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Building an elementary science teacher education community to advance equity and justice

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Subject

In the last two years, globally, nationally, and regionally, society has been deluged with a series of crises. Facing the COVID-19 pandemic alongside ongoing crises of climate change, racist criminalization, brutal immigration enforcement, and severe wealth inequality, harsh inequities faced by children and their families have been made more visible. In response to these crises, we have seen science teacher educators adapt, creating bold and innovative ways to share resources with one another in support of preservice teachers and colleagues. Together, as part of an informally-created, U.S.-based group called the National Elementary Science Teacher Education Group (NESTeg), we recognized the need to respond to these crises while creating spaces of learning, caring, and generosity. Rather than working individually at each of our institutions, the NESTeg community brought dilemmas and concerns related to these global crises to one another – in efforts to address harms taking place in classrooms, foster preservice teacher well-being, and develop collectively as professionals. Members discussed resources, research, and approaches that could respond to the crises and improve elementary science teacher education. Formed initially as a loose collective, the group has evolved into a community of practice in which members share a common concern and learn through their interactions with one another, sharing material and conceptual resources and tools (Wenger, 1998). The communities of practice framework embodies these efforts.

In this symposium, we share some of our individual and collective efforts in hopes of addressing one or more of these crises - educating preservice elementary science teachers (PSTs) to be well-started beginners with regards to equity and justice. While symposium participants conceptualize equitable and just science teaching in multiple ways, many are working towards a more equitable and just society that includes disrupting systemic inequities in elementary science instruction. Actions such as becoming aware of systemic inequalities, racism, our positionalities, and the role of science within oppressive systems; fostering environments that humanize and bring assets and joy to science; and positioning all students as knowers and doers of science are all described by symposium participants.

While working towards equity and justice is not new in education, focusing on equity and justice in elementary science teacher education is less common. We sometimes hear pushback such as, “Why do I need to teach equity in my elementary science methods course when teachers can ‘get it’ in other courses?” Or, “Science doesn’t address those ideas.” However, the multiple crises around racial, ethnic, and class-based injustices and the role that science has played in them (e.g., eugenics, health disparities, environmental inequities) should make it clear that injustice is everywhere in science and in elementary classrooms. Society and our collective institutions need to work so that those who are the most vulnerable and marginalized can thrive.

Though our focus is on our collective work preparing PSTs for equitable and just science teaching, we recognize multiple layers of privilege and oppression within this ecosystem. Our own varied positionalities and lived experiences, as described briefly below, inform our commitments and goals for our students. Our preservice teachers, like many across the U.S. are predominantly white, female, monolingual, and higher SES, though there are exceptions to this trend among our institutions. That their lived experiences and backgrounds are in many cases distinct from students in their field placements or future classrooms is a central focus for many of us in our work. In turn, participants in NESTeg, while reflecting some diversity, also reflect this

same trend: many of us are white, and most of us are women. Further, current NESTeg community members hold a range of status and power - from graduate students, to early career, mid-career, and senior faculty members, to practicing teachers. Thus, our own backgrounds, too, come into play in our work with each other and with equity-oriented science teacher education. Indeed, we have needed to rethink our own positionalities and recraft our space to decenter whiteness and foster more equitable approaches within NESTeg.

In our efforts to bring these ideas, efforts, and community to NARST, we propose to share a symposium that addresses the central questions: *While teaching elementary science methods courses during multiple global crises, what approaches did we learn about or share in our community that seemed to support preservice teachers in learning to teach science towards equity and justice? In what ways do these approaches seem to be working? Where do we still meet challenges?* Symposium participants will respond to these questions by describing our contexts; positionalities; approaches, frameworks and activities for advancing equity and justice; and the role that NESTeg community may have played for each of us in our work.

Symposium Design

We propose an interactive symposium in which after a brief overview and introduction by panelists, panelists and attendees will engage in small group dialogue about our guiding questions. We will begin the symposium by reviewing what the limited research literature suggests is important to consider on the topic of equity and justice in elementary science teacher education (Authors, in press). We will also discuss some of the history and nature of the NESTeg collaborative mentioned above as context for this work. Next, we will turn to a set of early career scholar panelists from the NESTeg collaborative who are engaged in doing the work. They will share their own positionalities and contexts followed by equity approaches, frameworks and activities that have been reflected on/discussed in NESTeg and used. Panelists will briefly mention what seems to be working, and what they are still trying to figure out. Next, time will be allocated for attendees to engage in breakout sessions, moderated by senior scholars from NESTeg. The symposium will end with the discussant sharing her research related to educating science teacher educators around issues of race and equity as she also comments on the topics raised in the session. Our hope is that this symposium serves as a catalyst for new collaborations, research designs, data collection, and analytic approaches on the work teacher educators are doing with elementary preservice teachers for equity and justice in science teaching.

Findings: Literature Review on Elementary Science Teacher Education

The symposium chair and another NESTeg member conducted a larger systematic literature review spanning the past decade focused on preparing preservice elementary teachers to be well-started beginners, drawing on literature from 12 major journals in science education and teacher education that addressed research related to PSTs and elementary science teacher education (Authors, in press). In conducting that review, we found relatively few papers that focused directly and explicitly on supporting PSTs in engaging in equity-oriented, justice-oriented, and/or antiracist science teaching, which in part inspired the development of this session. In engaging in our analysis, we found several patterns in the existing research on elementary science teacher education focused on equity and justice. While most of the papers (Avraamidou, 2014; Bravo et al., 2014; Mensah & Jackson, 2018; Mensah et al., 2018; Settlage, 2011; Yoon & Martin, 2019) focused exclusively on the effect of specific interventions in science methods courses on preservice teachers' attributes (such as their identities, beliefs, attitudes, and knowledge) or practices (such as their planning or teaching), a few papers

additionally considered the role of the field placement alongside the methods course on these same outcomes (Bottoms et al., 2015; Hernandez & Shroyer, 2017; Rivera Maulucci, 2011).

For example, Bravo et al, 2014, measured a shift in PSTs' beliefs with regards to justice-oriented science teaching when engaged in a methods course aligned to standards for linguistic and cultural diversity. However, their study also showed that PSTs' beliefs about science teaching for justice were stronger than their ability to enact such teaching. As another example, Bottoms and colleagues (2015) found that, among other themes, PSTs' deficit views of emergent bilinguals shifted to recognizing a need to change their own instructional practices as a result of their experiences in an elementary science methods course connected to an after school, Spanish/English dual immersion STEM club. This study suggests that supportive justice-oriented field placements can move PSTs' thinking forward with regards to teaching science equitably.

We will spend more time in the symposium unpacking the research, but for the sake of this proposal, we highlight five themes that will serve to organize ideas in the symposium:

1. **Building relationships** with PSTs is a critical step in shifting their beliefs and attitudes towards science and science teaching (e.g., Mensah & Jackson, 2018).
2. Working on our own and PSTs' **critical consciousness and knowledge of equity** is essential to shift PSTs' identities, beliefs, and early practices for justice-oriented science teaching (e.g., Settlage, 2011).
3. **Redefining science engagement** in ways that are culturally responsive, joyful, and inclusive is paramount to developing PSTs' abilities to enact equitable science teaching (e.g., Bravo et al., 2014; Hernandez & Shroyer, 2017; Mensah et al., 2018; Yoon & Martin, 2019).
4. Leveraging children's **funds of knowledge as assets** for learning is an important starting point towards shifting beliefs about students and the enactment of equitable science teaching (e.g., Bottoms et al., 2015).
5. **Working with partners and schools** to create justice-oriented field placements and a diverse teaching workforce is critical for deepening PSTs' understanding of culture and science and for shifting beliefs and attitudes of preservice teachers (e.g., Hernandez & Shroyer, 2017; Rivera Maulucci, 2011).

Findings: Panelists' Equity Approaches for Elementary Science Teacher Education

A strength of the NESTeg community is that we showed up for one another in a time of crises and brainstormed how to adapt while imagining future possibilities for teaching towards equity and justice. Though elementary science teacher education is not part of an active research agenda for most panelists, our teaching is a critical part of our work as academics and is work we continue to improve on in community with one another.

Each panelist has different positionalities and institutional contexts that necessitate unique efforts towards equity and justice. For example, panelists highlight the critical role of forming strong relationships with PSTs in a number of ways such as humanizing their own trauma and experiences so that they can imagine a more just and better way of teaching science to children. Panelists also present a range of frameworks and assignments involving ways to advance critical consciousness, bring joy and relevance to learners, forge connections between histories and communities with science and help preservice teachers see and build on children's assets and funds of knowledge. Finally, some panelists built connections with children in justice-centered placements - and did so using program structures and resources to advance pre-service teachers' experiences and learning. Collectively, we discussed and reflected on many of these efforts in NESTeg. These efforts are intersectional and overlapping, creating a complex web of

efforts to support and prepare our teacher candidates. We draw out some of these connections with parentheticals in the following narratives connecting each panelists' narratives to others'.

Panelist 1: Building relationships through disrupting my image of a "typical" PST

As a doctoral student, I always worked with traditional science teacher candidates. Unconsciously, I developed a specific image of a science teacher candidate. This image matched the usual demographics of the US teacher workforce: predominantly white students preparing to be teachers in an undergraduate program, right after high school. Now, as an early career science education faculty, I mainly work with non-traditional teacher candidates (Choy, 2002). I identify as being a non-traditional student. During my Ph.D, I was an immigrant, single mother of two dependent children, who had returned to graduate school after a gap of ten years. As a teacher educator, I feel challenged by my non-traditional teacher candidates because they present unique tensions and needs. They challenge my notions of a 'typical' science teacher candidate. Unlike my previous traditional teacher candidates, they attend a late-night science methods course with me after a long day of work. They drive during rush hour, grab a quick dinner and mostly sit quietly in the classroom. Many make requests to be able to step out to receive or make a phone call during class because they have dependents and responsibilities. They always share stories that reflect consistent tensions in their university-home-work life. Most non-traditional teacher candidates at my institution are first generation African Americans or immigrant students, who return to higher education after years of educational gaps.

My non-traditional teacher candidates implicitly challenged my regular approaches to planning and teaching an elementary science methods course. Various activities such as unpacking the science teaching standards, writing a sequenced lesson plan, modes of receiving and responding to feedback, that worked with my traditional students were a source of stress and panic for my non-traditional teacher candidates. My activities were not working the way I was used to. I turned to some literature around non-traditional learners which led to a few realizations. I was unknowingly adhering and contributing to certain inequitable practices within higher education. The truth is that most university coursework is predominantly designed by keeping the needs of traditional learners at the core while non-traditional learners and their needs stay at margins (Mello, 2004; Munro, 2011). Such unresponsive coursework demotivates and disengages non-traditional learners. As a result, I take a humanizing stance - to notice, to listen, to understand, and to be responsive to the needs of non-traditional students by designing an elementary science methods course that empowers them as future science teachers. My affiliation with NESTeg situated me within a strong community of science teacher educators. It gave me access to a multitude of resources and assignments from colleagues which I was able to implement with my teacher candidates.

In this effort, and also in response to virtual teaching due to COVID, my recent 'blended' science methods courses included assignments that involved non-traditional teacher candidates in informal science learning experiences. It was an opportunity to separate them from the prevalent didactic notions of science teaching. These assignments encouraged teacher candidates to experience the joy of science in everyday natural events (see also panelists 4 & 7). For instance, a weekly nature journaling assignment (see also Panelist 4) involved them in gathering observations, asking questions, making sense of patterns, and collecting data related to everyday natural events. Teacher candidates included their families and partners in their journals and made them a part of their learning process. Although these assignments were graded, they were framed as immersive experiences, a solo or a field trip with a partner, a lived story to share with a class community. The unrestrictive multimodal nature of these journal assignments inspired creativity,

and a sense of freedom and choice among teacher candidates. They felt empowered because they created original artifacts and documented authentic experiences to share. In an online course, these artifacts became central and afforded connections with other course materials and facilitated discussions related to elementary science teaching.

There are challenges to this work. One, there is a dearth of literature on non-traditional teacher candidates, especially within elementary science teacher education. Therefore, there is not much research to leverage. Also, increasingly universities are adopting online and blended course delivery models. To provide meaningful learning experiences for non-traditional teacher candidates within such learning environments is an added challenge. For my future work, I intend to continue developing my understanding of non-traditional teacher candidates' experiences, modes of participation, levels of engagement, and learning opportunities within my science methods course. It will have implications for designing a science methods course that can position non-traditional teacher candidates as well-started elementary science teachers.

Panelist 2: Developing preservice teachers' critical consciousness

I am a first-generation college student, immigrant, and junior scholar. I identify as a woman of color. My heritage is North African, Arab, and Berber. My native language is Berber. English is my sixth language after learning Berber, Moroccan, Arabic, Spanish, French, and then English. I work in a large public university in a conservative Southern state that is historically a place where equity and race issues have been points of contention. As a teacher educator, it wasn't until I was vulnerable with my students and shared my own identity and history that my teaching was more aligned with authentic ways of doing anti-racist work and not aligned with Whiteness (see also panelists 4 & 6). My work is around equity, justice-oriented teaching, and honing in on why it is important to focus on these two. To be critically conscious means to "develop self-knowledge, in particular, an awareness of ourselves as cultural beings as well as an awareness of the ways our cultures shapes [our] views" (Banks, 2005, p. 253). To examine our own biases, we need to first be aware of them which can help us understand where students are coming from but also to interrogate our own biases, however uncomfortable they may be. When it comes to science, it is important for PSTs to see how connecting our own racial, cultural, or ethnic identity is related to the nature of science and how science is shaped by culture.

In my elementary science methods class and drawing from Morales-Doyle's (2017) justice-centered teaching framework (see also Panelist 3), I have PSTs do an assignment where they examine their own identity and biases through a critical consciousness lens by completing a graphic organizer called an identity chart. This graphic organizer provides them with a tool to critically examine how they socioculturally position/identify themselves in regards to their everyday lives, and how they see others position/identify themselves as individuals. After creating an identity chart, PSTs select five items that are most significant in shaping their identity as individuals. We can also make it more specific to how they think it shapes their identity as a social justice teacher. As we compare their lists, this often deepens their understanding of who they are but also who and what they think shapes them as a social justice teacher. The chart pushes them to consider who they are as individuals, share their stories, and be aware of how societal structures play a role in how stereotypes and biases form.

I have leveraged my own identity in building this empathy. I have demonstrated a lesson about force and motion for my PSTs in two ways. I start by teaching it in Arabic, specifically the Moroccan dialect with no gestures. Then I teach the lesson in Arabic but using gestures. As they observe both science lessons in Arabic, I ask them to put themselves in the place of an English Language Learner in the classroom and to answer the following prompts:

1) How do you feel? How much do you understand?
2) What strategies are *you* using to help yourself understand what is being said?
3) What is the *teacher* doing during the lesson that helps you understand the content? What is the teacher doing during the lesson that makes understanding the content difficult?

Then we discuss how they felt. Most of my students share that they feel frustrated and lost, which gets them to empathize with how their own emergent multilingual students might feel as they navigate learning two languages (science and English) and the cognitive load it takes to learn science in a different language than their native language.

Panelist 3: Using asset-based language to co-construct ideas of equity

I come to this work as a Black man who has experienced science learning and schooling more broadly as oppressive institutions which were not responsive to my multiple identities. As such, critical race theory is the analytical lens through which I situate myself within the science education community. I view science learning as one's fundamental right (Tate, 2001), and that as experts on our own experiences, we have all used science to make meaning of our worlds in ways which may challenge the dominant Western science epistemologies. Equity within this context requires a realistic acknowledgement (Mutegi, 2013) of the racialized sociohistorical foundation which undergirds the greater education foundation. It is through this acknowledgement that we, as science educators, can then interrogate our own complicity within this system vis-à-vis curriculum and instruction.

Within the NESTeg community, we held several discussions regarding virtual instruction at the start of the 2020 academic year. From these conversations emerged a need for a new course framework for our elementary science methods course(s). In my course, I worked with the PSTs to center educational equity, given Morales-Doyle's (2019) charge to practitioners for creating shared meaning for the words and principles we claim to value (see also Panelist 2). Morales-Doyle (2019) views equity as intimately connected to notions of social justice and change within the greater sociohistorical context of teaching and learning. Throughout the semester, we would revisit and revise our notion of equity, with careful attention to ensuring its conception was operationalized throughout our discussions and assignments. This operationalization allowed us to understand the nuanced nature of transferring theory to practice.

One such example occurred during the end of the semester in which PSTs were tasked with evaluating children's ideas. During this 2-part assignment, PSTs first worked in groups to identify the components of the ideas that aligned with the NGSS along with questions they would ask of children to push their thinking forward. PSTs were then provided interview transcript excerpts of the children discussing their science ideas with a researcher to understand *how* children position themselves as learners. An immediate noticing was that during whole-class discussions on the student ideas, PSTs immediately defaulted to the use of deficit-oriented language to describe student ideas. However, when viewing the children's words about their ideas, the PSTs noticed that the children echoed the deficit language, causing the PSTs to reflect on the misalignment between their conception of equity and its practice. This was a useful tool to challenge well-meaning PSTs to challenge their positionalities regarding student ability, but arguably additional work must be done to develop PSTs' abilities to notice and productively act on these instances as they engage with their students.

Panelist 4: Humanizing teacher candidates, decentering Whiteness, and recentering joy

'Windows, mirrors, and sliding glass doors.' I use this metaphor coined by literacy scholar Rudine Sims Bishop (1990) in my elementary science education methods course as a

way to facilitate new ways of knowing, being, and operating within our natural and built worlds. As an early career scholar and teacher educator with immigrant roots, I've spent the past two years at our historically white institution in California's semi-rural Central Coast region, actively working to recruit and support teachers of color who reflect the racial, cultural, and linguistic backgrounds of students within California's public school system.

In a year of 'learning in place', I was keen to create learning experiences (via shared narratives) for my teacher candidates that allowed them to reflect on their own science learning experiences (mirrors), experience views of worlds that were new or unfamiliar (windows), and build empathy through the eyes of others. Through centering outdoor spaces (with tools of nature journaling; see also Panelist 1) and humanizing practices as core parts of our learning together, the self-reflection and relational work with one another focused on ways we let go and unlearn some of the colonial and capitalistic practices and cultures that have been hard-coded in our science classrooms. Simultaneously, teacher candidates were ushered on a path that centered care, radical love, and joy for themselves, their students, their families, and communities.

The work we engaged as a collective aimed to decenter traditional Western-centered approaches to science education and grow our repertoire of culturally and linguistically sustaining pedagogies that center the joy, curiosities, and wonderings of our young people see also panelists 1 & 7). I will discuss ways I have worked to decenter whiteness in my science education methods course by expanding our notions around the ways of knowing, with attention towards ways we 'language' in science that embrace the cultural and linguistic assets minoritized students bring into our elementary classrooms (see also panelists 2 & 6). Much of the work was contextual as our coursework adapted in real time to imminent issues (e.g., impact of air quality due to wildfires, disproportionate impact of COVID-19 on low-income and families of color) that impacted not only the livelihoods of PSTs, but also their students, families, and communities. Even though PSTs left the course more prepared in humanizing science teaching and learning, one of the major challenges PSTs experienced was the mismatch of values and priorities in their placement classrooms and schools. In other words, although my methods courses humanized teaching, decentered whiteness, and centered joy as part of science learning, my PSTs would enter school and classroom spaces that may not have shared these same ethos.

Panelist 5: Adopting asset-based perspectives on students' funds of knowledge and ungrading the methods course

I am an early-career scholar and white woman who works at a medium-sized, regional public university in a politically conservative state. The majority of my undergraduate students fit the typical profile of elementary education majors who are white women of traditional college age. My institution has recently been designated a Hispanic Serving Institution and has a mission to become a leading institution in serving Native American students. Additionally, 46% of our students self-identify as first generation college students. Within the elementary education program, the focus and commitment to equity and justice in teacher education is primarily carried out by individual faculty rather than being a program wide endeavor so students have a wide variety of experiences depending on who teaches their courses.

One of the big threads of my course is eliciting and using students' ideas for learning science. The importance of this is introduced early in the course and woven throughout the rest of the semester. We begin with the Funds of Knowledge framework (González & Moll, 2002; see also Panelist 6) to think about the diverse sources of knowledge that students bring with them to learning. As part of this discussion, prospective teachers identify their own funds of knowledge and we have a discussion about how it is natural to "normalize" our own personal

experiences and that we have to push back against that tendency and take asset-based perspectives on the experiences that students bring with them to learning.

In addition to having teacher candidates apply these ideas in their course assignments, I also try to model an equity and justice-centered approach as a course instructor. Two ways in which this informs my approach are flexibility and more recently the idea of "ungrading" (Blum, 2020). Both of these ideas recognize the ways in which structures of schooling are rooted in white supremacy. In adopting these approaches, I not only hope to disrupt these power structures, but also provide my students with a model of ways in which they might do this in their own classrooms in the future. I have only used the ungrading approach with one group of undergraduates so far, but while they were initially apprehensive about it, by the end of the course they seemed to appreciate it. As an instructor, I plan to build in more opportunities for students to reflect on their learning (a key tenet of ungrading) and to provide more support for this important skill which seems to be challenging for many of my students.

Panelist 6: Leveraging students' funds of knowledge as legitimate in the science classroom

I am a recently graduated early-career scholar in NESTeg and have been involved with this group for the past three years as a graduate student when teaching the science methods course at a university located in the southwestern United States. I am predominantly an English speaking Latina and a fifth generation resident of the local community in which the university is located. I am deeply vested in the knowledge resources belonging to diverse groups of people. I teach a diverse mixture of PSTs comprising White, Spanish/English bilinguals, Indigenous, and residential students. The PSTs are supported in a teacher preparation program which espouses a strong social justice statement committed to equitable access to learning. Our program is also anchored in the seminal work of González and Moll's (2002) funds of knowledge (FoK; see also Panelist 5) that is representative of the knowledge bases grounded in students' cultural and social experiences that occur outside of school. Funds of Knowledge is especially important within the mixed political climate of the state in which the university is situated. In the last elections, the state flipped from red Republican to blue Democrat. These changing and mixed viewpoints hold potential for meaningful conversations among both citizens and educators about what it means to think critically about the educational infrastructures which privilege canonical knowledge bases that are dominated by white power structures and how to establish and maintain equitable access for more inclusive learning environments, such as drawing from students' FoK for learning.

NESTeg has supported me to consider ways to break down white systemic power structures specific to science education in the pursuit to prepare elementary teachers for just and equitable science teaching (see also Panelists 2 and 4). One facet of NESTeg's goals is to provide strategies to prepare elementary science teachers to honor and utilize the diversity of students' outside of school experiences present in their FoK as resources in science learning and teaching. Gaining insights to how PSTs notice and interpret students' FoK, holds potential to identify opportunities to improve our efforts at supporting them towards more equitable science teaching. When PSTs create a space to promote and leverage students' diverse FoK for learning science, they are opening access points for equitable learning especially for children from nondominant groups whose ideas and outside of school experiences do not always align with the how science is typically taught in classrooms with a focus on vocabulary, facts, and scientific rules and laws.

I worked with PSTs over a semester to help foster their growing awareness of the FoK that elementary students bring to school and what it means for their teaching of science and students' learning. In this work, I supported PSTs' noticing of elementary students' ideas about

science as legitimate entry points for learning as opposed to traditional science texts and materials that are typically disconnected from their rich home and cultural knowledge sources.

There was a range of how PSTs noticed and interpreted students' FoK in the science talks. Some noticed and categorized the different types of FoK according to Moje et al., (2004), while others extended their categorization to interpreting how students made general connections from their FoK to the science topics discussed. Others were a bit more sophisticated in their interpretations by recognizing how students applied their FoK to make sense of specific science concepts. These insights present implications for me as a new science teacher educator. There are opportunities to leverage PSTs' strength-based interpretations of students' FoK toward responsive teaching that builds on students' FoK to promote student sensemaking. In foregrounding students' funds of knowledge as legitimate sensemaking resources for teaching science, PSTs have the potential to create equitable learning spaces that disrupt the dominant structures of knowledge by recognizing students' FoK in their teaching.

Panelist 7: Redefining science engagement through an innovative school partnership

2nd Grade Student: "Why are you guys here?"

Instructor: "We're here to learn with you about how to be teachers..."

2nd Grade Student : "Why?–we're not teachers!!?!?! Shouldn't you be talking to some teachers?!?"

I had this conversation with a 2nd grade student at a magnet school in the Northeast U.S. that has been in a 14-year partnership with my university. It highlights a crucial component of our elementary science education methods course where 'tutors' learn alongside their 'buddies'. This co-learning can leave both partners wondering who is benefiting more from the partnership.

Named after a famous civil rights activist, the school opened its doors in 1969 as a magnet school. Since then, the neighborhood surrounding the school's base became an area from which many families—mostly white—fled for calmer suburbs. The school is now 55 percent African American, 38.4 percent Hispanic, and 1 percent white. I am a junior scholar and white male at a historically white institution working to bring authenticity and joy back into science education (see also Panelists 1 and 4). For our teacher education students, who often come from middle-class families with dominant cultural capital, situated learning experiences include observing, creating, and teaching a 6-week long science unit that focuses on phenomena-based instruction, eliciting students' ideas, and assessing student sensemaking throughout.

Due to the pandemic, this "situated learning" took a very different form – but the partnership, if anything, grew stronger. One of our course goals is to develop the ability to recognize all students as capable sense-makers and employ strategies for making science accessible and relevant for all students. Every week our tutors met virtually with their buddies - along with myself, a liaison, and a science teacher from the school. These virtual instruction strategies included *science challenges* where methods students wrote, filmed, and sent interactive videos to students where they were challenged to begin reasoning about a perplexing phenomenon or design challenge and to bring their ideas and questions to the virtual class at the end of the week. This choice to focus on what we did have and could do highlighted students' new *local ecosystems.* I used this term to describe the incredible science we all had surrounding us and our little Zoom boxes we used as portals into each other's local ecosystems. A new kind of 2nd grade unit was born to reframe the science we were doing together, make our work more meaningful, and open up what counts as knowing in an elementary science methods course.

As one buddy shared at the end of the semester in a video she recorded (instead of doing a matching assignment she was given on Seesaw), "I appreciate you by helping us answer

questions - we answer questions by ourselves, we do stuff by ourselves, you guys ask us questions and we ask you questions - we answer them and you answer them...and my favorite part is when you help me and I help you and my friends help you and we help you all together. All of us help each others answers - bye!"

Breakout Sessions

After the panelists share their stories about their approaches, frameworks and activities, attendees will divide into five breakout groups to engage with the presenters around the following topics:

1. Relationships with preservice teachers
2. Critical consciousness and equity
3. Redefining science engagement
4. Asset-based funds of knowledge
5. Work with partners and schools

Because dialogue and opportunities for collaboration are a priority in this session, panelists and more senior members of the NESTeg community will facilitate discussion in each breakout group around essential questions including:

- What is it about this approach/framework/activity that seems key to its success?
- How might you include, modify, or adapt this approach/framework/activity for your context or based on your experiences?
- How might this approach/framework/activity grow and develop over time and use?
- What have you tried in your teaching that is similar to this approach/framework/activity or to its intended outcomes?

Moderators will record notes in the breakout sessions, and all notes and artifacts that are shared in the symposium will be available publicly in the cloud after the session.

Contribution and General Interest

Though there is limited research on equity and justice in elementary science teacher preparation, teacher educators have been responding to our crises with a sense of urgency, in an effort to disrupt and transform systems to promote equity and justice in elementary science teacher education. This symposium will bring together teacher educators engaged in this work to share our experiences. While the panelists have unique positionalities and contexts, they come together to learn with one another to advance teaching practice. They focus on (a) building caring and humanizing relationships with teacher candidates, (b) working on their own and their PSTs' critical consciousness and knowledge about equity, (c) transforming the culture of learning and engaging in science by seeing science as joyful, culturally sustaining, and connected in history and place, (d) leveraging children's funds of knowledge as assets, and (e) building justice-oriented placements with children and schools.

A hoped-for outcome from this symposium is that the topics that are shared and discussed may be used to catalyze future publications and research among these and other elementary science teacher educators. Additionally, we hope the symposium will motivate and energize others to engage in this work, that panelists and attendees can learn from one another, and that other organic groups of elementary science teacher educators might be formed or NESTeg's network/community/collective might be expanded. This symposium should be of interest to NARST members who educate preservice teachers, are engaged with elementary science education, and/or want to advance issues of equity and justice.

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