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Walking the talk: how defining equity turns to action in a research-practice partnership

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Introduction: This study examines how a research-practice partnership (RPP) involving university researchers and local education agency leaders across California engaged in the ongoing work of collaboratively defining and operationalizing “equity” in computer science (CS) education implementation. Grounded in Freire’s concepts of praxis, words-as-praxis, and dialog, this qualitative research explores how sustained engagement with defining equity became a transformative practice rather than a preliminary planning activity.

Methods: Over 4 years, the RPP iteratively developed three versions of an equity definition, responding to changing socio-political contexts. The RPP expanded from 5 to 17 leaders, ultimately scaling to influence a state-sponsored initiative encompassing 38 county offices of education. Data sources for the study include RPP meeting notes, interviews with RPP members, and analysis of evolving equity documents.

Results: Findings reveal four key themes: (1) productive tensions between CS content focus and equity emphasis that forced deeper examination of assumptions; (2) the necessity of iterative equity definition as an ongoing process responsive to socio-historical contexts; (3) inclusion/exclusion dynamics within the partnership that shaped both representation and understanding; and (4) how collaborative equity definition built capacity for sustained systemic change. Significantly, resistance to equity conversations paradoxically validated the need for sustained dialog, revealing underlying assumptions about CS education’s “neutrality” that required examination.

Discussion: The study demonstrates how collaborative equity definition serves dual functions: developing shared language for collective action while transforming participants’ professional identities and commitments. Participants became leaders of California’s statewide CS education equity initiatives, creating tools and approaches that continue to influence practice years later. This work contributes to research-practice partnership literature by showing how treating equity definition as ongoing praxis—rather than preliminary consensus-building—can create conditions for sustained educational transformation, with implications for STEM education partnerships seeking to center equity while navigating political resistance and changing contexts.

KEYWORDS

computer science education, equity, K-12 education, research-practice partnership, praxis

1 Introduction

Computer science (CS) education has emerged as a critical discipline for elementary and secondary 21st-century learning—specifically in the current technology age of artificial intelligence (AI), computer-generated misinformation, political polarization, privacy concerns, etc.—in which peoples’ safety, health, career opportunities, and well-being are dependent on their understandings of how computers are both shaped by and shape human life. Yet

significant disparities persist in access and participation across demographic groups (Code.org, CSTA, ECEP Alliance, 2024; Margolis et al., 2008/2017). The field remains highly segregated, with underrepresentation of women, Black, Latine, and Indigenous students continuing to plague the discipline from K-12 through higher education and into the workforce (Code.org, CSTA, ECEP Alliance, 2024; NCWIT, 2025). In the US, only 60% of public high schools offer a foundational computer science (CS) course, but these high schools are less likely to be in low-income communities and rural or urban settings (Code.org, CSTA, ECEP Alliance, 2024). Black, Latine, and Indigenous students are less likely to attend a high school offering foundational CS courses; Latine students are 1.7 times less likely than white or certain Asian students to be enrolled in CS courses; and English language learners and students with disabilities are underrepresented in these courses (Code.org, CSTA, ECEP Alliance, 2024). These inequities are compounded by systemic barriers, including (a) inadequate funding for CS programs in under-resourced schools, (b) lack of culturally responsive pedagogy that connects to students' lived experiences, (c) absence of diverse role models and mentors in CS fields, and (d) persistent stereotypes about who "belongs" in technology. Furthermore, the digital divide—unequal access to technology—disproportionately affects students from low-income families and communities of color, creating additional obstacles to CS learning and participation. Without intentional equity-focused interventions, CS education risks perpetuating and amplifying existing social hierarchies rather than serving as a pathway to economic mobility and civic participation for all students. In California, the context of this study, and home to Silicon Valley and the nation's technology hub, approximately only 5% of secondary students enroll in CS classes (Koshy et al., 2021b). These data highlight the urgent need for systemic approaches to expanding equitable access and inclusion in K12 CS education.

Research-practice partnerships (RPPs) have emerged as promising mechanisms for addressing complex educational challenges by bringing together researchers and practitioners to collaboratively identify problems, develop solutions, and implement sustainable changes (Coburn et al., 2013). These partnerships offer unique opportunities to bridge the research-practice divide while centering practitioner knowledge and local contexts in educational reform efforts (Fishman et al., 2013). RPPs have been particularly important across both STEM and non-STEM education projects, and specifically for focusing on issues of equity and justice. This is visible in RPPs addressing uneven suspension rates falling across racial lines (Anyon et al., 2017), culturally sustaining pedagogies for 7th grade literacy (Coppola et al., 2019), parent-teacher communication (Ishimaru and Takahashi, 2017), career education that privileges wealthier students (Kenny et al., 2019), etc. (see Vetter et al., 2022). Thus while this work describes efforts of an RPP focused on CS education specifically, the findings are applicable to any range of RPPs centered on equity and justice in education.

This study examines how a National Science Foundation-funded statewide RPP in California, titled Supporting Computer Science Access, Leadership, and Equity in California (SCALE-CA), approached the complex task of defining and operationalizing "equity" in CS education implementation, and how the act of defining "equity" impacted scaling efforts after the partnership was complete. The SCALE-CA RPP was initially composed of UCLA researchers, AIR evaluators, and 5 school leaders that expanded to

17 school leaders by the end of the grant, and then expanded to 38 county office administrators through a grant that built upon the RPP's work (Flapan et al., 2023). The larger goal of the RPP was to remedy issues of underrepresentation and unequal access to CS education. The RPP worked toward this goal by developing resources such as the CS Equity Guide and the accompanying workshop for school administrators, as well as culturally responsive and equity-focused CS education professional development experiences for California educators. In order to achieve their goals, the RPP recognized the need to come to a shared understanding about what "equity" meant for this work, especially given that school leaders' and administrators' conceptualizations of equity have major implications for how computing education is made available and how researchers' views of equity must also be made explicit and align with practitioner partners for the larger health of the RPP (e.g., Denner et al., 2019; Ryoo and Shea, 2015; Ryoo et al., 2015; Dorsey et al., 2023). This process of RPP members defining equity and regularly revisiting and refining it, led to respectful dialog and sensemaking about the meaning and the actions behind the definition. The process thereby provided crucial insights for scaling equitable CS and STEM education initiatives in California.

The success of the national CSforAll movement, and its California affiliate, Computer Science for California coalition (CSforCA), has witnessed the broadening of participation in computing, especially among underrepresented students in CS, with significant increases among Black students (+10%), Hispanic/Latino students (+7%), Native American students (+7%) and girls (+1.9%) in the last 2 years alone (Code.org, CSTA, ECEP Alliance, 2022; Code.org, CSTA, ECEP Alliance, 2024). CSforCA has made significant progress through statewide policy adoption, funding, and large scale teacher professional learning through its professional development model, Seasons of CS. As a result, schools have adopted computer science into the curricular offerings in K12 education and the number of students earning a bachelor's degree in computer science has more than doubled over the last decade. With computer science and AI in the spotlight, some educational priorities have shifted to respond to labor market predictions that emphasize CS concepts such as data, algorithms and programming, networks and computing systems. This focus on preparing students for career pathways that meet the demands of the job market has elevated STEM education to become a top priority (National Student Clearinghouse, 2025).

However, despite these advances, significant tensions remain. Computer science and AI has long regarded itself as "neutral," "objective," and "the great equalizer," but is a segregated field (Margolis et al., 2008/2017). While tech evangelists promote technology's promise for leveling the playing field, tech skeptics raise equally important concerns about how technology can reproduce existing inequalities (e.g., Noble, 2018; Benjamin, 2019; Buolamwini, 2017). Critical considerations include how biases become embedded into the algorithms and how incomplete data sets inform these systems. Despite the importance of addressing racial bias or inequality in representation in the tech economy, educators often feel ill-equipped to engage in conversations about equity and, more importantly, to examine how their structural decisions can have disparate impacts on minoritized communities. Furthermore, it is equally important for teachers to be aware of technology's effects in order to develop socially responsible computing in a culturally sustaining classroom that better prepares students to be both critical users and creators with technology.

While a partnership with the Computer Science Teachers Association, AI4K12, examines the societal impacts of AI—both positive and negative—as one of five big ideas for CS classrooms, implementation remains inconsistent. A recent survey of CS teachers found that just 61% of teachers saw the importance of covering computing's role in perpetuating biases related to racism, sexism, and other inequities in the classroom. This was most prevalent among teachers in elementary, higher-income, rural, and less racially-diverse schools. Although 77% of teachers acknowledged the importance of incorporating diverse cultures and experiences for student success, only 57% felt equipped to utilize material highlighting race, ethnicity, and culture (Koshy et al., 2021a). The RPP initiated by UCLA in partnership with school districts and county offices of education provided one approach to engage education leaders in conversations around equity and its impact on access in CS education in California. Importantly, the process of defining equity led to a greater understanding of the ways in which school leaders can interrupt inequality and instead, increase access to the foundational learning in CS.

What follows, will be a description of the theory informing both the RPP's approach to defining and enacting equity in CS education, as well as our analyses. Then, a brief overview of literature regarding RPPs and the importance of shared language and vision among partners, with a description of our RPP's process of defining and redefining equity to guide the collaboration's work, research methods, and what was learned from this study regarding the value and impacts of defining equity together. More specifically, this paper answers the following research questions:

- (1) How is developing a shared language with common understandings around the word “equity” necessary to advance equity-related work within an RPP?
- (2) In what ways did the process of defining equity become an action step toward advancing equity both within the RPP and in their school contexts?

The paper concludes with reflections on how these efforts may inform similar work in STEM RPPs and additional implications for computing education specifically.

2 Materials and methods

2.1 Theory informing our RPP'S approach to defining and enacting equity

This research practice partnership builds on Freire's (1970/1997) reflections about how praxis, words as praxis, and dialog are critical to forming humanizing and anti-oppressive educational contexts. This is explained in greater depth below.

2.1.1 Praxis

Freire (1970/1997) defines “praxis” as “reflection and action upon the world in order to transform it” in ways that allow people to free themselves from “domesticating” forces of oppression that “submerge human beings’ consciousness” and keeps them from escaping the oppressor-oppressed cycle (p. 33). Praxis brings together theory and reflection on those theories toward “purposeful action” in ways that

are “reflective, active, creative, contextual, purposeful, and socially constructed” (Breunig, 2005, p. 111). In critical pedagogy scholarship, praxis is seen as creating a bridge between ideas in abstraction and human practices in a continual process of seeking new understanding and knowledge that has no end because “Knowledge has historicity; it is always in the process of being” (Breunig, 2005, p. 111). In these ways, explicit attention to praxis is always needed to ensure liberation from oppression, as contexts continue to evolve over time. The international research network Pedagogy, Education, and Praxis (PEP) define praxis as a means by which to illuminate the moral-political aspects of daily life toward critically examining and reimagining what education can and should be. Drawing on Aristotle, Marx, Hegel, MacIntyre, Freire, Arendt, and others, the PEP network defined praxis according to six themes: (1) praxis as doing, (2) particularity, (3) morality and justice, (4) agents and agency, (5) history, (6) connectedness (Kemmis and Smith, 2008, p. 7; Mahon et al., 2020). The first theme of “praxis as doing” refers to the ultimate goal of praxis for taking action, either individually or collectively. “Particularity of praxis” (Kemmis and Smith, 2008) takes into account that praxis is situated in specific contexts, time, place, material arrangements, politics, and sociohistorical situations from which praxis cannot be divorced. The third theme reflects that praxis is not simply engagement in reflection to take any type of action, but a true commitment to take moral and ethical action that leads to justice and counters oppression. The fourth theme focused on “agents and agency” in praxis, elevating how praxis leads to individuals and/or collective groups refusing to follow traditional power hierarchies and structures toward self-definition (Mahon et al., 2020), “being bold” (Kemmis and Trede, 2010), “pushing back” (Smith et al., 2010), or “trouble-making” (Mahon, 2014). “History” in praxis acknowledges that action through praxis is not only rooted in peoples’ unique histories, cultures, and narratives, but consciously takes history into account when engaging in praxis toward improving educational experiences. And finally, the last theme of “connectedness” refers to how praxis does not take place individually in a vacuum, but in social spaces and through relations between and among people.

These aspects and definitions of praxis were very much centered in our RPP's efforts. Our goal to collaborate across university and school contexts in ways that brought together researchers and practitioners was rooted in an effort to continuously engage in both reflection (on educational theory within our unique sociocultural and historical contexts) and action (that was moral and justice-oriented in nature, attentive to particularity, agentive, and connected). This notion of praxis also informed both our reason for and approach to defining and enacting “equity” in both the RPP and our work focused on computer science education.

2.1.2 Words as praxis

Freire (1970/1997) explores how the essence of dialog are “true words”—opposed to empty and superficial blather—which is only made possible through praxis. “True words” are those that have both the dimensions of reflection and action of praxis and are geared toward “transformation” (Freire, 1970/1997, p. 68). Freire (1970/1997) points out that words focused only on reflection are mere “verbalism” such that:

An unauthentic word, one which is unable to transform reality, results when dichotomy is imposed upon its constitutive elements. When a word is deprived of its dimension of action, reflection

automatically suffers as well; and the word is changed into idle chatter, into verbalism, into an alienated and alienating “blah.” It becomes an empty word, one which cannot denounce the world, for denunciation is impossible without a commitment to transform, and there is no transformation without action (p. 68).

Similarly, words focused only on action are shallow “activism” that makes “dialog impossible”:

[I]f action is emphasized exclusively, to the detriment of reflection, the word is converted into activism. The latter—action for action’s sake—negates the true praxis and makes dialog impossible. Either dichotomy, by creating unauthentic forms of existence, creates also unauthentic forms of thought, which reinforce the original dichotomy (Freire, 1970/1997, p. 69).

The ultimate goal of words as praxis is to speak “truthfully” in ways that support dialog and using “words to change the world” (Freire, 1970/1997).

Importantly, all the aspects of praxis described in the previous sub-section above apply to our engagement with words and, specifically, words we use in dialog and action toward positive social change. In a highly quoted interview, Freire (1985) reflects on reading as something that:

...cannot be explained as merely reading words since every act of reading words implies a previous reading of the world and a subsequent rereading of the world. There is a permanent movement back and forth between “reading” reality and reading words—the spoken word too is our reading of the world. We can go further, however, and say that reading the word is not only preceded by reading the world, but also by a certain form of writing it or rewriting it. In other words, of transforming it by means of conscious practical action (p. 18).

In our RPP, we center these ideas about the importance of words as praxis; words as both reflection and action to read and reread, as well as write and rewrite the world. We came to the important recognition that our engagements with and uses of the word “equity” at the beginning of our RPP’s efforts together had neither ballast nor clear direction because of the varying ways that people were using it. Our RPP needed to take the time to both reflect and take action—engaging in authentic praxis—around the word “equity” itself and in concert with all the words we were using to define and engage with this word and concept. It was through this attention to language and how we read/write words such as “equity” that the RPP could enter into meaningful and productive dialog for positively impacting computer science education across different K12 school contexts.

2.1.3 Dialog

While praxis and words-as-praxis are essential to transforming educational contexts, these two things alone are insufficient. And this is where the role of dialog becomes critical to both envisioning and creating a better world in which not only some people have the “privilege” of engaging in praxis and words, but where all people have the “right” to do so because, “no one can say a true word alone—nor can she say it for another, in a prescriptive act which robs others of their words” (Freire, 1970/1997, p. 69). Importantly, such dialog for “cannot be reduced to the act of one person’s “depositing” ideas in

another, nor can it become a simple exchange of ideas to be “consumed” by the discussants” (Freire, 1970/1997, p. 69). Engaging in meaningful dialog, according to Freire (1970/1997), should be an act of “creation” that welcomes and values all voices for shared reflection and action.

In *Pedagogy of the Oppressed*, Freire (1970/1997) goes further to describe six key conditions that must be met to achieve meaningful and humanizing dialog. These include: (1) a profound love for the world and for people, (2) humility, (3) faith in humankind, (4) horizontal relationships of mutual trust, (5) hope, and (6) critical thinking. More specifically, Freire (1970/1997) notes that “love is at the same time the foundation of dialog and dialog itself” (p. 69). And when explaining what this love looks like, he describes it as commitment to other people and their freedom from oppressive circumstances. It also means recognizing when and how one’s own actions are oppressive, regardless of one’s positionality and power, and seeking to move away from that binary to envision something new with others and for one another. Such love and dialog are possible only with humility about what one knows and who one is. As Freire (1970/1997) explains:

How can I dialog if I always project ignorance onto others and never perceive my own? How can I dialog if I regard myself as a case apart from others—mere “its” in whom I cannot recognize other “I”s? How can I dialog if I consider myself a member of the in-group of “pure” men, the owners of truth and knowledge, for whom all non-members are “these people” or “the great unwashed”? How can I dialog if I start from the premise that naming the world is the task of an elite and that the presence of the people in history is a sign of deterioration, thus to be avoided? How can I dialog if I am closed to—and even offended by—the contribution of others? How can I dialog if I am afraid of being displaced, the mere possibility causing me torment and weakness? (p. 71).

These are key questions one must ask oneself to engage in humble dialog. Hand-in-hand with such humility is what Freire (1970/1997) calls “faith in humankind” which involves recognizing that all people—and not only oneself—has the ability to create and recreate and has the power to escape oppressive cycles in their own ways. This is a humble standpoint, one that acknowledges that no specific person or people should have privilege or be seen as more valued or important, including oneself.

Freire (1970/1997) then notes that from these first three grounding perspectives, one can engage in dialog that supports horizontal relationships (opposed to hierarchical ones) that can challenge sociohistorical norms of power and hierarchy while developing mutual trust between people. Trust is needed both for engaging in dialog, as well as can be the result of dialog. And trust is dependent on people demonstrating that they have “true, concrete intentions; it cannot exist if that party’s words do not coincide with their actions” (Freire, 1970/1997, p. 72). And this trust-supported and creating dialog is also driven by hope:

Hope is rooted in men’s incompleteness, from which they move out in constant search—a search which can be carried out only in communion with others. Hopelessness is a form of silence, of denying the world and fleeing from it. The dehumanization resulting from an unjust order is not a cause for despair but for hope, leading to the incessant pursuit of the humanity denied by

injustice. Hope, however, does not consist in crossing ones arms and waiting (Freire, 1970/1997, pp. 72–73).

Hope inspires dialog and efforts to engage in praxis and the “true words” described above. And finally, meaningful dialog is built upon critical thinking:

...which discerns an indivisible solidarity between the world and the people and admits of no dichotomy between them—thinking which perceives reality as process, as transformation, rather than as a static entity—thinking which does not separate itself from action, but constantly immerses itself in temporality without fear of the risks involved (Freire, 1970/1997, p. 73).

Critical thinking that makes space for envisioning a better world is essential to the liberatory dialog of which Freire speaks.

All of these elements were important to our own RPP’s approach to reflecting on, dialoguing with, and defining equity, both in the abstract and for taking action. Our partnership was based upon the deep love for the world and people that Freire described as we thought about how to improve educational experiences and outcomes for all children, specifically around computing in a world where technology has become a source of deep inequity, political division, and misinformation. We created a collaboration that seeks to develop horizontal relationships of mutual trust and humility that reflects faith in our fellow colleagues and hope for a different and better education system. And we engaged deeply in critical thinking in our dialog around equity and its purpose in computing education.

Thus it is with these theoretical frames of praxis, words (as praxis), and dialog that we built our RPP and our profound examinations and applications of “equity” to computer science education.

2.2 Defining equity

After the initial convening with the original five school leaders and five researchers in 2019, the RPP decided that collaboratively defining “equity” would strengthen the collective vision of the group as they set out to develop guidance and tools for equitable CS education implementation for the state. One leader shared best practices from his own district defining equity and led the process for the RPP. This leader shared valuable lessons from his own experience and suggested we engage in rounds of having the RPP break off into pairs of researcher and administrator, developing their own definitions together by answering the question “How would you define equity?” and presenting these definitions to the group as a whole, then synthesizing the various definitions into the definition seen in [Box 1](#) (Hadad et al., 2021a; Hadad et al., 2021b; Flapan et al., 2021).

But then, 18 months later in 2021—after COVID, the murder of George Floyd, the surge of the Black Lives Matter movement, the rise in anti-Asian hate crimes, and the January 6th US Capitol Attack—the definition no longer seemed to address the concerns the educators and researchers were grappling with to ensure all students felt a sense of belonging in a CS classroom.

To respond to the current political and social context, the RPP formed a subcommittee to revise the definition with suggestions from the entire group. The entire RPP submitted suggestions for how to improve the original statement by responding to the questions “What

BOX 1 Equity definition #1.

Equity Statement - Version 1 (2019)

Equity is accomplished when every student is provided with what they individually require to learn and succeed in fulfilling their personal, academic, and social advancement, and when success and achievement is not predicted by any demographic factor. This requires continually interrupting inequitable practices, examining biases, and creating inclusive environments for all, while discovering and cultivating the unique gifts, talents and interests that every student possesses.

Equitable practices are based in the belief that every child’s educational experience should be rigorous and relevant, and that everyone is capable of learning. These beliefs require providing a learning environment that is safe and respects every student.

While often used interchangeably, equality and equity are not the same. Equality suggests that all people should simply have access to the same resources, regardless of need. With equity, resources are distributed according to different students’ needs, while taking into account how certain students have been systematically denied access to educational resources, opportunities, and experiences based on race/ethnicity, gender, sexual orientation, socioeconomic class, and disability. An equity-based approach means acknowledging and challenging: (1) the institutional barriers impacting youth differently based on the way they look or where they come from, (2) countering practices rooted in stereotypes about who can or should excel, and (3) recognizing that people both present themselves and are treated differently in different contexts depending on how their various identities overlap and intersect. This requires an ongoing and cyclical approach to examining factors impacting youth’s experiences.

Computer science and computer science education have been documented as being highly segregated along race/ethnicity, gender, and socioeconomic lines due to a lack of access to high-quality computer science learning opportunities for all students. However, an awareness of equity issues in the computer science education community presents an opportunity to structure learning opportunities and environments with equity considered throughout the progression from K-12, as frameworks, policies, and courses are being built. Not only is computer science an emerging field of study that leads to high-wage and high-demand careers that can address socio-economic inequality, but it can empower students to be critical users of technology and creators in all fields touched by technology, finding their voice in the digital environment that is becoming increasingly part of our communities.

are the strengths of this definition? What’s missing? How has the context changed since we first defined equity?” Then, a group of three education leaders and one researcher reviewed the suggestions, and met biweekly to review each suggestion individually and discussed if and how to incorporate what was suggested, and how it aligned with what they believed was the goal of the RPP. These discussions surfaced differing ideas of what it means to be truly equitable, when issues of racism, privilege, rural exclusion, and ableism run up against concepts of merit-based appraisal. Borrowing from National Council of Supervisors of Mathematics and TODOS: Mathematics for ALL, the subcommittee structured the definition to (a) acknowledge the unjust system of CS education and its historical and current participation in institutional systems of oppression; (b) articulate the actions necessary to transform computer science education policies and practices that do not promote equitable teaching and learning; and (c) ensure accountability that those these changes were made and sustained. This was less of a definition, but more a statement about equity, as seen in [Box 2](#).

Some members of the partnership felt that the definition could still use refining and focusing on racial inequity, so in 2022, another subcommittee was formed. The RPP was asked again “What are the strengths of this definition? What’s missing? How has the context changed since we first defined equity?” Once again, this subcommittee met on a bi-weekly basis to work through the RPP’s individual

BOX 2 Equity definition #2.*Equity Statement - Version 2 (2021)**Preamble*

California is a wellspring for creativity and innovation; diverse perspectives, rich cultures, and intellectual vigor thrive in communities across our state. Our public education system can be a powerful engine for advancing our human potential. From transitional kindergarten through postsecondary pathways, each and every student deserves learning opportunities that inspire them and prepare them to thrive as full participants in California's future. Yet, these opportunities are not fairly distributed. It is the responsibility of educators to address policy and program flaws that are barriers to students' personal and educational growth, and economic advancement. It is our duty to speak up for those who are excluded, provide doorways for all, and foster productive connections, ensuring universal access to California's great promise.

Statement

It is the position of SCALE-CA that all students should have access to a quality and culturally responsive computer science education. In order for there to be an equitable and sustainable system of computer science education for all children, there must be (a) acknowledgment of the unjust system of computer science education and its historical and current participation in institutional systems of oppression; (b) understanding of the actions necessary to transform computer science education policies and practices that do not promote equitable teaching and learning; and (c) accountability to ensure these changes are made and sustained.

Acknowledgement

- *Certain populations of students have been systemically denied access to educational resources, opportunities, and experiences based on different facets of their identity including race/ethnicity, gender, sexual orientation, socioeconomic status, and disability.*
- *These inequalities often get reproduced in computer science education due to a lack of access to high-quality, culturally relevant/responsive/sustainable computer science learning opportunities for all students.*
- *In order for students to be fully engaged members of society, we must provide an education that, through the lens of computer science, encourages the exploration of issues that impact youth as a way to develop skills that lead to becoming articulate and proficient in the field.*
- *Computer science can empower students to be more than just consumers of technology, and instead be critical users and creators in all fields touched by technology, whereby they can find and use their voice, as well as promote issues of social justice.*
- *As technology becomes more intertwined in various aspects of our lives, we must empower students to be informed and educated members of society by developing their understanding of what technology is, how it functions, and its impact on our communities.*
- *Computer science is an emerging field of study that can lead to high-wage and high-demand careers; by actively inviting underrepresented groups into this space, we not only address socio-economic inequality, but create a technology sector that's diverse, inclusive, and reflects the life experience of those that use digital tools.*

Action

- *In order to develop an equity-based approach that centers students' experiences, we must approach the computer science classroom through pedagogical, structural, and cultural lenses.*
- *The pedagogical lens requires us to be accountable for empowering instruction for all students. We must therefore*
- *Recognize every child's educational experience should be rigorous and relevant.*
- *Recognize that every child is capable of learning.*
- *Create classroom environments that are inclusive, safe, and respect and affirm every student, embracing and honoring their diverse and complex identities.*
- *Discover and cultivate the unique talents and interests of every student.*
- *The structural lens requires us to examine existing structures and policies and make new ones. We must therefore*
- *Ensure that resources and opportunities are not to be distributed equally, but according to different students' needs.*
- *Ensure that not only all students have access to computer science education, but exposure to those who are in different demographic groups than them in computer science classrooms.*
- *The cultural lens requires us to examine what are the belief systems that exist that cause our actions to favor certain identities over others. We must therefore*
- *Acknowledge and challenge the institutional barriers impacting youth differently based on the way they look or where they come from.*
- *Counter practices rooted in stereotypes about who can or should excel in computer science.*
- *Recognize that people both present themselves and are treated differently in different contexts depending on how their various identities overlap and intersect.*

Accountability

- *Equity in computer science education is not a goal, but a process by which we strive to ensure that every student is provided with what they individually require to learn and grow personally, academically, and socially, and when success and achievement is not predicted by any demographic or geographic factor.*
- *This work is challenging and involves constant collection and analysis of intersectional data on access and outcomes, as well as reflection on how we can fight inequity through standards, curriculum, professional development, and our understanding of our own identities and biases.*
- *The work of implementing high quality computer science pathways is a collective responsibility.*
- *Teachers must be empowered with high quality curricula and the necessary tools and training.*
- *Administrators must embrace, champion and prioritize the change of a young person's education to include CS.*
- *Policy makers must produce quality legislation that ensures CS education is equitable, scalable, and sustainable.*
- *The professional sector must actively dialog with educators as to how computer science is taught, who is hired, and what workplace environments are like for underrepresented populations.*

suggestions to the questions and feedback about the second version of the definition into consideration. They reviewed each suggestion and discussed how it met with the current context of the CS education landscape and the overall goals of the RPP. This committee streamlined the second version based on the commonalities that were present in the whole RPP group's feedback, making it less verbose, and more clearly articulated who was underrepresented (e.g., "Black and Brown students, girls, low-income students, and students from rural areas") and how they could be better supported (e.g., "culturally responsive and sustainable education"). It also included families and community members as those that can be held accountable for how accessible opportunities are for students. These changes can be seen in [Box 3](#).

Through these processes, our equity definition evolved. The first definition focused on explaining the difference between "equity" and "equality," and specifically in computing education, what sorts of practices are required to achieve an equity approach. In the second version of the definition, we no longer explained the difference between "equity" and "equality," and instead, described what equity looks like in practice by outlining specific "acknowledgements," "actions," and "accountability" measures needed to ensure all students benefit from a meaningful CS education. These equity ideas were also clarified according to the specific roles and responsibilities of community members: teachers, administrators, policy makers, and in the professional sector. All of this was explained within the larger context of the state specifically, and why CS education is needed for all students. Finally, the third definition became more streamlined, removing the state context preamble, and became more explicit regarding who experiences unjust systems of computer science education and why. As noted above, other community members (including families) were also added to the definition of those who can be accountable for ensuring children receive equitable educational experiences.

In 2021, as the NSF grant that supported this RPP came to an end, California granted \$5 million, and then another \$15 million in 2023, to continue the RPP's work through a statewide CS professional learning initiative in partnership with 38 county offices of education representing diverse urban, rural, and suburban contexts. This larger group did not engage in an equity defining conversation, but those leading the statewide effort were part of the original SCALE RPP that formed the foundation of the new effort. In what follows, we include reflections on how the RPP's original efforts to define equity together ultimately informed this new phase of work and/or their perspectives and relationships to the new project.

2.3 Methods

This qualitative research study emerged from a RPP across California that began the first year with 5 county and district leaders and eventually expanded to 17 administrators. The collaboration subsequently expanded to a state-sponsored professional learning initiative encompassing 38 county offices of education representing diverse urban, rural, and suburban contexts throughout the state.

Data collection occurred over 7 years and included:

- 6 documents that each outline research-practice partnership meetings, including subcommittee meetings specifically focused on defining "equity," spanning the years 2019–2022.
- 10 interviews with school leaders - one conducted in 2019, and nine in 2025 over a span of 3 months.
- 10 partnership documents, including the collaboration's evolving equity statement

For the purposes of this paper, the research team zoomed in specifically on the follow-up interviews with school leaders and the different equity statements. In order to protect the identities and privacy of school leader partners, we used pseudonyms for each leader. However, we can share that interviewees included school leaders from across urban, rural, and suburban contexts. They were chosen to be interviewed because they are school leaders who were active in the RPP, and continue to be engaged participants in the projects that have spun off of the original RPP work. These interviewees are currently applying their equity leadership in various contexts across STEM education initiatives and thus could reflect well on past RPP efforts to define equity. Interviewees also included equal representation of those who led the equity definition activity processes and those who only participated in the activities. The interviewees chosen provided valuable insight as they applied what they learned in the RPP across large-scale grants such as the Educator Workforce Investment Grant and the California Math, Science, Computer Science Partnership. The school leader-partners from the RPP who did not participate in the interviews are no longer active in their K12 education roles or in CS education initiatives.

Specific meeting notes were then used as a resource to check ideas surfacing in interviews and equity statements with the actual interactions and conversations between partners that occurred during meetings. Data analysis involved research team members first individually analyzing each interview. The four co-authors of this paper reviewed all interviews together to develop a shared understanding of the emerging themes and patterns across what school partners described. Thematic analysis took a grounded theory approach ([Glaser and Strauss, 1967](#)), seeking to build new theory and ideas from the interview data itself. This was then compared to existing theory and ideas from Freire to explore areas of overlap and difference. During the first round of reading, each researcher was assigned 2–3 interviews to read closely for thematic analysis, then researchers came together to share back the themes they noticed and discuss similarities and differences in those themes. Initial themes included interviewee reactions to iteratively defining equity, impacts of this activity on individual perspectives and work in CS education, challenges in implementing equity-oriented CS education today, and appreciation for the RPP in connecting people across the state. During a second round of reading, researchers reviewed each other's thematic analysis for agreement/disagreement and further discussion. This second round of reading ensured that thematic analysis was consistent across researchers for interrater reliability. A third round of reading then involved overlaying themes that emerged from the interviews with the theoretical constructs in Freire's explorations of praxis, words as praxis, and the importance of dialog across theory and action.

Following thematic analysis of the interviews, the researchers then read all meeting notes in the data corpus that directly related to RPP activities in defining equity. Themes emerging from reading of these meeting notes were compared to interview themes and Freire's theories of praxis, words as praxis, and dialog. More specifically, moments in meeting notes that overlapped with ideas and perspectives that emerged in the interviews were marked as a way to triangulate

BOX 3 Equity definition #3.*Equity Statement - Version 3 (2022)*

Equity means that (1) all students should have access to a meaningful, empowering, high-quality, and culturally responsive and sustaining computer science education that allows them to explore relevant issues; and (2) computer science education should be humanizing and counter the oppression and exclusion that many youth experience in school.

In order for there to be an equitable and sustainable system of computer science education for all children, there must be (a) acknowledgment of the unjust system of computer science education and its historical and current participation in institutional systems of oppression; (b) understanding of the actions necessary to transform computer science education policies and practices that do not promote equitable teaching and learning; and (c) accountability to ensure these changes are made and sustained.

Acknowledgement

- *Certain populations of students, such as Black and Brown students, girls, low-income students, and students from rural areas, have been systemically denied access to educational resources, opportunities, and experiences based on different facets of their identity including race/ethnicity, gender, sexual orientation, socioeconomic status, and disability, as well as the intersection of those facets.*
- *These inequalities that exist in the broader educational landscape often get reproduced in computer science education due to*
- *A lack of access to high-quality, culturally relevant/responsive/sustainable computer science learning opportunities for all students;*
- *Beliefs about who can excel in educational spaces often degrade the potential and capacity, specifically of Black and Brown students and girls, as a way to rationalize their underrepresentation; and*
- *Local, state, and national policies that result in shortages of Black and Brown teachers, shortages of counselors, funding disparities; and lack of funding.*
- *In order for students to be fully engaged members of society, educational stakeholders must provide an education that, through the lens of computer science, encourages the exploration of issues that impact youth as a way to develop skills that lead to becoming proficient in the field.*
- *Computer science can empower students to be more than just consumers of technology; by allowing them to find and use their voice, we encourage them to become critical users and creators in all fields touched by technology.*
- *Computer science is an emerging field of study that can lead to high-wage and high-demand careers; by actively inviting underrepresented groups into this space we address socio-economic inequality and*
- *promote a technology sector that's diverse, inclusive, reflects the life experience of those that use digital tools, and promotes issues of social justice.*

Action

- *In order to develop an equity-based approach that centers students' experiences, we must approach the computer science classroom through pedagogical, structural, and cultural lenses.*
- *The pedagogical lens requires us to be accountable for empowering instruction for all students. We must therefore*
- *Recognize that every child's educational experience should be rigorous and relevant.*
- *Recognize that every child is capable of learning.*
- *Create classroom environments that are inclusive, safe, and respect and affirm every student, embracing and honoring their diverse and complex identities.*
- *Discover and cultivate the unique talents and interests of every student.*
- *The structural lens requires us to examine existing structures and policies and make new ones. We must therefore*
- *Ensure that resources and opportunities are not to be distributed equally, but according to different students' needs.*
- *Ensure that not only all students have access to computer science education, but exposure to diverse computer science classrooms.*
- *The cultural lens requires us to examine implicit and explicit biases. We must therefore*
- *Acknowledge and challenge the institutional barriers impacting youth from historically underrepresented groups.*
- *Counter practices rooted in stereotypes about who can or should excel in computer science.*
- *Recognize that people present themselves and are treated differently in different contexts depending on how their various identities overlap and intersect.*

Accountability

- *Equity in computer science education is not a goal, but a process by which we strive to ensure that every student is provided with what they individually require to learn and grow personally, academically, and socially; success and achievement should not be predicted by any demographic or geographic factor.*
- *This work is challenging and involves constant collection and analysis of intersectional data on access and outcomes, as well as reflection on how we can counter inequity through standards, curriculum, professional development, and our understanding of our own identities and biases.*
- *The work of implementing high quality computer science education is a collective responsibility for various stakeholders.*
- *Teachers must empower students through culturally responsive and sustainable education that supports their identity and interests.*
- *Administrators must prioritize CS by ensuring teachers are empowered with high quality curricula, tools, and training.*
- *Policy makers must produce quality legislation that ensures CS education is equitable, scalable, and sustainable.*
- *The professional sector must actively dialog with educators as to how computer science is taught, who is hired, and what workplace environments are like for underrepresented populations.*

Families and guardians can empower students by encouraging them to pursue their identity and interests.

and reinforce whether or not we were correctly understanding and interpreting interviewee's reflections. Overlaps between what came up during meetings as captured in meeting notes and interview ideas informed the results section described below.

The larger themes (which led to some of the headings in the Results section) included:

- Tension between CS concepts and equity.
- Iterative definition through conversation.
- Inclusion leading to feelings of exclusion.
- Defining in socio-historical contexts.
- Building leadership capacity for systemic change.

Analysis of the equity definitions involved one team member comparing the three definitions, checking for similarities and differences between them and taking note of how ideas evolved over time. These shifts in the definition were then compared to meeting notes taken by another research team member who was closely involved in the RPP sub-committee meetings for defining equity. The themes for the equity definitions were then compared to those that came up among the interviews (listed above).

3 Results

Analysis of the data revealed themes that illuminate how educational leaders approached defining and operationalizing equity in CS education and why they believed it necessary to do so. These leaders felt that there was a need to continually (a) navigate tensions between CS concepts and a focus on equity, (b) define equity iteratively with an awareness of the current sociopolitical/historical climate and its application to the context, (c) grapple with an inclusion/exclusion dynamic within the equitable representation of the RPP itself socio-historical contexts, and (d) build leadership capacity for systemic change.

3.1 Navigating tensions between CS content and a focus on equity

One of the most prominent tensions that emerged from the data involved striking an appropriate balance between focusing on CS content knowledge and centering equity in implementation efforts. This tension manifested differently across participants and contexts.

Three participants expressed concern that excessive focus on equity discussions detracted from the practical work of implementing CS curricula. For instance, during the process of developing the first equity definition, Mary, a white administrator from an urban district with a large population of low-income Latine students felt frustrated that too much focus was on the discussions of equity, rather than the implementation of it. Moreover, she felt a sense of urgency to provide parity in access to rigorous CS learning for her Latine students in comparison to their white and wealthy counterparts in more affluent districts. Similarly, Everett, a leader of color from a county that serves many students from migrant worker families expressed that he had "interest in teaching computer science to everyone," but not in the "racial conversations" that would detract from his work. Hannah, a leader from a large county office who identifies as white, wished that

some time discussing equity was instead spent building up the skills of the school leaders in CS content and tools and pedagogical approaches to implementing them in classrooms: "I think it gives administrators not only a reference point, but an ability to talk about why grounding computer science, education and equity is important, and why having a variety of different voices in computer science space is important and not just important for the voices that have been historically left out or underrepresented."

However, for some leaders, centering the equity discussions was viewed as fundamental rather than tangential to quality CS education. Sharon works in a large county office and stated that, from her perspective, "centering equity is critical to CS education." Robert, who works in a smaller county office, stated, "[The process of defining equity within the RPP] was my foundation. That was the foundation of all the stuff that I do now that I stand for. It kind of, like, opened up my values. I knew those were my values, but it really opened up to really what I should be focusing on ... It was extremely, extremely important, because that was a foundation for me to get started with the work I do now." These differing viewpoints created productive tension within the partnership, forcing participants to grapple with fundamental questions about the relationship between content knowledge and equity-minded justice.

In the three equity definitions developed by the RPP and subsequently published online, it was not apparent that this tension existed between CS content vs. equity. However, this tension arose in the discussions shaping iterations on the equity definition as RPP members grappled with finding ways to center equity in CS learning contexts rather than treating it as a separate focus to consider, divorced from the realities of CS education. And thus one can see a shift in the first definition (which spends time clarifying the difference between equity and equality, but separate from CS education contexts), to the second and third definition (that get more explicit about what specifically must be considered within the context of CS learning in order to center equity) (see [Boxes 1–3](#)).

For example, the first definition notes that equity "is accomplished when every student is provided with what they individually require to learn and succeed in fulfilling their personal, academic, and social advancement, and when success and achievement is not predicted by any demographic factor." The definition points out that equity involves addressing institutional barriers, stereotypes, and how people are treated differently depending on their intersectional identities. Yet what that looks like in CS education contexts is not specified beyond saying that CS fields are highly segregated and so equity must be "considered throughout the progression from K-12, as frameworks, policies, and courses are being built" so that students can be "empowered" to be "critical users of technology and creators in all fields touched by technology, finding their voice in the digital environment that is becoming increasingly part of our communities." In other words, the ideas about what "equity" means in this first definition is still being described separately from what CS education involves. However, in the second and third versions of the definition, more effort is made to clarify what equity means for CS education specifically. While this move did not incorporate CS concepts and skills (e.g., abstraction, pattern recognition, algorithmic thinking, etc.), it did support explaining what CS education equity requires by: (a) explicitly calling out that students "should have access to a quality and culturally responsive computer science education," (b) that "unjust system[s] of computer science education and its historical and current

participation in institutional systems of oppression” must be acknowledged by teachers and administrators alike, and (c) actions must be taken up to transform CS education policies and practices specifically (rather than educational policies and practices more generally as in the first definition). The second and third definitions call out what inequities people experience in CS education contexts specifically (e.g., systematic denial of access to resources and learning opportunities, lack of culturally relevant CS curricula, etc.) and the actions and accountability structures that need to be taken up for CS learning to be equitable. For example, teaching with a “cultural lens” and trying to expose students to different demographic groups in CS classrooms, or collecting and analyzing intersectional data about CS access and outcomes to ensure that policy and school CS education decision-making is rooted in accurate information. In these ways, the act of engaging with the equity definition helped surface the challenge some people felt between focusing on equity vs. CS content, and for others, the need to keep pushing for equity to be centered as foundational to CS teaching and learning, vs. an add-on consideration to CS educational contexts.

In more practical ways, the defining of equity helped the RPP develop a practical tool for school leaders: the CS Equity Guide. This tool provided a roadmap of actionable steps school leaders can take for implementing equity-minded instruction in schools and launched a professional development for administrators where they could explore these issues more deeply. The RPP also developed a unique process for applying the definition in real-time scenarios. In these monthly meetings, the RPP would explore a “problem of practice” where a leader would present a challenging situation related to equity in computer science education and the other members of the RPP would provide follow-up clarifying questions that would support this leader in finding solutions or responses. For instance, Hannah shared her frustration that while meeting with principals in her local school district, a common response that angered her was, “our students cannot read and write - how are we supposed to teach them computer science?” The RPP brainstormed ways to acknowledge this person’s question, name the frustration that it engendered, and develop effective responses to it. As a result of these meetings, the RPP co-created another tool, “Reaffirm, Respond, Resources,” on how best to answer common pushbacks that may unintentionally threaten the equitable implementation of CS. When reflecting on what they had learned in the RPP, Hannah admitted they still get frustrated when they hear pushback to increasing access in CS, but also conceded, “I’ve softened a little bit on the anger it induces. When I [would] hear something like that, [it would feel like] a personal affront, ...my work is not important. I [would] get personally upset. Now, I would argue we are preparing students to read and do math, and function in an increasingly digital world.”

3.2 Defining equity needs to be a constant iterative process

The research-practice partnership engaged in an extended, iterative process of defining equity that was characterized by sustained conversation, perspective-taking, and gradual shifts in understanding. Lori stated that at the beginning, “some people [who were working on the first definition of equity] leaned more toward social justice and race, and other marginalized groups or students with disabilities,

ELLs, some learning equally—to make it more palatable to their context... the conversation was polarizing.” But she and Robert described how these conversations “changed hearts and minds” throughout the partnership’s dialog. Robert, who identifies as a man of color, entered the conversation feeling as though they had little to learn about equity from his own personal experience and then was surprised to discover how his perspective changed from having discussions about equity with white colleagues. He mentioned, “I knew those were my values, but it really opened up to what I should be focusing on, my values, and it was great to be able to hear from two white people talk about this from a different lens.”

Throughout this process, participants like Michael as he described it, “learned to negotiate through disagreements, perspective-taking in the iterative process, [and] model give and take.” This approach emphasized the “importance of challenging whose knowledge is valued” and worked to “inspire in (my) own region to center educator and student voice.” John, a white county leader from an urban county, mentioned, “The thing I noted was I appreciated the iteration, the iterative process, particularly as the group grew, I think it was like 5 in the 1st year...It was a pretty small group, and continued to grow to in 2 subsequent years, and consequently the like, the focus on equity, the definition, or the bigger statement of equity also grew, and there was a neat feedback process to collect input. I also noted it seemed harder to come to consensus as the group grew to state the obvious.” Samantha, a leader of color from a large county office, shared, “It was interesting to see the varying opinions of each one of the SCALE members while working through the development of the third iteration of the equity definition. This was a positive experience that helped me develop a firm foundation of what CS equity means while working with different educational partners in providing culturally responsive CS experiences. I’ve also been able to consider my colleagues’ insights through their contributions to the definition, as part of our ongoing journey to ensure that CS experiences remain equitable and culturally responsive.”

However, not all participants viewed conversation as sufficient for creating change. Another leader of color, Sean, felt that he knew how to operationalize equity because he “lived it” and noted that equitable implementation does not happen by having conversations, but through changing “laws and money,” highlighting ongoing tensions about the relationship between dialog and structural change.

Despite skepticism about the power of conversation alone, two leaders of color acknowledged that discussions provided support to people with new language and ideas for applying equity to educational efforts in local regions. Sharon, who identifies as a woman of color, shared, “SCALE created a shared language and an intentional space to interrogate power, systems, and the lived experiences of students, educators, and communities, especially those underserved from high-quality computer science education.” This suggests that dialog served important capacity-building functions even when not directly producing policy changes. These sorts of shifts toward new language and ideas were clearly articulated from the first to third iterations of the RPP’s equity definition. Across these definitions, the language became more specific regarding demographic diversity and student identity (e.g., race, gender, etc.), clearer about the types of institutional barriers students experience in CS learning contexts specifically, and more explicit about the ideas, actions, and accountability measures central to ensuring CS education is more equitable and consequential for all students.

Lori, who is white, noted that the iterative process of defining equity also “forced the RPP to notice who is at the table and who is missing” when discussing issues of equity, which led to the RPP making “purposeful invitations to more administrators of color” during its second and third year of collaboration. This was also reflected in the different iterations of the equity definition, as by the third definition, the RPP decided to explicitly call out the needs of Black and Brown students and girls, etc. As a result of the process of defining equity, it forced the RPP to look within and consider the RPP itself an example of “equitable” engagement among its partners. The process of defining equity led to the intentional recruitment and retention of leaders of color with demonstrable changes in the make-up of the RPP, thereby “enacting equity” in the representation and engagement among our RPP.

3.3 Responding to socio-historical contexts

The RPP operated within a dynamic socio-political environment that significantly influenced both the urgency of equity work and the challenges faced in implementation.

The partnership’s equity focus gained momentum in the summer of 2020, as COVID and the murder of George Floyd exposed equity gaps and the wounds of racism that still divided the country. This period provided a supportive context for centering equity in educational initiatives and created openings for difficult conversations. This was visible in the different iterations of the equity definition that, as noted above, became more explicit in which populations have been denied equitable and meaningful CS education (e.g., Black and Brown students, rural students, girls, etc.) and are most impacted by institutional barriers in public education.

However, the political landscape shifted dramatically in subsequent years, when the U. S. President’s 2025 Executive Orders to eliminate a focus on Diversity, Equity, and Inclusion (DEI) created new challenges, with education leaders feeling unsure about the sustainability of their equity-focused work. At this point, the RPP was no longer actively working on editing an equity definition, however the next phase of work which grew upon the original RPP was deeply impacted by the shifting sociopolitical landscape. As Hannah stated, “I’m [now] wondering who’s going to be in the room, and who might have something to say about the words that I’m using in a way that might limit me from doing the work at all.”

This “equity whiplash” revealed a significant tension that emerged around whether centering certain identities and experiences in equity work inadvertently excluded or marginalized others. Michael, who identifies as white, expressed concerns about the racial focus of equity discussions during the definition conversations after 2020, stating that there was “too much focus on race at the expense of other differences like gender or neurodivergence.” He saw this focus on race as a focused point, like the “sharpening of a spear” that placed all the attention on racial issues at the expense of other equity gaps. He also wondered whether “the hyper focus on race portended the subsequent resistance to DEI,” connecting the partnership’s internal dynamics to larger cultural and political shifts occurring simultaneously.

Despite these challenges, leaders maintained their commitment to equity-centered approaches. Sharon stated, “Equity is not a trend for us. It is a core value,” indicating that the partnership’s work had

created lasting changes in participants’ professional identities and commitments.

3.4 Building leadership capacity for systemic change

Perhaps the most significant long-term outcome of the SCALE-CA RPP was its role in developing leadership capacity for sustained, systemic change in CS education equity. The RPP served as a crucial pilot and proof-of-concept that laid the foundation for California’s subsequent statewide implementation efforts, demonstrating how a collaborative equity definition could be scaled beyond individual partnerships to create lasting institutional change.

The RPP leaders became the co-designers architects of California’s statewide scaling efforts, assuming leadership roles in the Educator Workforce Investment Grant and other initiatives focused on sustaining equity in CS education across the state. This progression from local collaboration to statewide leadership represents a form of organic scaling that emerged from participants’ deepened understanding of equity and their enhanced capacity for collaborative leadership. Rather than requiring an external mandate or top-down implementation, the equity-focused approach developed through SCALE-CA created its own momentum for expansion.

The partnership’s influence is most visible in the development and ongoing impact of the CS Equity Guide and accompanying workshop, which emerged directly from the RPP’s collaborative work and continues to shape CS education leadership across California and nationally. These resources, still actively used today, represent the translation of the partnership’s equity definition process into practical tools that other educational leaders can adapt to their local contexts. The sustained use of these materials demonstrates how the work of collaboratively defining equity, though challenging because of different perspectives and contexts, can generate resources with lasting impact.

Participants exemplified this capacity-building function through their continued leadership in equity-focused CS education initiatives. Sharon, for instance, leveraged the leadership capacity developed through the RPP to expand her influence both within her own district and region, as well as through her involvement with the statewide project. She mentioned, “One recent success has been supporting districts in reimagining their CS pathways with equity at the center. Through [the statewide project] we have helped districts analyze enrollment data by race, gender, and program status, which led to concrete actions, such as eliminating gatekeeping prerequisites and expanding introductory CS courses into middle school.” Her trajectory illustrates how participation in collaborative equity definition processes can transform individual leaders’ capacity to advocate for and implement systemic change. Similarly, Samantha gained new tools and approaches through the RPP that she was able to apply directly to her equity work in CS education, demonstrating how collaborative processes create transferable knowledge and skills: “Working through the equity statement and having conversations with members in the SCALE group helped shape my perspective and approach in working with and planning for modeling and sharing equitable CS practices.”

The partnership’s influence also extended to other statewide initiatives, including a significant state investment in the California Math, Science, Computer Science partnership grant, where many of

the school leaders from SCALE-CA expanded their focus on equity and worked to provide professional learning opportunities across the state in these three foundational disciplines. This cross-pollination of leadership shows how a collaboratively developed equity definition can create networks of committed leaders with shared understandings and approaches across multiple contexts.

Throughout these scaling efforts, participants emphasized the importance of systemic rather than piecemeal approaches to equity in CS education. As Everett noted, “And I think that if you are talking assets-based, we need to really look at everyone who has the assets. But do we need to have these people be the experts all the time? Or can we level up from each other like while we do this, why is that not built in?”

The scaling work also revealed ongoing challenges and opportunities for expansion. John highlighted the need to extend outreach to small schools associations and improve coordination in rural communities where unmet needs remained significant. This county office leader shared, “So this research project tried to find ways to dig in further into that one size does not fit all notion. How do we support small schools?” This recognition of persistent gaps demonstrates how the collaborative equity definition process created not only tools and capacity but also ongoing awareness of where additional work was needed.

As Sean alluded to in his comment about “money and laws,” the financial sustainability of equity-focused CS education remained a central concern as the work scaled. Participants recognized that meaningful access required sustained funding commitments, and their advocacy for such resources was informed by their deep understanding of what equitable CS education required—an understanding developed through years of collaborative definition and implementation work.

Perhaps most importantly, the tools, frameworks, and approaches developed through the SCALE-CA partnership continue to shape current efforts years after the original grant period ended. As Sharon reflected, “SCALE created a shared language and an intentional space to interrogate power, systems, and the lived experiences of students, educators, and communities, especially those underserved from high-quality computer science education. The collaborative CS [Equity] Guide wasn’t just conceptual; they were actionable tools that I continue to adapt and apply.” This lasting impact suggests that the collaborative equity definition process created knowledge and tools that transcended the specific partnership context and could adapt to changing circumstances while maintaining core commitments to equity and justice.

The transformation of individual participants into statewide leaders, the development of enduring resources and tools, and the creation of networks committed to equity in CS education represent different dimensions of the leadership capacity building that emerged from sustained collaborative engagement while defining and enacting equity. This capacity building function may be one of the most important contributions of research-practice partnerships focused on equity, as it creates the human infrastructure necessary for long-term systemic change.

4 Discussion

This study illuminates the importance of collaboratively defining equity within an RPP and embodies the Frierian principles of praxis,

words-as-praxis, and dialog that guided our work. The SCALE-CA experience demonstrates that meaningful equity work requires the continuous cycle of reflection and action that Freire described as essential for transformative education.

4.1 Praxis in action: reflection and transformation

The iterative process of defining equity across three versions over 4 years exemplifies what Freire (1970/1997) meant by praxis: “reflection and action upon the world in order to transform it.” Rather than settling for a static definition, the RPP engaged in ongoing cycles of reflection on their equity understanding, followed by action in their local contexts, which then informed further reflection and revision. This process was particularly evident when the partnership recognized that their 2019 definition was insufficient following the events of 2020, leading to changes that they felt better addressed issues of racism and systemic oppression.

The RPP’s commitment to “particularity of praxis (Kemmis and Smith, 2008)—attending to specific contexts, time, place, and sociohistorical situations—was demonstrated in how external events shaped their equity conversations. The murder of George Floyd, the rise in anti-Asian hate crimes, and later political shifts around DEI created different contextual demands that required adaptive responses while maintaining core commitments to justice-oriented action.

4.2 Words as praxis: moving beyond empty language

Three participants’ concerns about “too much equity talk” reflected anxiety about “verbalism”; specifically, that extensive discussions might become divorced from concrete implementation. Conversely, those who wanted to focus solely on CS content implementation without equity conversations risked what Freire called “activism,” or action without the reflective dimension necessary for transformation (Freire, 1970/1997).

The RPP’s sustained engagement with defining equity represented an attempt to achieve what Freire called “true words”: language that contains both reflection and action dimensions and is oriented toward transformation (Freire, 1970/1997, p. 68). As one participant noted, the conversations “changed hearts and minds,” suggesting that the collaborative definition process created new possibilities for “reading and rewriting the world” of CS education. Even when there was disagreement, it contributed to shared understandings and the importance of integrating those perspectives in the work.

4.3 Dialog as humanizing practice

The findings around navigating tensions and building inclusive representation directly connect to Freire’s conditions for meaningful dialog. The partnership’s struggles with whose voices were included, how to balance different perspectives, and how to maintain horizontal rather than hierarchical relationships reflected the challenges Freire identified in creating authentic dialog.

The county office administrator who noted that defining equity “forced the RPP to notice who is at the table and who is missing” demonstrates what Freire meant by the humility required for dialog—recognizing one’s own limitations and the need for diverse perspectives. Similarly, the concerns about whether focusing on race excluded other identities reveals the ongoing challenge of creating dialog that embodies “faith in humankind” while acknowledging the “particularity” of different forms of oppression (Freire, 1970/1997).

The tension expressed by the leader of color who indicated that they “lived” equity and did not need conversations, but rather “laws and money” to enact change, highlights Freire’s emphasis that dialog must be grounded in “love” and “hope” while leading to concrete action. This tension suggests that effective dialog in RPPs must explicitly connect reflection to structural change, avoiding the trap of endless conversation without material outcomes.

4.4 Building capacity for systemic transformation

Perhaps most significantly, the RPP’s approach to defining equity created what Freire would recognize as critical consciousness: the ability to “perceive reality as process, as transformation, rather than as a static entity” (Freire, 1970/1997, p. 73). Participants developed new language and frameworks for understanding equity that they could apply in their local contexts, representing the kind of “conscientização” (“consciousness raising”) that Freire saw as essential for liberation from oppressive educational structures (Freire, 1970/1997, p. 49).

The partnership’s evolution from a small group of five to statewide influence through 38 county offices demonstrates how collaborative praxis can scale beyond individual transformation to create systemic change. The sustained impact, with leaders maintaining equity commitments despite political shifts, suggests that the deep engagement with defining equity created lasting changes in professional practice and identity.

4.5 Implications for research-practice partnerships

The connections to Freirian theory suggest several key considerations for RPPs attempting to center equity in their work:

Embracing productive tension: Rather than avoiding disagreement about the relationship between content knowledge and equity, partnerships should invest in sustained cycles of reflection and action. The transformative potential lies not in achieving a perfect definition but in the ongoing process of examining and revising understanding in response to lived experience and changing contexts.

Attending to words as sites of struggle: How partnerships use language matters deeply. RPPs must recognize that defining equity is not merely a preliminary activity but an ongoing practice of creating “true words” (Freire, 1970/1997, p. 68) that can guide transformative action. This requires constant attention to whether language remains connected to both reflection and action.

Creating conditions for authentic dialog: Successful equity-focused partnerships must actively cultivate the conditions Freire identified for meaningful dialog: love for students and communities, humility about what we know, faith in all participants’ capacity for transformation,

horizontal relationships of trust, hope for change, and critical thinking that sees reality as transformable (Freire, 1970/1997, p. 68).

Connecting individual and structural change: The tension between conversation and structural change reflects a fundamental challenge in equity work. RPPs must explicitly design processes that connect personal transformation with policy and resource changes, avoiding both empty dialog and unreflective activism. The process of defining equity and enacting it resulted from these dialogs between personal and structural, as well as the connection between teaching computer science content while mindful of the context in which it is being taught and who is teaching or leading it.

This study demonstrates that when RPPs engage seriously with the work of collaborative definition—treating it as praxis rather than just planning—they can create the conditions for sustained, systemic transformation in educational equity.

4.6 Productive resistance: why pushback validated the process

The resistance some participants expressed to equity-focused conversations might initially seem to contradict our argument about the value of collaborative definition. However, this pushback actually demonstrates the theoretical insights Freire offers about the necessity of dialog for transformation. The participants who expressed frustration with ‘too much equity talk’ were exhibiting what Freire would recognize as natural resistance to consciousness-raising that challenges existing power structures. Their concerns about ‘racial conversations’ detracting from CS implementation revealed precisely the kind of thinking that perpetuates educational inequity - the false separation between content delivery and social justice.

Rather than undermining the collaborative process, this resistance created opportunities for deeper dialog about fundamental assumptions. The evolution of the equity definition from a generic statement about individual needs to an explicit acknowledgment of systemic oppression reflects how working through disagreement led to more sophisticated understanding. Without this tension, the partnership might have settled for superficial consensus that left underlying inequities unaddressed.

4.7 Limitations, future research, and transferability

This paper’s findings may be limited by the specific voices chosen for the interviews. In particular, since we did not include interviews with RPP partners who are no longer active in CS education or in their original K12 education roles, we may be missing perspectives of those who are less engaged and/or interested in defining equity and working in RPPs which are the focus of this paper.

The research described in this paper centers the perspectives and experiences of school leaders and their understanding of equity and the agency they have to influence access and opportunities for students. Future research would benefit from the addition of student and family voices to provide a more complete picture of equitable CS implementation. This could be accomplished through triangulation of data from school leaders, parents, and students as primary stakeholders in school community engagement toward equitable

access to computer science education. Moreover, a deeper dive into discourse analysis would illuminate the power structures, biases and meaning making of the various perspectives of equity and how it is operationalized.

In addition, this research practice partnership's iterative approach for defining and enacting equity serves as a model for other partnerships and potential adaptations across different educational contexts beyond this pilot. The interviewees' increased understanding of equity transferred into their leadership in subsequent major statewide initiatives to increase access to computer science education. The research detailed here can provide actionable steps for others interested in defining and putting into practice an equitable approach to education. For example, collective impact models for transforming educational systems, as well as STEM ecosystems, and other multiracial coalitions pursuing equity could benefit from this research. The value of collectively defining equity across contexts, time, and place serves as a reminder that our notions of equity are constantly evolving. An iterative approach to defining equity and enacting equity that takes into consideration these local adaptations and perspectives, helps foster a deeper understanding of equity and highlights educators' role in expanding equitable learning opportunities.

5 Conclusion

This study demonstrates that the work of defining equity in research-practice partnerships is not a preliminary step to be completed before “real” implementation begins, but rather an ongoing practice of collective reflection that lies at the heart of educational change. Through years of sustained collaboration, the SCALE-CA partnership, and its evolution to the statewide work, revealed that when educational leaders engage in authentic dialog about equity—guided by principles of praxis, words-as-praxis, and humanizing dialog—they develop both the language and the capacity necessary for systemic transformation in computer science education.

Importantly, the resistance and tensions that emerged throughout this process were not obstacles to overcome but essential elements of transformation. The pushback to focusing on equity conversations revealed precisely the assumptions that needed to be surfaced and examined for meaningful change to occur. This resistance forced the partnership to move beyond superficial consensus toward deeper dialog about fundamental questions: Can CS education truly be separated from questions of equity? Who benefits from maintaining the fiction of CS as “neutral” and “objective”? What does it mean to center equity rather than treat it as an add-on consideration?

The productive nature of this resistance is evident in the evolution of the partnership's equity definition itself. The journey from Version 1's generic explanation of equity versus equality to Version 3's explicit naming of “Black and Brown students” and acknowledgment of “unjust systems” demonstrates how working through disagreement led to more precise, actionable understanding. Without the tensions created by resistant voices, the partnership might have settled for comfortable but ineffective language that avoided naming structural inequities.

This study reveals how a collaborative equity definition serves a dual function: it (1) develops shared language for collective action and (2) transforms individual professional identities and commitments. The sustained impact of this work, evidenced by leaders maintaining

equity commitments despite shifting political landscapes, suggests that deep engagement with defining equity creates lasting changes that transcend political moments. Crucially, this transformation occurred not despite resistance but because of the productive dialog that resistance generated.

As California continues to expand CS education through the statewide initiative that grew from this partnership, the equity definition and collaborative processes developed through SCALE-CA provide a foundation for ensuring that this expansion serves all students, particularly those who have been historically excluded from computing opportunities. The process revealed that defining equity is never complete—it remains an ongoing practice of examining assumptions, surfacing tensions, and collectively working toward more just educational practices.

Our experience in the RPP reinforces Freire's theoretical exploration of praxis, words as praxis, and dialog. The unique location of these theoretical explorations within the context of a CS education RPP offers new insights about how to apply the ideas Freire describes in his work toward partnership work across research and practice.

Ultimately, this research affirms Paulo Freire's insight that authentic education is always a practice of liberation, and that liberation requires confronting rather than avoiding conflict. The participants who resisted equity conversations were not barriers to overcome but essential voices whose concerns helped deepen the partnership's understanding. By engaging productively with resistance rather than dismissing it, the SCALE-CA partnership created conditions for the kind of transformative education that can help all students and teachers develop the critical consciousness necessary for creating a more just and equitable world. This approach offers a model for other educational partnerships seeking to center equity: embrace the tensions, expect the resistance, and use both as opportunities for deeper dialog and more meaningful transformation.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, in accordance to UCLA IRB guidelines and agreements.

Ethics statement

The studies involving humans were approved by University of California Los Angeles. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

RH: Project administration, Formal analysis, Validation, Supervision, Conceptualization, Writing – review & editing, Investigation, Writing – original draft. JR: Conceptualization, Funding acquisition, Writing – review & editing, Methodology, Writing – original draft, Investigation. JF: Validation, Writing – review & editing,

Writing – original draft. SC: Validation, Formal analysis, Conceptualization, Data curation, Investigation, Writing – original draft, Funding acquisition, Writing – review & editing.

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Conflict of interest

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