across all sections.

Civic Responsibility and Democratic Participation

CalTPA rubric makes no explicit references to the concept of civic responsibility and democratic participation; however, it makes indirect references to the theme including such language as civic engagement, democratic participation, collective decision-making public problem-solving, and community action. Other indirect signals to the theme are "collaborative" communication modes, "whole class community," "safe learning environment," and "equal access to content." Additionally, the syllabuses place emphasis on concepts such as ethical behavior, professional responsibility, respectful discourse, and community engagement.

The analysis shows that CalTPA rubric emphasizes participation within the classroom but does not extend learning toward civic agency or democratic action, which are core ESD goals. In addition, certain concepts in the syllabuses align with democratic participation skills, even though civic engagement is not framed as a discrete learning outcome. In other words, civic responsibility is conceptually present, primarily as a professional and pedagogical stance rather than a student civic action framework.

ESD Competencies for Educators

CalTPA rubric references to ESD educator competencies are implicit but strongly align with several UNESCO ESD educator competencies. The examples of competency alignment include **anticipatory and reflective practice** (providing evidence of learning, rationale, assessment alignment), **equity-centered pedagogy (**asset-based framing, cultural validation, UDL), **Learner-centered design (**differentiation, adaptations, inclusive environments, **Critical pedagogy (**higher-

order thinking, academic language development). Furthermore, across the twenty-three syllabuses some educator competencies are strongly represented including c**ritical thinking** (inquiry, reflection, analysis, argumentation), **Collaboration** (peer teaching, group lesson planning, professional learning communities), **Self-reflection** (journaling, ePortfolios, reflective practice), and **Equity-oriented pedagogy** (asset-based approaches, cultural responsiveness).

The findings show that ESD educator competencies are strongly present implicitly, particularly those related to reflection, ethics, collaboration, and critical inquiry. The CalTPA rubric develops foundational ESD educator capacities, especially around equity and inclusion, but stops short of transformative or action-oriented ESD. For example, critical educator competencies are not mentioned in the rubric such as transformative action, futures thinking, sustainability ethics, and global citizenship. Table 1 below provides a summary of the relationship between themes and level of presence in the syllabuses.

Table 1
Relationship between Themes and Levels of Presences

Theme	Level of Presence
Education for Sustainable Development	Implicit, strong pedagogical alignment
Environmental Literacy	Explicit in science; implicit in ELA
Equity and Social Justice	Explicit, central and foundational
Civic Responsibility and Democracy	Explicit in mission, implicit in pedagogy
Systems Thinking	Explicit in science; implicit across curriculum
ESD Educator Competencies	Strong implicit alignment
Interdisciplinary Learning	Explicit and pervasive.

The data analysis of the documents demonstrates strong structural and philosophical alignment with ESD, particularly through equity-centered pedagogy, inquiry-based, interdisciplinary learning, and ethical and democratic professional commitments. However, ESD and sustainability are framed implicitly rather than explicitly. This finding suggests an opportunity to name ESD directly and explicitly connect literacy and science learning to sustainability challenges, civic engagement, and environmental justice.

Discussion

The purpose of this study is to identify, define, and contextualize educator competencies for ESD within the California teacher education landscape and to examine how these competencies are reflected in teacher preparation and professional learning. Taken together, the data reveals a consistent and meaningful pattern: while ESD is rarely named explicitly, the core competencies required for ESD are widely embedded—often deeply—across California's professional standards, performance assessments, and program-level curricular documents. This finding

positions California TPPs as ESD-aligned in practice but not in language, suggesting both strength and missed opportunity.

Educators as Transformational Agents: Alignment with Professional Expectations

Analysis of the UNESCO (2018a, 2018b) frameworks establishes educators as agents of societal transformation, expected to cultivate learners' capacities for critical reflection, ethical action, systems thinking, and democratic participation. When interpreted against California's professional standards, this conception of the educator is strongly mirrored.

Both the TPEs and the CSTP position educators not merely as instructional technicians but as ethical professionals, collaborators, advocates, and institutional actors. Expectations related to restorative practices, inclusive learning environments, bias recognition, collaboration, and engagement with school governance align directly with UNESCO's call for educators who "guide learners through transformation" while also transmitting disciplinary knowledge.

The data supports the interpretation that California's professional expectations already conceptualize educators in ways consistent with ESD, particularly in their emphasis on equity, well-being, and long-term societal outcomes. This alignment strengthens the study's central claim that educator competencies for ESD are present, albeit implicitly, within California TPPs.

Capacity Building and Competency Development: Strong Social Alignment, Limited Ecological Framing

Across the documents analyzed, capacity building for educators emerges as a dominant theme. The TPEs, CSTP, CalTPA rubrics, and syllabuses all emphasize competencies such as:

- Critical thinking and reflection
- Equity-oriented and asset-based pedagogy
- Collaboration and professional learning
- Learner-centered design and differentiation
- Data-informed and evidence-based decision-making

These competencies align closely with UNESCO's ESD educator competencies, particularly normative, interpersonal, strategic, and critical competencies. The data therefore suggest that California TPPs are actively developing educators' capacities to foster social sustainability, democratic participation, and institutional transformation.

However, the analysis also reveals a systematic imbalance. While social justice, equity, and civic-oriented competencies are explicit and foundational, environmental sustainability and ecological systems are weakly represented or absent, especially in TPEs, CSTP, CalTPA rubrics and non-science syllabuses. Environmental literacy is largely confined to science methods courses and is not articulated as a cross-cutting educator competency. This limits the scope of ESD as enacted in California TPPs and narrows sustainability primarily to social and institutional dimensions.

Education for Sustainable Development as an Implicit Framework

A key interpretive finding of this study is that ESD functions as an implicit framework across California teacher preparation. The documents consistently promote:

- Holistic learning environments
- Real-world relevance
- Interdisciplinary learning
- Learners as active participants and problem-solvers
- Education connected to community, society, and future well-being

These elements directly reflect UNESCO's definition of ESD as holistic, lifelong, transformative, and action-oriented. Yet, because ESD is not explicitly named, its full integrative and future-oriented potential is not realized.

This pattern is especially evident in the CalTPA, which strongly supports equity, inclusion, reflection, and instructional coherence but does not incentivize environmental literacy, interdisciplinary sustainability issues, or civic action beyond the classroom. As a high-stakes assessment, the CalTPA's silence on ESD effectively signals to candidates and programs that sustainability is optional rather than essential.

Systems Thinking and Interdisciplinarity: Present but Operationalized

Systems thinking and interdisciplinary learning—both central to ESD—are evident across the data but are operational rather than conceptual. CSTP and TPEs emphasize alignment across curriculum, instruction, assessment, and professional practice, as well as recognition of systemic inequities. Similarly, syllabuses—especially in science—explicitly reference interconnected systems and NGSS crosscutting concepts.

However, systems thinking is rarely framed as socio-ecological or futures-oriented, and interdisciplinarity is often justified for instructional effectiveness rather than sustainability problem-solving. This suggests that educators are prepared to work within complex systems, but not always to name, analyze, or transform those systems in relation to sustainability challenges.

Implications for Educator Competencies in Californian Teacher Preparation Programs

In relation to the study title, the data supports three central interpretations:

1. Educator competencies for ESD are already substantially present in California TPPs, particularly in areas of equity, collaboration, critical inquiry, and democratic dispositions.
2. The absence of explicit ESD language, especially environmental and futures-oriented competencies, limits coherence and intentionality, resulting in uneven implementation across programs and content areas.
3. California's teacher preparation infrastructure provides a strong foundation for ESD, meaning that relatively modest reframing, supplementation, and policy alignment could transform existing standards into an explicitly ESD-oriented system.

Implications and Recommendations for California TPP Redesign

The findings of this study suggest that California TPPs are well positioned to advance ESD but currently do so in fragmented and implicit ways. While educator competencies aligned with ESD, particularly equity, social justice, critical thinking, collaboration, and systems awareness, are strongly embedded across professional standards, assessments, and curricula, the absence of explicit ESD framing limits coherence, intentionality, and depth. The following implications and

recommendations address program redesign at policy, curriculum, pedagogy, assessment, and institutional levels.

Implications for Educator Competencies for ESD in California TPPs

1. ESD is structurally present but conceptually underdeveloped. The data indicates that ESD-aligned competencies are already embedded in California TPPs, especially through equity-centered pedagogy, interdisciplinary learning, and democratic dispositions. However, because ESD is not explicitly named or framed as a guiding paradigm, sustainability learning remains uneven, dependent on individual instructors, content areas, or candidate interests. This results in missed opportunities to prepare educators for complex socio-ecological challenges.

Implication: California TPPs require a **shared conceptual framework** that explicitly integrates ESD across standards, assessments, and coursework.

2. Social sustainability is prioritized over environmental sustainability. California's teacher preparation system strongly emphasizes social justice, equity, inclusion, and well-being—core pillars of ESD. In contrast, environmental literacy and ecological systems thinking are largely confined to science methods courses and absent from assessments such as the CalTPA.

Implication: ESD in California TPPs is currently imbalanced, emphasizing social and institutional sustainability while under-developing environmental and future-oriented competencies.

3. High-stakes assessments signal what matters most. CalTPA's silence on sustainability, interdisciplinary problem-solving, and civic action communicates that these competencies are optional rather than essential. Because performance assessments drive instructional priorities, the lack of explicit ESD expectations constrains program-level innovation.

Implication: Without assessment alignment, ESD integration will remain peripheral and inconsistent across programs.

4. Educators are prepared as ethical practitioners but not always as change agents. California standards conceptualize teachers as reflective, ethical, and collaborative professionals. However, the competencies related to transformative action, futures thinking, and collective problem-solving beyond the classroom are underdeveloped.

Implication: Teacher candidates are prepared to navigate existing systems but are less prepared

Recommendations for TPP Redesign

To effectively respond to contemporary sustainability challenges, teacher preparation programs (TPPs) must undergo critical transformation.

1. Explicitly integrate education for sustainable development (ESD) into California's teacher preparation frameworks

California should formally recognize ESD as a cross-cutting priority within TPPs by:

- Embedding ESD language and competencies within TPEs and CSTP revisions
- Aligning ESD with existing priorities such as equity, culturally sustaining pedagogy, and whole-child education
- Positioning ESD as an integrative lens rather than an additional requirement

Recommendation: Adopt an ESD competency framework aligned with UNESCO (2017, 2018) that explicitly incorporates social, environmental, economic, and civic dimensions of sustainability.

2. Redesign coursework to promote sustainability interdisciplinary and problem-based sustainability learning

TPPs should redesign core and methods courses to:

- Integrate sustainability themes across English language arts, science, social studies, mathematics, and the arts
- Address real-world, community-based problems (e.g., climate justice, water access, public health, digital equity)
- Use inquiry-based, project-based, and experiential learning approaches aligned with ESD pedagogy

Recommendation: Require at least one program-wide interdisciplinary sustainability inquiry embedded across coursework rather than isolated in a single class.

3. Strengthen Environmental Literacy Across All Credential Pathways

Environmental sustainability should not be limited to science education. All teacher candidates should develop foundational ecological literacy and understanding of human–environment relationships.

Recommendation:

- Embed environmental literacy expectations into general pedagogy courses, literacy methods, and assessment design
- Align environmental learning with culturally responsive pedagogy and local community contexts
- Frame environmental sustainability as inseparable from equity and social justice

4. Revise Performance Assessments to Incentivize ESD Competencies

High-stakes assessments should explicitly evaluate ESD-aligned practices.

Recommendation: Revise CalTPA rubrics to include indicators such as:

- Systems thinking and interdisciplinary connections
- Real-world sustainability problem-solving
- Civic engagement and student agency
- Ethical reasoning and futures-oriented reflection

Even the important alignment between ESD framework and ESD, some modest rubric language changes would have significant downstream effects on curriculum and instruction.

5. Prepare Teacher Candidates as Civic and Community Change Agents

TPPs should extend democratic participation beyond classroom discourse to include civic agency and community engagement.

Recommendation:

- Integrate community-based learning, service learning, and partnerships with local organizations
- Encourage candidates to design lessons that connect content to community issues and collective action

- Position civic responsibility as a professional competency aligned with ESD and global citizenship education.

6. Support Faculty Capacity Building for ESD

Sustainable program redesign requires educator preparation faculty who understand and model ESD.

Recommendation:

- Provide professional development on ESD pedagogy, systems thinking, and interdisciplinary curriculum design
- Create faculty learning communities focused on sustainability and equity
- Incentivize curriculum redesign through grants, workload recognition, and promotion criteria

7. Institutionalize a Whole-Program Approach to ESD

Consistent with UNESCO's whole-institution approach, ESD should be reflected in:

- Program missions and conceptual frameworks
- Clinical partnerships and fieldwork expectations
- Program assessment and continuous improvement processes

Recommendation: Align accreditation, program review, and continuous improvement processes with ESD outcomes to ensure sustainability is not dependent on individual champions.

The recommendations are also summarized in Table 2 below.

Table 2

Key Educator Competencies in California that Align with Education for ESD

Educator Competency	Competency Description (Teacher Practice)	UNESCO ESD Competency Alignment	Observable Indicators in Teaching Practice
Systems-Oriented Instruction	Designs instruction that helps students understand interconnections among environmental, social, economic, and cultural systems.	Systems Thinking	Integrates cross-disciplinary concepts; uses systems maps, real-world phenomena
Critical & Equity-Centered Pedagogy	Facilitates critical examination of sustainability issues through an equity and justice lens.	Critical Thinking; Normative	Uses culturally sustaining materials; engages students in questioning power and inequity
Ethical & Values-Based Teaching	Models ethical responsibility, care, and intergenerational justice in teaching decisions.	Normative; Self-Awareness	Frames lessons around ethical dilemmas; reflects on professional values
Futures & Climate Literacy	Prepares students to understand climate change and envision sustainable futures.	Anticipatory	Teaches climate science and justice; uses scenario planning and future-oriented inquiry
Action-Oriented Learning Design	Designs learning experiences that empower students to take informed sustainability action.	Strategic; Integrated Problem-Solving	Implements project-based learning tied to real sustainability challenges
Collaborative & Participatory Practice	Engages students, families, and communities as partners in sustainability learning.	Collaboration	Facilitates dialogue, group problem-solving, and community engagement
Cultural & Indigenous Knowledge Integration	Incorporates diverse and Indigenous ways of knowing into sustainability instruction.	Normative; Collaboration	Uses community knowledge; honors Indigenous ecological practices
Place-Based & Experiential Pedagogy	Connects learning to local environments, communities, and lived experiences.	Strategic; Integrated Problem-Solving	Uses fieldwork, service learning, and local case studies
Reflective & Adaptive Practice	Engages in ongoing reflection to adapt teaching for sustainability goals.	Self-Awareness	Uses reflective journals, feedback cycles, and data-informed adjustment
Teacher Leadership & Advocacy	Acts as a sustainability advocate and change agent within schools and communities.	Strategic; Self-Awareness	Leads initiatives; participates in school or district sustainability efforts

Limitation

The study is based on document analysis which did not capture how competencies are enacted in lived practice or how faculty and candidates interpret these texts. However, the study's purpose is conceptual and analytic rather than evaluative. Findings are intended to inform future empirical research on implementation and enactment.

Conclusion

The findings of this study indicate that California TPPs already possess a strong ethical, pedagogical, and structural foundation for Education for Sustainable Development. What is needed now is intentional redesign rather than wholesale reform. By making ESD explicit, interdisciplinary, and assessable, California can transform its TPPs into what not only promote equity and excellence but also prepare educators, and their students, to contribute meaningfully to sustainable, just, and resilient futures.

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