BOARD ON SCIENCE EDUCATION

Conversations about Science Standards Series: Insights about Equity and Inclusion in Science Education

Heidi Schweingruber: welcome, everyone. I'm Heidi Schweingruber, the Director of the Board on Science Education. Here at the National Academies. We are going to allow just a couple of minutes. If people are running from other meetings, or on the east coast on the west coast of people are having their first cup of coffee and waking up. We're really thrilled to be able to have this conversation with you as part of our Science Standards Conversation series. I'm. Watching more people continue to hop on. I encourage you to say hello to folks in the chat. We do have the Chat operational. We do also have a live stream option online. So, we're going to be trying to include those people in the Q. A. Parts of the meeting that I'm going to wait a little bit to see if we still have people joining. You know. We had quite a few RSVPs, and I know how tough it is to be running from meeting to meeting. Look at that! Just a couple of more minutes. Encourage you to say hi to participant fellow participants.

As I said, Welcome, welcome. We're thrilled to be starting this conversation series around what we're learning from science standards. This was the Brainchild of folks here at the Board on Science, education members, and discussions with people in the community. This grows out of and is out of, reflections on, a series of conversations we held over the past year. Now, it's almost a full year. Our last meeting was April of 2022 around, taking stock of where we are on implementing standards. And during those discussions it became clear we're learning a lot as we do this, and as we look toward what we're doing, moving in the future around implementation. But also, as we're tweaking our vision moving forward, we thought we needed to have continued conversations where we're really gathering new insights and using them to guide our work together. So, we identified a couple of topics that we thought we need a deep dive on next slide. and so, we've constructed 3 new meetings, this one on equity, inclusion, and science, education, where we want to be talking about, what are we learning? There was a move in the framework for science education to be elevating a vision for science that centered an elevated science for all students and did discuss notions of equity. But that was at least a decade ago, and we're in a different place, and our understandings. And so, we knew we needed a conversation there inside some research on science, learning and teaching research has moved forward as we're doing implementation. And we're learning from the implementation. So, we'll have another conversation around those topics. And then we're gonna have a culminating event that will be hybrid first t0 0ur virtual, where we'll bring a lot of these insights together as well as new insights about how we're navigating implementation and navigating these changes to the system. And what that means. Looking forward, our overall goal is to bring the Science Education community together to develop a shared vision of the future. Of course we're not jettisoning the framework and NGSS. And related standards, visions, but sort of refining what that's gonna look like, and how understanding how we can leverage new insights from our implementation work and from research. As we continue to move forward. And we want this to be a collective conversation here today.

We're really wanting to dig in and put some ideas on the table about advancing equity and inclusion in science, education. We're gonna start with some insights from research which, if not with a phenomenal panel putting some ideas on the table and we'll take a break. Then we're gonna hear from folks in the practice community who are taking many of these ideas and these commitments, and in making them a reality in a, and I need to say in it difficult political context. Not just a difficult practical context. Was I going to have a chance for conversation to break out groups, and I do want to emphasize the 2 panels and discussions there are going to be

recorded and provided. After the meeting, however, the breakout groups we've decided not to record. We want those to be safe places for conversations and a little cone of silence where people can be honest about the challenges they face. We know that particularly folks working on the ground, and districts and states are really navigating some tricky terrain. And so we wanted to create a space where you can have conversations with your colleagues about the really fine work you're doing toward equity and inclusion without being worried about being captured on tape and then projected online. So those are are not recorded. And then we have a final group discussion. That group discussion will be recorded.

So many who've participated in our meetings have heard me highlight these norms for participation before I emphasize that they're just as important in the virtual space as they are when we're together in person. We really believe the idea that differences in in opinion are not only welcome, they're valuable and lead to better thinking and innovation and insight. But that means we have to be open and listen respectfully to each other. I've sometimes said, you know, attack or take a part the idea, not the person, so to have respectful conversations where it's okay to disagree. But you disagree in a way that is respectful of the person you want to promote an inclusive environment where everyone feels welcome, valued, respected, and supported, that includes in the chat as well as in verbal comments. We have a chat open for everyone to talk to each other. It should be set so that it's not possible to do a lot of individual commenting to each other except to the host and co-host and that's just to make sure we're creating a safe environment and bullying behavior won't be tolerated.

In fact, the academies have a policy on preventing discrimination, harassment, and bullying. We really strive to maintain environment free of harassment and intimidation, and that is online as well as in person. So we have a shared commitment, and that also extends to everyone who participates in our activities and events. And so we really encourage you to be mindful of that. If you experience something. I'm very open to having people let us know. As we strive to create this environment. It helps us to have feedback on, whether we're successful and on things we can do to help create the space we want to create

So we we're doing this in a for the folks here, and not on the live stream. This is a regular zoom. So you need to ensure you're muted unless you're speaking. That will just allow us to focus on the people who are presenting. We absolutely encourage active engagement and engagement in chat. And i'll tell you we've gotten a wonderful input from chat, and so and people can share resources. And we are going to try to also share the chat when we're sharing the recording. So you'll get access to resources that are shared. We're going to take Q. A. In slide. Oh, Amy is gonna put the link in chat. This is also to kind of level the playing field in terms of the people who are watching, and the live stream as well as people in the chat. We will do some monitoring of the chat to see if there are questions there. But please please use slido to put them to put the questions there. That will allow Amy to be kind of sorting through them from all the different folks who are watching and participating in this meeting.

So all right. So that was it. And we are now going to pivot to our first panel unless there's anything I forgot, Amy. So we're getting a little bit of a head. Start on the panel. We're super excited to have a set of 3 researchers to present ideas about it approaches to advancing equity and inclusion. And in Pre. K. 12 Science education. I am. We're going to start with Dr. Tia Madkins. Dr. Madkins is an assistant professor in the Sem Education program and the Department of Curriculum Instruction in the College of Education and a Faculty research affiliate with the Population Research center and the center for the study of race and democracy at the University of Texas. At Austin. Her research focus is on supporting Pk: 16 educators to design inclusive STEM, plus computing classrooms and to engage equity, focused teaching practices to transform learning environments for minoritized learners, especially for black girls. I'm going to introduce each speaker before they speak. We have 3. They will have 15 min each. And Tia, I

will give you a heads up at 5 min and 2 min, and I will interrupt, because I I find it hard when I'm speaking to be tracking chat or something else. I hope that's okay. I'll just politely say, oh, you have 5 min and sorry for the interruption, but i'm going to turn it over to you.

Tia C. Madkins (she/hers) UT Austin: That's totally fine, Thank you, and I appreciate those timer and I have mine. We're going here, but it really helps to have the the reminder. Thank you all so much for the invitation to learn together. Today I have a script that i'll use, so that I don't ramble too much. I'm a black woman of the oral storytelling tradition. So if you see me looking this like if i'm reading my script, I look forward t0 0ur time together today.

Here we go, so i'll start by just sharing a little bit about my positionality and how I come to the work. And then I've been asked to talk about how a purchase to equity inclusion have shifted over time, so i'll just share a little bit about kind of where we've where we are in the field just really, briefly, and then i'll focus on some insights from research related to working with young children in science, education, and what that can look like as we try to align in Gss. With justice orientations. So I'm, a third generation teacher who grew up with aunts and uncles who mostly taught in segregated schooling context, and I learned from an early age the importance of justice, and viewing teaching as a political act, I carried those understandings with me as a student teacher in Los Angeles, as you can see here in these pictures and in my work as a teacher and teacher educator in the Los Angeles unified school district, which is the second largest school district in the Us. I primarily worked with minoritized learners in upper elementary classrooms. I also did considerable work in our district as a teacher, leader, and teacher educator related to culturally relevant science, teaching and supporting novice teachers to do this work in science classrooms. I also saw our district make investments an upper elementary science education in the mid 2,000 s initially for grades that were being tested. But I saw that triple down more so to the Pre. K. Through 2 space, and so based on that. I know that science, education is of great importance to young children.and both our research and practice suggest that young children need to have more meaningful and rigorous science, engineering. learning experiences, but they also those experiences also need to move towards more just, sustainable educational futures where our children use science, engineering, knowledge to be change agents, and further empower their communities in ways that they see that. and so the work that i'll share. It is grounded in those experiences and thinking about what it means to really teach science where you center equity. And so their research that I've engaged in over time is to achieve those goals. And part of my research focuses on teacher learning processes, and how we can seek justice as part of the learning experiences we facilitate for young children that are in Gss. So I mean : my colleagues and I. Today we build upon a rich history of scholars in the learning, sciences, and science, education and teacher, education and our equity-focused research, agendas, and the implications there are for practice and science. Classrooms are especially important as Heidi just mentioned. and our current socio political climate.

We have to find ways to do this work, even in difficult times, like the ones we're living in, which, unfortunately, are not new. People have been doing this for a long time. so we're not doing anything that educators and prior generations haven't already done. and I just remind us of that. We've been talking about issues of equity and science education for quite some time, and to this end and my next point i'll move to to share a little bit about approaches to equity and inclusion, and how those have shifted over time, and how that work relates to next generation. Science standards. Higher research has helped move the field from prioritizing assimilationist perspectives to really centering asset based approaches and more expansive views of science and science. Education. For some time. Researchers both in and outside of science. Education, like those you can see here on this slide have urged us to take up asset based approaches. these scholars have really urged us to take up asset based approaches to working with minoritized learners based on their racial ethnic linguistic gender class and other socio-cultural

identity. Markers all of them have a different research agenda. But what's common is that their research guides us, and understanding the importance of centering issues of equity and science, education, reforms and viewing children's repertoire of practice as resources for learning rather than viewing them, their families and communities as efficient or in need of repair.

So I really wanna highlight that that work. We stand on their shoulders as we start to think about the work that we're currently doing right and over time as we've moved towards the framework and thinking about next generation. Science standards. researchers continue to point out there' been some missed opportunities related to centering equity in that kind of instruction. Dr. Rodriguez is here going to be with us today. had said previously that Ngss. In the framework needs a call for specific and transformative action. Megan banning colleagues in a chapter. But chapter they published in an St. Edited volume. say that Ngss practice science practices offer opportunities for teachers to draw and build upon students community-based sense, making repertoire to create a more culturally expansive space of science learning. Here they're just talking about. We can really combine those science practices that we want the science engineering practices that we want children to be using. We can really relate those to what children are already doing to make sense of things in ways that they're already doing at home and in their communities.

And then, finally, my colleague, Maxine Mckenna, and I have talked about how this really is an opportunity for us to center work that's politically relevant, and those kinds of that kind of teaching and learning that really centers asset based approaches. But if we don't actually talk about it and make it explicit, Teachers and teacher educators have to connect those dots for themselves. And so we really want to center that as part of the work that we're doing. And so collectively, this work just reminds us that issues of equity are inextricable from science, teaching and learning. And now i'm going to shift my attention in the remaining time that I have to what this work can look like as we're thinking about preparing features to work with young young children to do work sorry in science classrooms.

And so last year on the National Academy's. published a report that really focuses on Pre K Preschool through the elementary grades, and so they come up with some new definition for some definitions. I think we can really latch on to around equity, one that's very obvious, and the most dominant way that we think about. Equity is around increasing opportunity and access. But what the scholars who generated. This report really point us to is that we know it's important to increase access, but we also know it's not enough, and so we have to consider opportunity and access and relationship to the other equity strands. and those are around achievement, representation, item, identification. and that simply just means changing policies and practice to remove barriers to participation in science and engineering and increase. achieve it. And we can think about that in lots of different ways, but also representation and identification with science. We also have to come up with expansive views of STEM corporate, large, but also science in particular we have to expand what counts as science engineering without re-efying the status qu0 0r what Megan bang and shudding, but so you have previously argued around epistemic heterogeneity simply put we can't repackage what we've done previously under the guise of equity focused work, we actually have to shift our thinking such that the learning pathways we invite young children onto, especially those who are from black, indigenous, and Latin. A communities are truly expensive where children's ways of knowing and doing are valued and recognized. and they also have ample opportunities to support their identity development. So this is where we're starting to see those shiftsand then finally thinking about justice which this report defines. It's addressing the systemic oppressions that cause those barriers to participation. and seeking for a treatment of all people, and supporting opportunities for self determination and driving. And so, If we think about equity in these ways, we can not only

facilitate learning experiences that are Ngss. Aligned. but that are also quote, meaningful, interesting, and compelling for young children. and as i'm sure my colleagues will reiterate in their presentations During this panel, our research with young children, and with with older children, as well as inextricable from justice movements. And so i'm going to shift now to just sharing a few key takeaways from that complex work based on my own research and practice related to how we can increase elementary pre-service teachers understanding of how to do this work and their capacity to to engage in this work.

So these are just some pictures of folks who have been in my elementary science methods, course, and the kind of work that we do there : to really again increase their understanding of what it means to do justice oriented work and their capacity to actually do this work. Once they g0 0ut into their own classrooms. What we found is that educators really need intentional interconnected experiences and thinking about what we need specifically for elementary pre-service teacher education, some of the work that I've done shows underscores what we see in the literature related to the kinds of experiences that we know. That pre-service teachers need, even for those of us who have strong commitments to an understandings of social and racial justice. And so within and across courses and professional learning settings, Educators need both explicit any experiences that have an explicit hyper focus on equity, focused science teaching as well as continued conversations. And so what I mean by that is that we need these experiences. For for example, in one session we're really focused on how we can support emergent bilingual learners and thinking about ratio linguistic justice. But we also need to have continued conversations about other equity issues and keep coming back to them.

One way that I've tried to do. This in the work is having a core reading that we revisit every week, and then adding on layering on new readings. and then, outside of the coursework that teachers are engaging in, we have to find ways for them to develop and maintain relationships with children, families and communities, and further develop their own political clarity, which is again that understanding of what justice really is and what it can look like. but also the socio-political and social, historical, live realities of the communities. We say we're serving. We have to ground those course for those courses and those learning experiences, important theories of learning and critical theoretical perspectives. and we have to help them understand the ways in which deficit thinking might permeate the space, and both help them to acknowledge the ways that they might be, they might engage in deficit thinking and counteract that and their only work.

And then, finally, i'll just leave you with a few considerations from every of it. Publication with Chris Christristina with that Cal State. La. And we talk about how to do this work and pre-service, teacher, education. and just thinking about political clarity. Development is really important. Thinking about strength based or asset based approaches. And how do you do that in coursework? How are you explicitly connecting social justice issues to standards. And then how do your course, readings, and the other materials that you're using prioritize justice, centered science teaching so that students in their courses really walk away with deep understandings of how to do this work, and why it's important to engage in this way. and then obviously fostering a environment. I look forward to the Q. A.

Heidi Schweingruber: Fantastic, and you finished with 2 min to spare. Very impressive. Thank you to you. We're ahead of scheduled questions for a speaker that are sort of smaller, really focused for that speaker. We're willing to take them now. So, Amy, I just wanted to ask if there's anything in slido.

Tia C. Madkins (she/hers) UT Austin: It's okay to answer it. Now approach right? So I think one thing that people often assume is that teachers from racially minoritized backgrounds in particular have the expertise already to do this kind of work. and I think we shouldn't make those assumptions right. While people of color research has shown this tend to have more critical

consciousness development because of their lived experiences and their engagement. And this kind of day to day work it doesn't mean they know how to leverage their resources for teaching right. So I think we have to be cognizant of that. That's something that I try to be cognizant of in my work. and I think it's also important that we remember. Oh, sorry! That was my actual 15 min. I think it's important that we don't shift our focus, and I guess the the quick way of answering that is what i'm trying to say is, we have to do this work with everyone. We know that it looks different when we're working with primarily white teachers right from upper middle class backgrounds. In particular. There's different work we have to do, but everyone has to do some learning, and i'm learning

Heidi Schweingruber: great great question. Great answer. Thank you. We're going to move t0 0ur next panelist, Daniel Morella Doyle. Dr. Morales Doyle is an associate Professor of Science, Education and Coordinator of the Licensure Strand of the Masters and Education Science Education Program at the University of Illinois, Chicago. His Research examines the potential for Science Education to act as a catalyst for social transformation. I'm going to turn it over to Danny. I think you should be able to share your screen as you present. Right? Perfect. Thank you. And again I'm going to set a timer for 50 min, and I will interrupt. I apologize.

Daniel Morales-Doyle: Yes, I mine, too. So thank you very much for the invitation to participate today. It's an honor to be part of this amazing panel, and to be in dialogue with you all. Thank you, Tia, for brilliant presentation. I hope that you all see resonance between what Tia shared and what I have to share. I want to start from a point of agreement and inspiration of sorts in the framework that inform the development of the Ngss. I've long appreciated this statement, especially the part in red font. A major goal for science. Education should be to provide all students with the background to systematically investigate issues related to their personal and community priorities. And so I've been fortunate enough to be part of a collective here in Chicago that tries to actualize that charge. We call ourselves the Youth Participatory science collective. Our group includes mostly high school science teachers, but also scientists, community organizers, and young people. Some of us have been working together for as long as 17 years focused on developing science, curriculum and authentic community based science projects around issues of environmental racism that have been identified by local communities as priorities to use the words from the framework. About 6 years ago we got some funding from Nsf. To support, formalize, and extend some of what we have been working, and I it more informally. So we think of you Participatory science is sitting somewhere between citizen science and use participatory action, research or y bar. And so this work that i'm going to talk about has happened almost exclusively in high school settings, and so much of what I say will probably be need to be reinterpreted or adjusted for context with younger children. But I encourage you to check out a recent piece in the Bank Street occasional papers that I co-authored with Alejandro about how she brought some of this work into a sixth grade classroom.

So sometimes identifying community concerns that overlap with what we teach in high school chemistry can be a challenge. and then other times. It just kind of all comes together. So this image is from a program at a baseball game at my local neighborhood public high school in Chicago. So the school's about 2 blocks from my house. My children attend one of the neighborhood elementary schools that feed into this high school. and my colleague, Tomas Rowski is one of the chem chemistry teachers at the school. He's part of our He's Participatory Science collective, and he sent me this image. It's an advertisement from the program for the baseball game. So imagine on one page you have the varsity baseball ruster. and on the next page you have this AD. So I want to zoom into the text. So this add explains how this chemical plant produces catalyst for oil refining in the petrochemical industries. Right? I don't know if the company thought they were exercising transparency, or why exactly, they included this level of

specificity and their advertisement in in a high school baseball program. But this text ended up serving as a starting point for a project in this teachers class in too much this class.

So it turns out that this plant is located in a neighborhood where about 84 0f the residents are Latin, a. With most families having roots in Mexico. and according to the EPA website. this plan is one of the 2 major polluters in the neighborhood. They report releasing Molybdenum compounds into the air, and so the teacher, tomat in his class, made a plan to carry out an investigation right, which is an ingredients of practice about whether this air pollution was contaminating soils and local parks and Greek spaces. So this project is representative of a number of other projects that teachers, students, organizations, and scientists in our collective have worked on together. And so we really agree with the fact that there's a great deal of promise and possibility in the way that Ngss elevated practices. I'm like planning and carrying out investigations to the same level of importance as scientific concepts. At the same time we for long in terms of working together. In our collective we became pretty frustrated with the standards. We knew that our projects we're teaching rich chemistry, concepts and practices. But for some reason we were having trouble aligning the lessons with the Ngss. So that promised us to undertake an analysis of the standards. Guided by these 2 questions, and so the next several slides that i'll go through if you want to follow up and read more, or in a 2,019 paper and science education that I wrote with Tiffany Children's price in many chapel.

And so we're really looking about the ideological commitments of the standards versus our own as they relate to issues of environmental justice. So we started our our analysis by looking to critiques of the standards levied by some of our other colleagues; and just as we saw openings in the elevation of practices, we also agreed with a lot of these critiques, and they were helpful, but none of them exactly described our frustrations. so we decided to analyze the text of the framework that guided the development of the standards, focusing on the disciplinary core ideas associated with most of our projects, and so that includes matter in its interactions, waves in their applications, in technology and Earth and human interactions. And we identified in these disciplinary ideas statements that mentioned or alluded to the benefits of science and technology or the harms of science and technology. It turned out there there were so few references to the arms of science and technology that we also looked at statements about the harms of human activity more broadly. Then we also analyze the high school performance expectations associated with these disciplinary core ideas, noting whether each performance expectation implied, asking students to understand, use, conserve, regulate. or regulate chemicals, materials, or substances.

S0 0ne of the things we found were these problematic, narrow views of materials and chemicals, where they were framed only as beneficial products, and the earth was framed mostly as a repository for human consumption. So these are example quotes from the framework that undergraded the Gss. Different materials with different properties, are suited to different uses. The ability to emanate to the ability to image and manipulate the placement of individual atoms and tiny structures, allows for the design of new types of materials with particular desired functionality. For example, plastics and n nano particles. So this statement might not seem terribly problematic on its own. but it positions synthetic chemicals, and engineered materials as useful, desirable products only. nor in the document. Our chemicals also problematized as potentially hazardous. There are discussions of pollution, but they're disconnected from the discussion of these products and the disciplinary core ideas of chemistry. Think about the example they they use here of plastics. I can think of no better entry point into a discussion about the downsides of producing synthetic chemicals, given what we know and still have yet to learn about the impact of plastic waste in our ecosystems.

So in the second quote says: materials important to modern technological societies are not uniformly distributed across the planet. For example, oil in the Middle East, golden California.

Most elements exist in the earth's crust concentrations too low to be extracted. But in some locations where geological processes have concentrated them. extraction is economically viable. So in the second quote the decision about whether to extract material from earth is framed as a simple geologic economic calculation. There's no consideration of values, and whether we should treat the earth as a repository for human consumption. There's no consideration of politics, and whether the people doing the extraction of materials, have any right to do so right. The examples here are instructive. Again, they betray a colonial view of land in both cases, first, in terms of Imperial wars, that the Us. Has was in the Middle East in recent decades. And then also with respect to the Imperial war of expansion, that the Us. Ways to Inx California 175 years ago. just before the famous gold rush.

S0 0ur analysis ending ended up, aligning with some of the other critiques that identified problematic ideologies embedded in the standards. But we located them specifically in the ways that the disciplinary core ideas were defined. But we also began to see that part of the problems with the ways that the Ngss. And promoting disciplinary ways of thinking, actually tend to ask teachers to promote the enterprise of science. which is not a fundamental departure.but rather a continuation of what science and it science, education in the United States has always been about.

Now I want to be clear in an era with rampant anti, vaccine, misinformation and climate change denial. There's some good sense in promoting the enterprise of science. and I think there's also broad consensus that the ways in which the Ngss. Have shifted away from organizing curricula around laundry list of canonical concepts and towards organizing curriculum phenomenon. I think there's science in context but oftentimes ngss aligned curricula do not adequately consider the ways in which phenomena happenin social, cultural, historical, and political context.

Furthermore, it's actually not only the phenomena that have it in context. The practices, disciplinary core ideas and cross getting concepts also exist in context. And what I mean is, if we're thinking about equity as access to the scientific disciplines. We have to recognize that the disciplines are more than a set of practices and ideas. Some people would add that the disciplines are also composed of their practitioners, that there are communities of practice that defines what constitutes the field of biology or the practice of physics. But behind even those communities of practice. The disciplines are also defined by institutions. There's chemistry, departments, and universities. there's professional organizations, their funders. and there are also corporations and industries that define the scientific disciplines in my neighborhood context. To return there for a moment. as I described it before the disciplinary practices and core ideas of chemistry are taken up in this chemical plant arguably more than anywhere else. and so we have to contend with the fact that the chemical industry has played an important role in defining the disciplinary core ideas, boundaries, and perspectives of chemistry. and every scientific discipline has similar problematic boundaries that shape what counts as legitimate learning and knowledge in that realm.

We see how the ideas and practice of science are codified in ways that align with an industrial view of chemistry in this performance expectation from the and Dss. And I would argue that this performance expectation pretty much accurately describes, more or less what they do inside of this plan refine the design of a chemical system by specifying a change in conditions that would produce an increase in the amount of products at equilibrium. so as part of shaping what counts as chemistry. The chemical industry also has a long history of ignoring the environmental and health implications of their products, and by products. In other words, they also, like the ingredients, have separated the beneficial properties of synthetic materials and and materials extracted from earth from there less desirable consequences. So the company that owns the plant here recently paid the Us. EPA 63 million just a few years back to clean up toxic waste sites that they had scattered around the country. Now somebody lives down the street from this

plan that concerns me. the this specific plant wasn't included in the settlement, but it did include one a a different one, about 15 min down the road. So when I think about real world phenomena to anger chemistry, curriculum, and especially if I want them to be locally relevant place based and even connected to equity and justice. I think about this plant.

So what strikes me about this example in my neighborhood is that it's actually not exceptional. It's a relatively typical example of the chemistry, chemical industry. and and the ways that that's connected with the ideas of of the discipline of chemistry so recently one of the major sponsors of the Ngss Dupont similarly agreed to pay 26 million dollars to clean up a contaminated way site just a few further miles down the road in East Chicago, Indiana, where they had manufactured pesticides and other toxic chemicals for years. I want to be really clear that i'm not suggesting that there is any indirect, or any direct inter interference by Dupont and the writing of the standards. But instead, the Ngss. Failed to depart from their industrial view of what chemistry is so. Instead of writing performance expectations where we're using chemistry to protect or repair our community from the harms done by the fossil fuel industry or the chemical industry. The standards got stuck a little bit in viewing chemicals only as useful products.

So I want to be clear that I am suggesting that may be giant corporation to stay out of what we learn in schools, and that grassroots, voices, like students, teachers and community organizations, should have more input on what we teach and the use participatory science collective. We found creative ways to make sure that students in our classes could meet the problematic elements of the performance expectations, while still foregrounding a different justice and community oriented view of chemistry, the earth and the earth materials.Again, if you want to read more about this. we describe it in a 2,019 paper. and I will finish there

Heidi Schweingruber: Fantastic. Thank you so much. We are going to see if there's any clarification questions. We can take a couple. Are there any in

Amy Stephens: that are greater focus on the nature of science and Ngss. Especially the idea that science is a human endeavor, which is therefore not immune to issues of human fallibility, would address some of your concerns.

Daniel Morales-Doyle: I think that is part of it, and I think you know. One of the things we say is, we have to teach students to appreciate, appropriate and critique the enterprise of science.

Heidi Schweingruber: Terrific. Thank you. All right. our last panelist, and then we will have 2 discussions. Last, but not least is Enrique Suarez, Henry Suarez. He's an assistant professor of Science Education at the University of Massachusetts. Amherst. His reaches research focuses on designing learning environments that create opportunities for elementary age, emerging multilingual students to leverage their conceptual resources and trans languaging practices for learning science, Henry. And again, i'm sorry I will interrupt to to give you a heads up on time.

Enrique/Henry: So the work that i'm going to be sharing with you, as already mentioned, is around thinking a little bit more about what I mean by linguist and justice and science classrooms, and you know which is again deeply rooted in the work that I do. And I begin with, you know, kind of like telling a little bit of the challenge that I see in in our in our science classrooms. I think that you know both as Tia and Danny have mentioned the science. Learning in this country has been raised and class then often focus on remediation and preceding students and their families, ways of knowing the ways of communicating as needing, fixing in the particular case of bi multilingual learners. There is this idea that academic language and appropriate ways of communicating, really organize much of the learning that they do in in in schools. And I think that in a, in a, in a system where elementary age kids are getting on average, 18 min of science per week by multilingual kids who are being pulled out to receive Esl services, receive close t0 0 min of instructional time and science per week, right? And you see,

this is a represent represented in the over emphasis of the acquisition of English based science vocabulary. Again, with the idea that If you speak right, then you will be taken seriously. But I think that this is very much under here to buy a assimilationist logic into thinking about what learning what counts as learning.

So I really think that we should be thinking or rethinking our approaches to language and languaging in classrooms, and and needing a new framework for conceptualizing what justice means in those spaces. I begin, you know, kind of like building on on on what he and Danny were saying. I begin that we should be wanting minoritize students to engage in complex intellectual activity and position them as knowledge, focus and knowledge producers rather than you know. Kind of like empty vessels that need to be given knowledge and and ways of thinking. But I I draw heavily on on the work, as Steve was mentioning from learning scientists to rethink equity. And for me it's not about producing sameness, but it's sort of instead of creating opportunities for students to self, determine who they want to be, who they want to become, and how they get there, particularly through bringing multiple ways of knowing, multiple ways of communicating multiple ways of being into coordination for them to create again, kind of like new ways of of learning and becoming.

The introduction of the practice is really open of opportunities for us to engage for students to engage in that kind of work for us to engage in that kind of education. But again, in terms of bi and multi-level learners. I think that we go. We need to go beyond kind of like what we have so far and just for a little bit of historical context. You know our our field, or or the stronger voices in our field; for for decades have told us that bi multilingual learners are not capable? Or are Don't have the resources or the strategies to be able to engage in this deep. complex activity of making meaning of the natural world? So, for example, a at a paper that was published in the mid 19 nineties tells of that, you know non non-english speakers use a lot of words. A large amount of language to express ideas that could be communicated in short, concise state. And so I guess you know, these kids were academics and not just bilingual learners. you know. 10 about 10 years later. Another, you know, very sighted popular paper tells us that we need to give students the the resources to be able to move away from quota code, everyday language to more scientific forms of language.

And to me these kinds of historical or, you know, kind of trajectory is important, because they very much inform what ended up on the standards. The standards themselves in the framework. Don't explicitly say that English is the language of science. But there are statements throughout both documents that imply that English-based forms of communication and specifically scientific forms of communication are the only ones that are accepted, or the ones that we should be striving for, and then leave everything else behind. Right so I think that it's an simplified here from the Appendix F. When we're thinking about the practices. Specifically, the the practice around this course.

Notice the categories that we create to put the students into right. So their English language learners, their students with disabilities, students who are speakers of social or regional varieties of English. who then they can argue from evidence and provide explanations, using their less than perfect English Well, who gets to determine who's English is perfect right? Why are we putting these students again in in relation to this standard that we haven't specified that we haven't explicitly stated. But we all know what we mean right so in to me this is again well intention, but it's this idea that there is this kind of like the the benevolent helping hand of the science educator, giving these students the language that they need for them to be able to engage in meaning making.

I think it's important to go beyond this and sort of like, dig a little bit deeper and contextualize these documents on this research within the linguistic injustices of the Us. Educational system.

And I think that in in this particular case, which linguistic without T, you mentioned a little bit ago is particularly helpful for understanding how we said that we are creating power systems that separate forms of communication from one another, and said the Standard. You know the white standard, that why we have to regression of English as a standard, that we still we strive for right, and we see it in the the cultural genocide of native people in the Americas. I mean it's no no coincidence that the boarding schools one of the first things that they did was prohibit indigenous people from speaking their languages.

It is enforced in the in the way that you know, kind of like an anti blackness in schools, and in what forms of English, against sort of like viral forms of English are allowed, and are seen as academic or valuable. And then, of course, you know, it shows up in in the oppression of of racialized by a multilingual folks. Again, kind of like organizing not only forms of school, but also policy. Around what languages are are spoken in classrooms. and and who's bilingualism? A multilingualism celebrated right like If you're a white person, is speaking, you know, French or Mandar, and then you're great. But if you are an immigrant from another country, and you, you know like, then you have to go through these steps for us to be able to take you seriously.

So I think that part of our work is is not only, you know, rejecting the labels that we as ascribed to these students, and and really create opportunities where we see their multilingualism and multiculturalism as intrinsically connected to science, but also again bring some of these anti colonial approaches to really expand kind of what what counts in the as learning what counts as forms of activity in the science classroom. But this to me goes beyond the classroom, and I think that it's important to recognize that we first of all the language that's quote Unquote Scientists use is not given by the universe. Use it. The the universe doesn't come with a glossary, like all of it, is creative. But for humans by humans and people have been understanding and relating to the natural world around them for tens of thousands of years, using their own languages, using the for all forms of communication. and really using until the the nineteenth and twentieth century, with the expansion of the British Empire. And then, you know, for, like the Us. Empire, that we have accepted that English is the lingua franca of science or STEM in general, but it doesn't have to be. And, in fact, people now we're recognizing that that homogeneous form of communication is actually harmful, not only because it keeps people out, but it keeps us from doing better science and understanding the world in more complex ways.

So you know, thinking about this kind of like big context, I think that my approach to pushing back or disrupting it is to really bring a trans language in as a laboratory framework that helps us move away from this very traditional framework of thinking, of languages and registers as existing in boxes that have no connection to each other. And then you're basically like adding, you know, kind of like pieces to a puzzle. and instead recognize that once Again, language is for human by humans, and because they are embedded within the socio-cultural socio-political social historical context. then the distinctions that we make are very much in forum by power. Hierarchies so trans languaging allows us to think more broadly instead of these boxes that exist as all existing within part of a larger linguistic repertoire that people draw on in order to be able to engage in meaning, making activities as sort of like. Consider it within certain boundaries or expectations. Moreover, I I think that you know stay with the word is not enough like, because we also make some powered decisions around. What forms of communication are valuable, or are seen as a scientific. So you know, we should be considering, in addition to these registers, and the time quote, name, language is thinking about gesture, thinking about drawings in the case. and consider more broadly the semiotic repertoire that people build and develop.

And I want to be very clear here. I'm not saying, you know, like, I I think, that it's important to recognize these as assets that come to the classroom but I think that we must go beyond this like acid-based approach to thinking about learning that like this is what's going to help that one multiple kid and instead. Recognize that again we are embedded within the system where this

white listening subject is already making decisions around, what forms of participation, what forms of communication are valuable, and which ones are going to be needing fixing, and because they are deficient, right so like again, like it's not just about recognizing the resource, but also restructuring the power hierarchy within the classroom about like what counts as acceptable.

So to make this a little bit more concrete, i'm going to show you a few examples here that I think, will hopefully illustrate kind of what it is I'm trying to say. All come from elementary, aged learning environments, which is the the where I spend most of my time. S0 0ne example comes from a third graders who were trying to make sense of how a guitar produces different sounds. and they were plucking the tar, they noticed that the the length of the string made a difference. The tension on the string made a difference. and even the speed with which the string was vibrating made a difference. What's interesting about this episode is that all of these students were bilingual or or emerging by manual. They created and use automotive Ps. To describe not only the sounds that the the strings were producing, but also to describe the string themselves. So they were, you know, using Team Tom, Tom and i'm sure the Ted who's the singer here would appreciate that as a way of of communicating right like they didn't say high pitch. They didn't say low pitch, but they just by virtue of saying tank on, like everybody understood what they meant. and not only that, but they were able to build on that to make even more sophisticated arguments, or in this case construct their model that attends to the tension on the string, and how the tension on the stream again affected the the pitch of the sound that it was producing; and in this particular case, which is an example that I love quite a bit.

It's this one student, Bruno, who was Brazilian, and he constructed basically the same spectrum of tension, but in 2 different ways. Once he was attending to the looseness of the string, and then the other one. He was attending to the tightness of a string. and again being able to combine the plucking, the planning, the automotive Ps. These, like invented labels, more looser because he was feeling it as he was plucking it, allowed him to create this complex model. Similarly, a fourth crater. When she was trying to explain how electricity moved through a circuit, she started from this idea that again kind of like the battery has the electricity stored in it, and then, once you connect it, then the electricity flows through the the circuit. But then she had an idea of connecting 2 circuits from the same battery. And if you, if you read kind of like what she was saying, as she was going through her explanation about like. Why is it that when you connect to circuits what we now call, or what we call in parallel, one of them bulbs is brighter than the other. you know we can kind of get an idea of of of how she's thinking about it more current here than here. but it isn't until you start overlaying the speech with her gestures, that she was tracking the electricity, moving through the wires, and then to the bulb, and then, being able to compare that you re. You recognize that again.

This is a more complex model of electricity moving through a parallel circuit, which again is way beyond what a third grader would do. But you know he or she is doing it. And then here again, kind of like. I would argue that it is this interlaying of the gesturing of the object of the speech, of the drawing that gave us access to the sophisticated idea of how we said that we're moving through the circuit, that we wouldn't be able to have access to. Can we shut down or or narrow the forms of communication to be only about quote English, based technical vocabulary. And then, you know, after this, a couple of sessions. After this we were exploring electrical resistance. and she noticed that we were using these gel pens with silver ink in them that we're conducted, which were phenomenal because depending on the thickness of the on on the faces. So I really dec out. And this kind of stuff. so depending on the thickness or the length of the conductor, you know, more electricity would be able to throw because you flow through it, because you would be increasing or decreasing their assistance. And she saw that again well, because she was able to build the the circuit. She increased the lens. She increased the

thickness. She noticed that there was a difference in the brightness of the ball that was connected to the circuit. and here she using, you know, overlaying semiotic resources again, from like the gesture from her drawings, using linguistic resources from Spanish linguistic resources, from English, she was able to construct this mechanistic model of how is it that decreasing our increases that increase in the thickness of the conductor changes, or with the amount of electricity that falls through it again. Very sophisticated work for a third greater. because, again, you know, she was able to bring all of these resources together in a space that i' her to do that.

So if I look through kind of like, pull back, I think that we would have a hard time arguing that these students didn't engage in 3 dimensional learning. But I instead, and, in fact, you know, like beyond, so like they were in third grade, and they were doing fourth grade science, and even I would argue high school science with some in some extent. But my argument here is that they were able to do that because they were able to build on their trans sandwich and practices because they existed, or they were learning in a space that normalized. That form of communication, not as a stepping stone of like. This is where you are, and this is rudimentary, and this is the beginning, but instead, recognize it as valuable, because again, in my mind. consensus is not about homogeneity. But as Danny was encouraging us to ask for, you know, like, what is it that we consider legitimate learning in this space, and it with your limit. Learning is for you to be able to bring all of these forms of communication in in the service of thinking about cost and effect. When you're thinking. When you're creating mechanistic explanations about the geometry of the conductor. Then that's exactly what we want you to do that that's exactly what we should be doing, as scientists are in the science classroom.

So again, you know, I think that it is important to see the the sense making repertoires, and all of the resources that students bring, and really remain vigilant about around this contributions of efficiency to students, and I think that we should be recognizing their sophisticated recent strategies as legitimate. Again, they're not stepping stones. There will be refinement. That's what we do in education, but not because they are bad, or because they're beginning, but because you know they're limited explanatory power. And how is it that we create spaces where we are not position as benevolent helpers where we, giving things to student, but instead, are able to recognize the productivity of the resources of the brain. And also you know, how do we make these language ideologies explicit? Like I mentioned, they are very much separate throughout the documents, and yet they are in place it. So if we really going to be serious about linguistic justice in these bases, then we need to start thinking about how it is that we're going to be able to decenter and new contextualize, not only technical language and assessment. but also creating opportunities for reaching complex forms of activity and managing. I had a quote, but i'll stop here, and then i'll just I' to the end. Thank you again.

Heidi Schweingruber: Thank you so much that I love the synergies across the 3 presentations. It's really fabulous. We are going to turn t0 2 discussions to help us think about pulling threads across. Before that. I do want to see Amy. If there are any clarification or quick questions for Henry in Slide. Oh. not that I see. Okay. It'd be some processing, so it might pop up right after the discussing. You'd have a we've had a lot on the table, so we're going to turn t0 0ur 2 discussions to help kick off in the meeting and panelists. You can also ask each other questions if you want to do that. So i'm going to go first to Stephanie Marshall. Stephanie is an assistant professor at the University of Minnesota, Twin Cities. Dr. Marshall situates her work at the intersection of educational policy, leadership and science education. focusing on the systemic and organizational needs for science, education. She examines equity in science, education through building and sustaining networks. The impact of policies on science and the role of school administrators in science, education. and Stephanie I'm. Going to turn it over to you. The

the discussions you have 10 min. You do not have to take the full 10, but again I will interrupt you to just give you a sign when you're towards the end of your time.

Stefanie Marshall: So I I really appreciate being a part of this conversation today, and thank you to Tien. And again, Jenny, for offering a pivotal research and recommendations to achieve equity in science classrooms. I mean you've given us a lot of information acknowledged to build on today and think about in the future. And so, when I was originally thinking about this, I was thinking about Dr. Alexis Patterson Williams work. I am book invoking the inner witness of what will it take to actually do a lot of this work and engage in these critical ways. And so, first I want to start with who are our current teachers what I think. So thinking about our current teaching force. It's important to recognize who they are. So many of them are us European, American, middle class, monoling or women with. Let me experience interacting with people of Martin's background. This lack of experience. engaging with marginalized youth results and negative preconceived ideas about students of color. Given these limited experiences, there's a need to strategically develop the critical consciousness of teachers mit ctl, and it's often the case that teachers have not critically examined their own lived experiences to develop their critical consciousness, limiting their pedagogical decision-making for diverse learners. And we heard about that some today. 2 so this speaks to teachers generally, but we also know that this applies t0 0ur science and STEM teacher. Specifically we have to understand wh0 0ur teachers are, so that we can prepare them to do what we have described in, and what we've heard in these presentations. So, moving beyond where we are, as Enrique said, we will. It will require that we have space to do this work, and it, and and, for example, to notice for science, equity to to recognize the everyday, the science and everyday talk and communications employed by students, and to engage their brilliance and their noticing. And so when I think about science, and as we've heard about what science. what students need to be have the capacity to do, and teachers need to have, like the capacity to do within their within a a broader context. We need to think about science within an ecosystem science and STEM policy. Implementation cannot be in disentangled from the attitudes and ideologies of the culture, the belief systems, and that folks have. or the influence of former policies. A lot of people often ask me why our elementary teachers teaching science, for example. and there's a long history to that, and we we've been offer these rich examples this morning. However, we also need to think about the signals within jobs of teachers that tell them that science is not a priority. So what what Pds are invested? In? What resources do elementary teachers receive. what assessments matter? We are telling teachers that without telling them explicitly what matters which is also largely due to past policies. And so, when we think about the standards, we also have to consider what's what evoking the the inner witness of teachers, so that they can be critical, so that they can engage our students and their communities in ways that are authentic. So we heard from Doctors Mackins, Morrison, Doyle, and Swear is about what is needed, and the potential of work with teachers, youth and communities and science education. There's a need to even sustain this work, because we also know that Mit. Ctl. And once teachers, especially early career teachers, when they enter into schools, they adopt the culture of those schools, so we can prepare them. But how do we sustain those practices? So we really need to consider that one. And so a couple of questions that came up for me and thinking about what the about these presentations, what was offered today? When will Teachers educators feel the freedom to authentically teach science and equitable ways. And so, when I think about the the freedom to do this work, many get excited about what we are talking about today. but they don't feel that they have the space to do so and so how do? And again, how do we evoke this inner witness, so that they that so that our teachers feel that they can be critical and not question themselves, which also constrains what they're actually feel like they have the capacity to do in classrooms with our students and in the community. And then Dr. Marouse Doyle made me think about this question, how is science being? How it has it been bounded. and how can we release those bounds? And

then, finally, equity work requires working in community, and that's what I was also hearing from our presenters today that it's not happening in isolation, that the decisions one person makes, impacts someone else within this larger, broader system. And so we have to think about this infrastructure, and how we can really support folks, and thinking beyond the work that they do as an individual. But what are they doing collectively within this larger system? And so I will stop sharing.

Heidi Schweingruber: Those are great questions, panelists. I'll encourage you to think about those questions because they may come back to you as we move into the discussion We're going to move t0 0ur second discussion. Algebra. Rodriguez Alberto is a Professor of Education, and a professor of Cross Cultural science, education at the University of Houston. In fact. his reach is folk research focuses on the use of socio- transformative constructivism as a theoretical framework that merges critical cross-cultural education. Tenants as a theory of social justice with social constructivism as a theory of learning

Dr. Alberto J. Rodriguez: It's a fantastic to see everybody here today. and I've known, and Rick and Danny things with all of us, have less white to now we're beer, but then it's this great to see you both. I'm i'm becoming more aware about Here's wonderful work, so I i'm i'm always a pleasure to hear everybody, you know, share their their fantastic cover, search and ideas. I think it's going to start a little bit that going backwards, you know, starting with Enrique and highlighting some of the major comments that everyone made, because I mean the example that we can share about that fourth grader, you know, just tapping into his complete trans language and repertoire, you know, to make sense to explain. You know his understanding of electricity in a circuit. It's a wonderful example about how the the importance of moving away from colonial ways of thinking as a English being the only way to communicate understanding and encouraging. You know, a students to manufacturer understanding in in multiple ways, you know again, you still trans language as a, and we can mention as a liberatory approach. So you know, tapping into a serious home language, you know, the whole semiotic repertoire of expressing understanding is one way that you know that we need to. Yeah, I guess we we way of enhancing the standards instead of promoting the notion. You know that language, intensive means only in English language in terms of, you know, going away from that kind of thinking. Similarly you know that with them, and then you know that brings attention to the importance of moving away from this romantic notions about science, I understand, as always being benign, and then in getting encouraging students to engage critically with understanding science. You know especially the historical and an actual, you know, everyday life context in which you know they can apply their understanding of science. So it's important, you know, like I I really like the way that he make sure. You know that phenomenon happens in real social, everyday context, and it's important to engage with students in that kind of important work. and then going back to what the high L. Of what T. I mentioned that I think is really important is about. They need to help features connect the dots, you know, like teachers need a lot of opportunities to see. You know examples of how to make some of these practices that we're talking about making science with them. More culture, you know, socially relevant. They need examples, you know, across the teacher education program. No, you actually science message classes, and then the opportunity to actually see this enacted, you know, in schools. So i'm gonna share the screen here. You have to have a little bit of my own work. You have to throw attention to this important component about making giving teachers more opportunities to see some of this working action. So i'm going to play this slide here. So everybody able to see that slide. Yeah. So this is part of a project that I've done on that. I did it over 2 classes. My own science methods classes, along with a a a colleague who was using a differing approach in his science maintenance classes. So so need to some results that but it's not to highlight a common theme above both classes, even though we were using different approaches when it comes to implementing a science, or seeing science not being taught in the classrooms. So these are for service teachers who are placed in

a practical school essentially for 27 h each semester, and then they, and then they have an opportunity to spend a whole day in the classroom with a a practicing teacher, and we ask the question, you know, like out of the 9 school practical business. You know how often they sold their teachers teach science. I can give you a moment to guess how often that happened. As if you're right. So this is what we found out out of the 61 students that participated over half of the students. They didn't get to see a science teach science in elementary school. No, even once. And then some of them. So that teaches the science a few times, especially this one's here that they number one and 3. That so science, being told 5 t0 7 times, is because they were placed with a elementary school teachers that were teaching science at the great for a very 5 level. So they had an opportunity to see them teach science because they were practicing for the standardized testing. So this grows a really important attention that for us to be able to help, we service teachers and help teachers implement some of these ideas promoted by the Ngos and the Ss. As some of the ideas that I work. Colleagues have shared here today, you know, to make sign as more Google and socially relevant. We need to create this space where our pre-service teachers I have opportunity to see some of those practices being modeling schools, and at least the opportunity to actually see science being taught. So some of the recommendations, you know that that that kind of come across is the idea of placing them in this kind of place of the with teachers, with mental teachers or cooperated teachers that are at least supporting the opportunity for them to practice what they are learning in that work classes. So in my classes I'm. Modeling how to makes science school children socially relevant integrating engineering practices across the curriculum. But then they are not allowed to implement some of these ideas in their own classrooms. You know, when they're in place with a practice and features. because science is not being taught, and the recent report that came out. You know that I've I've I've I've the one of the highlights again. Is this the same thing. You know that we need to provide this basis for teachers to be able to practice these practices at the same reports. Also, you know they that that and and and many others we're involved with also make some recommendations about the importance of providing the spaces. I once also mentioned about the need to provide equal standing, as much instructional time for for teaching science as math and language arts. And then one of the things that we're trying to do, trying to move away from. They comp compromise ways of thinking about science and math, and then trying to move forward towards. And the National Academy is complete. A big role in drawing more attention to the need to provide equal time for for for science and engineering practices, you know, to be taught especially in elementary schools. Otherwise, you know, we will continue to see all of these different issues. : and one of the things that we could be doing is providing some of these workshops for cooperating teachers or mental teachers to see a better connection between what we're covering in digital education programs in terms of integrating the and Gss. And you know what is happening in the schools. But I think with that kind of kind of opportunities for support. And I really believed also that You know, our researchers need to be engaging in in more narrative of engagement, I guess, and reporting some of the things that are working or not working very well in terms of integrating the Ngss. Because we keep on reporting on how well the standards are being implemented, based on on. Now, we're funded research. you know, I think it it kind of paints. I kind of warped or bias the story about the implementation of the engines in the schools, because, as I mentioned before. You know. No. All of the schools I know in the I are, or teachers are trying to implement the ingredients in their classroom, because No, even it's not even science being taught in in this basis. Yeah, and I think i'll stop there. But I think I I think They' to highlight this aspect because of all the things that we're talking about it's important to create that space for us to be able to see science be, and to you know, beginning teachers and practice of teachers have an opportunity to practice some of these ideas. So a lot of stuff there.

Heidi Schweingruber: That's fantastic. Thank you both terrific reflections. Amy alerted me that we do have a clarification question for Henry for that presentation. I do also want to queue the panelists and the discussions, but we'll go to the panelists first. I want to give you some time to react to everything to the the comments from discussions, questions that were raised, the things you heard from your colleagues discussions in the chat before going to questions, because I suspect that you have some things now where you're like. Oh, and i'd also like to say this, or oh, great point. I see a connection here, so i'm going to give you each a chance to do that. The first will go, Amy, to the question on slide. Oh, yeah, and and then we have others. But we'll after the panelists have a chance to react. Then we'll go to the Q. A. We have some plenty of time for that, but I wanted to give Henry a chance on that clarification question.

Amy Stephens: Yeah. So, Henry, the question is, what kinds of support do teachers need to support students with trans languaging?

Enrique/Henry: That's a great question. Thank you, Amy and Krista, for posting that question. I think it's multi dimensional. Really one, I think most of all is an understanding that languaging is a complex social process. that it is multilingual, multimodal and multi-century like a Professor Lee way it's just that we make decisions around which ones we deem acceptable, based on the socio-political. And so the cultural context that we find ourselves in right. I mean I think that if you, if you go back 100 years ago. It's kind of an weird thing to say now. But in the early 19 twenties, when a lot of immigrants from Europe we're in the great we're coming to the Us. There was a so much research about how you know, kind of like Mediterranean, Italian, Greeks, Spaniards, Portuguese would just with gesticulate while they were speaking, and that like how that was I a marker of how less intelligent they were, because, like real intelligent people like didn't, just like when they were like speaking or whatever right. So you you find these kinds of like language ideologies. like all throughout our histories and in ways that come int0 0ur classrooms in ways that come int0 0ur teacher. Preparations int0 0ur curriculum, int0 0ur standards. So, like, you know, similar to what both Stephanie and and Martin were saying just now. So, being able to recognize that that is the culture within which we are embedded is an important first step, because if you don't see how we are pushing people into these narrow forms of communication and and kind of like closing opportunities for others. Then you know that that that that's kind of like a non-start, so that that that is one aspect of it. The other aspect of it is or the other kind of like support is. The next step is like we're going to say, Well, how do you make the space where you teach a multilingual multi-colored man? Most of sensory multi-modal space, even when you yourself may not like, identify as a multiple person, or maybe monitoring the speaker. However, we choose to define that. So I I I have a colleague that your colleague, Eminem, a child from the University of Wisconsin, has, like beautiful research up in Chicago, where I'm, a monolingual English teacher in the third grade purposely creates moments for his multilingual, my multilingual students to read poems, to share their ideas in their own multiple languages, and even if not. Everybody understands what they're saying. There is this expectation that the classroom is a multilingual space, and where all of the languages around you under are are welcomed again, like, even if we are not able to understand everything that everybody's saying kind of like at every single moment of the day. So again, kind of like making moves to create, to to normalize the multilingual multi-century. the dimensions of languaging is important. And then the the then the next step is like Well, what kind of curriculum I mean, and and that folks in the call who are really interested in this idea of curriculum development. But how do we create curriculum that once again the center English, the center, like technical vocabulary or phone call disciplinary forms of talk as the ultimate goals of what it is that we're trying to accomplish of of where we're trying to go. But I know that it's not easy, especially in this sort of like political climate. But I think that you know part of this courage that it takes to to again to like, recognize that people have been making sense of the universe in

their own languages, and and English doesn't have a premium on knowledge. So why should we continue that myth?

Heidi Schweingruber: I'm going to loop back, as I promise to see if you have any reflections or or reactions to what you had since you went first. And and now you've had a chance to hear some of the things and make connections across your colleagues. They want to give you a first chance to add any reflections, and then, after we get some reflections and try to keep them short. So we have some time for the Q. A. But I want to give you a chance to jump in.

Tia C. Madkins (she/hers) UT Austin: Thank you. I think the thing I'm sitting with now is just the importance of people understanding the complexities like the multi layers like I really appreciated Danny's. I love that article. By the way, Danny. : I really appreciate the attention to place and to context in a very real way, and I think that's a lesson for all of us, you know, relating back to what even Stephanie said around community, and thinking about the ways in which our work is related to so many others. and that we can't. We can't think that we're doing this work in isolation if we really want it to to take off. So I encourage everybody on the call to think about the ways that we can stay connected and do work. That's all in service and minoritize children, families, and communities.

Heidi Schweingruber: Thank you. Danny. I'm gonna go to you next. And then Henry I'm coming to you, and then Stephanie and i'll about to. I'll give you opportunities. Danny.

Daniel Morales-Doyle: A couple of things stand out. One is that, despite our various critiques of the Ngss. I think we also recognize that if there there are a lot of situations in which, getting to the point of organizing instruction around phenomena and valuing student sense, making the way, the Ngss. Asks us to would be a big step forward in the majority of science teaching contexts in the United States. And so I think what that means for me is that we don't have to be constrained by the status quo. We can intervene in the status quo, and also dream of better possible futures of alternate features at the same time. and so that we can intervene when a school is hardly an elementary school is hardly giving its students any science instructional time, and we can also dream about bigger and more imaginative ways of engaging those young people with science. We don't have to settle for the minimum, even as we intervene. sometimes incrementally. And and I think of Stephanie's work with school leadership as being important there. Right? That's That's a a part of this conversation that doesn't often come up when we're all science education focus. But I think wanted to highlight that. you know school leaders can play a big role in moving between the status quo something that's more culturally and community responsive and even dreaming beyond that

Heidi Schweingruber: awesome I I love, I love, I love the way you frame that so clearly, and that's the spirit of why we wanted to have these conversations is continuing to work now, but dreaming toward the future for sure. Henry.

Enrique/Henry: Yeah, to to pick up on what Danny was saying, you know. But when Stephanie and over to challenge is to think about like, what are the the environments in which our pre service teachers are going into, you know, like what's happening in schools, You know my mind when immediately to leaders, to leadership, right like both building leaders and district leaders and state leaders as well. and and you know we we may have the best of intentions, or or the most innovative critical building years, or walking around with a checklist of what they expect to see, and it's about quiet students. It's about organized learning, and if it's about, you know, kind of like, you know, academic vocabulary, because that's what's going to be tested. Then then it's a little difficult to be able to like. Make meaningful progress. That is sustained over time, so I I I I appreciate the the work that Stephanie and other folks like Kate Mcneil are doing around. How do we support leaders to also reframe How do you understand? Science learning brought me, and for just oriented purposes? Yeah.

Heidi Schweingruber: thank you. I'll bear to. I'm going to go to you. And then, Stephanie, i'll gonna give you the last word on this first set of commentaries.

Dr. Alberto J. Rodriguez: That is something that we should be we be more conscious about is that the pre-surface teachers that I've been working with, you know many years in different contexts. They want more opportunities to engage with the Ngss. To integrate engineering practices. When we interview students in this particular project, you know that I referenced earlier. They were saying, oh, gee like I wish I've been hearing about this in my science content areas. I wish we have another science message class. So we get a chance to learn more about this because they see the value of it. but they keep on going back and asking questions like, Well, you know, nobody is implementing them into school. Where can I see teachers actually doing it, or they say things like, Well, how am I going to implementing engineering Design Project? You want to go that 20 min to teach science in the in in a classroom, you know. So so really important is structural issues, policy issues. So it's not from from there. And I mean they're really interesting in in integrating this idea, and they see they've been put to some engagement. So we need to find a way how to provide more of the spaces again for them to be able to to move, to move this this ideas forward. you know, as we look into the future and expand the impact.

Heidi Schweingruber: Thank you and Stephanie. And then we're gonna we do have some questions in chat that we're going to go to Stephanie.

Stefanie Marshall: Yeah, just to pick up on what you, said, Alberta. I want to make sure that we I mean, I know many of us on this call are all of us recognize that many teachers want to engage in this work, I think, just like recognizing that. but having the tools in the space to do so. And again, i'll say freedom to do so, the investment to do so. So when thinking about leaders and the decisions that people folks are making who ultimately makes the decisions about how resources are allocated. and and and supporting those folks to I I think Danny and Ricky just mentioned, like this re-imagining, and this re envisioning that we need to move towards. They need that support and understand what that looks like to. so that they can support it through their decision making. And so there's just there's a lot of work to do, and and just and going back to what what T. I mentioned the just the complexity of this. So it's gonna require spaces or or or people the right people in the room. I think Thomas Philip has said that on a panel, maybe a year ag0 0n this, for this same programming. where he said, the right You can't make the right decisions without having the right people in the room. I mean, that really stuck to me stuck with me.

Heidi Schweingruber: Thank you, Stephanie, and and I'll just add a little personal reflection. I feel like in our positioning at the National Academy. We feel responsible for helping to get the right people in the room. So I want to go to some of the questions on slide. Oh, Amy, and I think it's not practical to have every panelist and discuss and have answer every question. So maybe we have a couple start. I can't see every one. Let me see. I think maybe the best way to do it is to raise your hand in Zoom. If you'd like to take the question. I hate to say i'll take the first 2 people, because that then that feels like a buzzer situation and game show thing. But I don't want to do it that way. So a little. Wait time, and then we'll see who feels like they want to take that question, and we just don't have time for every person. So, Amy, i'll let you read that question.

Amy Stephens: Yes, and as a reminder in Slido, you can upvote questions. So if there are some pressing ones that you want answered up. Vote. The first one that I see is Stephanie's point about community is huge, but the resources devoted to establishing growing, collaborative community are very limited. If you had to pick, what would you prioritize building that community or revising standards? And why?

Heidi Schweingruber: Oh, what a great question! I don't see a hand raised yet, although i'm tempted to put Stephanie on the spot since you were mentioned. But I don't want to do that. I feel like I can't answer that question.

Stefanie Marshall: It is a big question, a great question when we think about. So I'm just gonna put it in context. When we think about revising standards, what takes time. And so I think you can't do in thinking about different timescales of what you can do. You can start organizing and working towards different efforts at the same time. But I do think, and what I talk about with my pre-service teachers and in service teachers Who can you Who do you need to engage with, to move something forward. and so like. And they also thinking about, what can you actually do tomorrow? And so, when we think about the the specific challenges and problems. If we're thinking about in school challenges like, who do I need to talk to? Who do I need to develop a relationship with. So it so some things may take strategizing. Everything takes strategizing, but I think, depending on what the specific problem at hand, it recognizing that it may take time. And so, when we think about building community, we have to do that over time, because it. when I also think about what was mentioned earlier developing authentic relationships. But I I I do think there is things that we can actively think about what we're going to do tomorrow, and then long term.

Heidi Schweingruber: Are there any other panelists or discussions you'd like to add. and any reflections to Stephanie? You can just jump in hearing none. We'll go to the next question.

Enrique/Henry: That's what I was going to say, Henry, did you want to jump in? I think that you know we the the the documents are important, and they they provide a framework, but because of multiple reasons that the way that they up to the classroom is very much filtered through the community of the school in the district of the teacher of the classroom. So I I really do think that a ground up approach in my mind with the limited resources that we have would be even more.

Heidi Schweingruber: if we start now to really build the broader, more inclusive community that connects more to local and regional. We're actually gonna have better standards when we ever do them like we need. But we need to do a lot of front and work. Now, to get to that point. That's my that's my inserting my cell phone. So let's go to another question. What can I do to make science more culturally relevant using science communication. and n0 0ne's on deck right? N0 0ne's on deck, but we'd love to hear people. Oh. reflecting on that.

Dr. Alberto J. Rodriguez: I'll i'll. I'll jump in for a while what people are are forming some of their ideas because that recent report that I mentioned from her. I sort of research. One of the recommendations that I think is really interesting. They said. The idea of connecting more with parents about, you know, the importance of integrating engineering design practices, making a science, you know, connected to everyday life. I I think that's an important component. You know that I myself, in my own research. I I have not try to make that connection to try to get more clients better and for more involved about some of the things that we're doing so. So Barnes get an opportunity to see that, you know, if science is being pushed aside, and being taught as often it's an issue that they should be concerned about. And when there is some science being taught on some engineering practices being model that they have a little bit more of an understanding about. Why, that's important, you know, and obviously connected to their their everyday lives. And they can help their kids become, you know. critically engaged citizens. So I think in that, in relation to you to you, being a communications person, finding ways of how to highlight and point parts to to example. So how do some of these really cool activities are being implemented, and how that's important for enhancing. You know the students deeper and understanding of science. So I think that would be one way of thinking about that.

Heidi Schweingruber: Anybody else want to share some reflections on the question. Feel free to unmute and jump in, Danny.

Daniel Morales-Doyle: They're always about science, education, to what end? Right in science, to what end? And so I think, ways where we open up more democratic and public dialogue and discourse and and dialogue in communities about why we do science, how we do science. And then to the same point, how and why we do science, education getting to Albert. Those by getting parents and young people and activists involved in those conversations is a way to build a different to my earlier point. The chat, grassroots vision of of why we take up science education so that it's not always aligned with. You know, national narratives about military and economic competitiveness. But actually what communities need.

Heidi Schweingruber: And and I I just want to say I mean some of what you raised about critiques. The Ngss. Around shining a light on the harms and the ways that science itself has been co-opted by the industrial and militaristic. You know, in science communication you can als0 0pen up those conversations. and your portrayal of science. So there's an opportunity there. Another question, Amy.

Amy Stephens: Excellent. I love that we have time to get through some of these. How can those tools, skills be best developed.

Heidi Schweingruber: Gonna give some wait time here. It's a big question. Anyone willing to jump in and offer some ideas? See, Danny.

Daniel Morales-Doyle: I don't want to take up too much space. But I for our group the use Participatory science collective. It's been about learning, history, learning, the historical context of the communities where we teach of the relationships between science and history, science and industry, and the the history of environmental justice, victories, and the key to that has been to really allow the group in collective ways to determine the directions of our professional learning where teachers are identifying what they need to to understand the context.

Tia C. Madkins (she/hers) UT Austin: Yeah, I think just to add on to that, I think one thing we found really helpful is at least for pre-service teachers who are new to going out into communities One way we try to help them engage more deeply with the school communities in which they are serving is to take community walks. And one way we've done this Thinking about phenomena is having them. Take pictures, having them go back and do a little, think up, Think aloud with the children in their classrooms about what's in on, they see. And then thinking about relating that to social justice issues it's just a little a tool we've developed over time to kind of help them see Why, what's actually happening in the communities, and what what rich resources are already there, and what's important to the kids and the families related to those that they can actually bring back into the classroom.

Heidi Schweingruber: That's awesome. Amy.

Amy Stephens: Another question. Oh, I should unmute myself to to actually speak. This question can be a bit big, a big one I'm, curious with panels would recommend for a framework 2 0r an Ngss 2 based on what they've shared today. What's the next steps?

Heidi Schweingruber: That is a big question. I'm loaded to call on someone. But. Danny, I thought you had the most concrete suggestions. But I think everybody has some ideas in this group, I think. feel free to jump in to get us started.

Enrique/Henry: And and you know Danny mentioned that the work that we're through published a few years back about different dimensions that we could be considering, as we think about like what the 2.0 version of the work could look like address, both diversity and equity as part of engagement. So I think that you know, going back to that piece from 2,015 and jars would be very helpful. I think that the in addition to those dimensions, what Danny and Tia have both kind of like pointing to is like locating the phenomenon within the the community

within the social, political. So it's a cultural context of people. I think that this is sort of like related to like Martinez question of how? What do we do with scientists? And it's like, you know. We need to understand that the things that we study are part of who we are, and we come at them from who? From who we are right, so like, I think that. recognizing the the the stronger connection between humans and phenomena and sense making is really important. I think that you know the the framework really started us in that direction. But we need to strengthen those connections in a way that doesn't weaken objectivity, right? Because we scientists are really good about keeping distance under the veil of maintaining neutrality and objectivity. But it's that, recognizing how, being able to strengthen that connection will help us build even stronger objectivity and stronger understanding right? And I I personally, you know, as I said, I would love to see a a clear articulation of the language ideologies that are embedded in the in the document that are expected in the classroom, and that the open up opportunities for reconsidering assessment, you know, like I, I could sit here and talk about gesturing and drawing all day long. But if the end of the day, the assessment doesn't include that, then you know we're it, it's a difficult position right? So I think that. having a little bit more clarity around the ways that we can assess students, and for what purposes, I think it'd also be very, very helpful.

Heidi Schweingruber: Does anyone want to have something else? I think we I I think we have time for maybe one more reflection, and we have another time for another question, Amy, if there is one. But let me see if anyone wants to add to what Henry's shared. Tia has added something in the chat also. All right. I'll. I'll move to the next question, Amy, and this is probably our last one to keep us on time.

Amy Stephens: I think that's right, and I think it's a geared, perhaps a bit more, towards Henry, and the the questions around the emphasis to learn STEM in English is often a requirement. What are the resources that are available in multilingual it for some classes.

Enrique/Henry: Yeah, there there are a lot of different efforts. Amelia. who is in the call, I think. Yeah, as part of that. A pretty, exciting initiative, both well, actually 2 really exciting initiative, one with her colleague, Tanya, from Msu, and thinking about how do we bring literacy and and and science learning together. There's also an initiative from the open side. Folks to like Think a little bit more clearly about how to articulate these commitments and the in the development of the curriculum. So I I think that there are a lot of things that are brewing. But I don't know if I would point to anything right now that I think is pretty transformative, and that doesn't just sort of like retrad the same. All kind of like idea that you need to learn English before you can. Even I understand the world that around you. I'm sorry I have a hard time keeping history faces. I say that. But yes, so keep keep stay tuned. Cool stuff coming, but more work to be done for sure.

Heidi Schweingruber: Great! I think i'm gonna close this up, for now we have a break. Now I just wanted to say thank you to this amazing panel and the discussions like, if I wish we had a room full of people applauding because I think it would be really loud, possibly a standing ovation that was fantastic. and put some ideas on the table. Our intent is to take these conversations and carry them forward to the June meeting, where we can be thinking about what it, what is the future look like both in our incremental steps and our transformative steps. So we have a break. Now we're going to come back and listen to some practice practitioners on the ground, people who are decision makers and leaders actually implementing in ways where they're trying to work toward equity and inclusion. So I think that's going to be a very interesting conversation, and we'll have lots of links with this panel who are all working with practitioners also are doing. I want to emphasize Again, we're recording all of this, those recordings will be available online. I've actually heard of people making good use of these kinds of presentations that we offer in pre-service courses and professional development is jumping up points. I encourage you to think about that. Please come back at what would be 1230 Eastern time. I'm

not going to do the calculation for each time zone. But please come back promptly, and we'll jump into that next panel, and that will be followed. as I said, by some opportunities, the breakout groups, but they're actually opportunities to meet your colleagues and talk with them. Those will not be recorded. So those are really safe spaces to ask some deeper questions, and to go back and forth, and our panelists will be in those conversations as well. Thank you so much. Have a great break.

Heidi Schweingruber: welcome back. We are starting our next session. We're gonna maybe give it a minute, because we know that some people may be rejoining and newly joining. Some people are watching the live stream and are just joining the zoom. Great welcome back t0 0ur next portion of this conversation about equity and inclusion in science, education, particularly with respect to the science standards and the framework. We are now going to have a conversation with people who are on the ground making the change that we all are hoping to see. and some of their insights about that work. We have 2 folks who are going to form a panel. They'll talk a little bit to each other, and then we have a discussion. I'm. Going to introduce the 2 panelists first, and then they each have a chance to put some of their experience and reflections on the table. Andre de Leon is the an education programs, professional in the office of standards and instructional support, and the Nevada Department of Education. I want to highlight. He's a member of the Council of State Science Supervisors, and has been for quite a while leading science in the State. Michelle Snyder is the State STEM integration specialists in the division of elementary and secondary education at the Arizona Department of Education. She also is I'm not wait, not Arizona Arkansas. Arkansas. Okay, Michelle Arkans Law Department of Education. She is a member of the Council of State Slides as well, and has been engaged in this work for a long time. So Andrea and Michelle I'm going to turn it over to you to put some things on the table. and I think you were each given maybe 5 min to say a little bit about yourself and the work that you've been doing related to equity and inclusion so Andre. Why, don't I start with you, and then i'll go to Michelle, and then we'll have a little back and forth.

André DeLeón, NV (he, him, él): Thank you. He and thank you, everybody. And hi, Michelle, I didn't even get a chance to say hi to my partner in crime here this morning. So, as I, you said, I am the the science person for the State of Nevada, as well as instructional materials. And so that's kind of given me a couple of lenses in which to look at the work in which we are undertaking and talking about this morning. So so just to give you a background. So we're doing this work as an organization or working to do this work in this organization we're currently working with. Yeah. A national Equity project in order to kind of do when a we. We kind of realize that you have to. You know you have to walk it before you talk it. And so we're working as an organization to be that equity and justice organization, so that when we g0 0ut to and work with school districts you know it's it doesn't become one of those finger pointing things where it's like. We talked about doing equity in the district, and say, Well, how are you doing it as an organization? And then we kind of have to fast up and say, Well. we're not. And so that's the work that we are doing. Now, again in in the department with an eye toward. You know it's unfortunately. You can't stop the process and fix yourself first before you do the work. So you kind of have to do them both at the same time. And this is what we're attempting to do. And so I I I want to talk to you is like how we growing as an organization, and how, unfortunately, we still d0 0ur content areas in the science. because people don't realize how science, how great sciences is yet. And so they're not seeking to umbrella that over all their content areas, though they share. But in the in the meantime, as an organization, one of the things that we had to do is know the history. the system, and how we got to a point where it the system systematically oppressed certain people, and then systematically help out others. And so, in order to do that, we had to understand how we got there. And s0 0ne thing that always stands out to me is a quote by Thomas Jefferson. and you can google it to get the exact quote, because i'm gonna paraphrase it because I don't like. But basically he talked about education as a process to

separating the week from the chaff. And that was. you know it it. That's very telling, because in today's you know, in today's educational system, we haven't truly moved away from that. And so we, as an organization, individuals in it, have you understand that that was the starting point to what we call our educational system, and once we come to understand that. then we could seek to do the work that we see to do in regards to being education for all. And I just I just want to throw out 1 0ne quick thing. And so what we are doing is. yeah we we're, we're we're using. We're in the we're. In the second phase of our work with the equity project. Where in doing that internal work and kind of finding ourselves in the process, and kind of owning where we are in that process. So you know, you always hear about the people moving in this work at their own pace, right? And we understand that here. But we also understand that as we don't do that work. That's another cohort of children that we're not under that we're under serving. So we've had 4 0ffices. Ha! That are working the model that work and working with National Equity Project, so that those 4 0ffices can kind of be the the model for the other offices to them. Do that work. I always look at it. I I look at this as kind of like being in a a little a baseball coach when you're coaching Lily baseball team. Everybody plays at least 3 innings right. Nobody sits on the sidelines and watches the better players to at least in good little League Baseball League. And the idea is that when you're watching these exemplar offices do this work. You know that you're gonna have to step up and do your 3 innings, too, so i'll stop there.

Heidi Schweingruber: Thank you so much great ideas on the table. Michelle, I'm going to go to you, and just to give you guys a heads up. I know you each have 5 min, Michelle. How 5 min. Then i'm going to ask you if you want to comment on anything your colleague said so as you're listening to each other, and then we'll go to Tiffany for some reflection and then discussion. So, Michelle.

Michele Snyder: I currently serve as a state and integration specialist. But for the past 11 years I was just like Andre really trying to drive the science standard implementation here in the State of Arkansas. And so that team has grown. So it's that's a wonderful sign by my leadership that science continues to build from the State level across our State. We luckily have a collection of education Service cooperatives here in Arkansas that are really our boots on the ground for science. In each of those cooperatives you don't have one or 2 science specialists. In addition to map in the middle. And so they have really been our connections with schools and districts and district leadership around equitable access for all of our students. Arkansas is a really unique state. We have 5 unique geologic regions, and along with that are 5 multi diverse cultural pockets of our education system here in Arkansas, so trying to navigate all of those many systems underneath. Our State leadership has definitely been a challenge, and currently we are challenged now under a new State leadership. We are struggling with some of the things that are being brought to the table by our legislative towards, and there are a lot of educators who are stressing their concerns about where our system in the State of Arkansas this is not unlike any Southern State. So that is really what's in my realm. I do want to second on what some of our early or speakers I mentioned, which was incremental changes. I think we've made it bitty little incremental changes toward implementing the science standards and 3 dimensional teaching and learning here in Arkansas. But we still have a long way to go, and one of the things that Dr. Marshall mentioned is our teachers. Again, we have 5 culturally diverse large regions here in Arkansas we don't have enough teachers. We don't have really dedicated STEM teachers and so trying to impact instruction in a STEM integration strategy. Because we know if we don't, integrate in our schools. science and engineering, and all of these other components that research says really improves reading and math skills. And so that's really been our big push here is to really try to infiltrate those math and Ela systems to get science taught in schools, and again to inspire our students and our teachers with STEM identity and and interest. And so I want to thank a lot of the partners that have been provided to us through the Council and State Science Supervisors access a big shout out to my team there. Heidi, you guys have

done some great work with all of your reports. We rely on those reports to really educate our leaders who spend most of their time in that in the La. So that's really been the start. The space that we have sort of tedged over the past 10 years, and we're looking at potentially having to revise our science standards coming up, and we don't know where that will be. So encourage that we're starting this conversation this spring talking about equity inclusion, because if we don't check that box. we may lose these valuable practices and cross-cutting concepts in those dimensions that I think we, we can make them more community based and focused. So that's really been my whole thing with this, and i'm looking forward to bringing on some more conversations with all of you today.

Heidi Schweingruber: That's great, Andre. Did you want to add anything to what Michelle said? Or do you want to build on?

André DeLeón, NV (he, him, él): Yeah, actually, One thing I want to tag off of is it Michelle talked about getting this out into the community right? Because one of the things you know I I think I can speak for a lot of the people I can see on the this Hollywood Square screen is that we don't have that that access t0 0ur school community like we would like to. I would love to be able to walk through schools 4 0r 5 days a week, and and see what's going on in science education. But I don't have that luxury because they they stick me in an office like this and say they get, you know, get your stuff done in front of a computer screen, and Michelle kind of brought up the fact that it it we have to be out there the things that she's doing and working with our community community upfront. And and, as I think about it. the the access we do have is in structural materials. That's where. Because when you talk to educators about science, education, they identify that by the instruction material. And s0 0ne of the things that we have to do is make our instruction materials more reflective of the the equitable side science that we want to teach. And so in that vein one of the lenses we. We added a a second category t0 0ur room, because, you know, before it was all about alignment, the standards, and then you guys work out the rest. And we've added a social justice category t0 0ur instruction materials so that we could actually. you know it. It's one thing to talk about equity and justice. But it's another thing to show people how you would teach equity and justice as it pertains to science. Education.

Heidi Schweingruber: Thank you, Michelle. I'll give you a chance to add some more, and then we'll go to Tiffany.

Michele Snyder: Yeah, i'm gonna second the instructional materials piece it's no secret to this group that we need to see more instructional materials, because that really is our our our strategy, our our sort of our navigating tool. But i'd like to also comment that Andre's leadership is focused on equity and inclusion, and they're committed to adding these elements to standards, and that is by no means what will happen here. So that's a problem we face every day.

Heidi Schweingruber: Thank you for sharing that. I think that's one of the really complicated things about our current moment is how much it varies by state and community how much it's embraced. Thank you for that. I'm gonna let Tiffany. So we framed as a discussant, but in some ways is also a panelist. Tiffany meal. Tiffany is the former deputy superintendent of curriculum and instruction at the Hope for Oklahoma State Department of Education She is now at the University of Washington working in the access. Grant I want to point out. She's also a long term member of the Council of State, signed Supervisors for people who've seen access typed, or heard people say access that is, advancing, coherent and equitable systems of science education. It's a project of Csq done some other organizations. So, Tiffany, I'm going to give you a chance to do some reflections. We are going to take questions. I know we have some in slide. Oh, I have one myself that I might t up. But, Tiffany, I'm going to give you a chance.

Tiffany Neill: Thank you so much, Heidi, and I really appreciate being a part of the conversations Today I have to admit my brain is switching just a little bit from just leaving the State Agency last week to a a university setting this week. But as I've listened to my colleagues, Michelle and Andre, and of course, the panelists this morning there were a lot of things that I began to reflect upon. First. It is true, we have learned so much regarding science, teaching, and learning over the last 10 0r so years since the publication of the framework for K. Through 12 science education. and I I think i'm particularly grateful for the way in which, in many ways we have been learning, and that is through many of the research and practice partnerships that are evident by our our panelists this morning, and working closely together to understand what? What is working well and what limitations still exist. I'm. Also reflecting today on the conversations based in my practitioner experience, but also listening t0 0ther practitioners for many years in in my own State and Oklahoma, but across the nation, as they have been being asked to implement what for many of them have been cyclic shifts in their instruction all the while knowing that they are limited in the professional learning support they've had in well aligned or even closely aligned, instructional materials, and honestly even the resource and leadership support in their own districts to do so. So that's certainly something that's weighing on my mind this morning. I also want to point out. We've been talking a lot about the standards this morning, as it relates to the work we can do for more equitable and just science, education. and standards are certainly a pivotal piece. In the larger system, however, as many of our panelists and my colleagues have mentioned today, they are but one piece and the other areas that we really it. It would be a missed opportunity to to be intentional about attending to in this work of equity and justice are related to curricular materials, professional learning, assessments, pre-surface, preparation and all of the other components that we know make up that system for far too many of our practitioners. They are still at the very beginning of this work of implementation, of the vision of the framework, or at the very beginning of work and examining their own biases and and what needs to happen in their classroom for more just and equitable science education. I had a chance to speak to a group of third grade elementary teachers a few weeks ago, and as much work as I think we've done in our state to introduce teachers to standards and standards. Implementation I was. I was quickly grounded in the fact that all of them all 5 0f them. We're not even aware there were science standards. and that was eye opening for me, but also very relevant, I think, t0 0ur conversations today. Additionally, I spoke to a few middle school and high school teachers that were recently certified through emergency pathways. Again, standards were a foreign concept to them. What they were more focused on were curricular materials, professional learning opportunities and the ways they could connect the science learning in their classrooms in ways that were relevant to their students. So those were really the doorways that I think we still have a lot of opportunity to influence just a couple of last reflections here. When we think about standards and what it takes to revise standards. I just want to, maybe introduce to people who have not been a part of that work at a State level. Many States review a revised standards every 6, sometimes 12 years in some of our States, and while I am a dreamer, i'm a grounded dreamer. I recognize that the effort that happened several years ago with the next generation. Science standards. We may not be in a climate today where very many States could take up a new set of national standards, or be influenced by those standards. But what we all had the ability to do at the State level is to have research and practice recommendations, influence any shifts that we might have in our in our cyclical revision process. So I think there's real opportunity to influence at a state level. Some of the standards efforts we've been talking about today in particular, my own state. The last Standards Review we did We had practitioners and researchers say, let's make sure those clarification statements are reflective of phenomena that are locally relevant rather than perhaps relevant t0 0ther states. We all recognize. There are still so many limitations with state assessments, and again with our our instructional materials not being well aligned. So I guess, for offering up for what we could do next. I think we must continue to learn and and listening t0

0ur researchers today is certainly helping me think about that in different ways. But there are so many spaces where groups like this could provide recommendations. 4 influences on local standards Review at a state level for high quality and structural material re works, evaluations as Andre mentioned for item, specifications for assessments of the State level for curricular frameworks. But it has to be done through intentionality with research and practice partnerships in my mind. And lastly. we've talked a lot about science and engineering practices and disciplinary core ideas today. But gosh cross-cutting concepts to me are the space where we can really attend to a lot of the work that we want to do with equity and justice. When we think about those relevant phenomena that address social injustices. We look at cross cutting concepts like cause and effect systems, stability and change, and there is so much opportunity to do the phenomenon investigations that we want to do related to those and I often forget, and I try to remind people cross-cutting concepts are the third dimension They are as important as the other 2 dimensions, and so I am hopeful we can do some work in that space. Thank you.

Heidi Schweingruber: Great. Thank you for those reflections. I know we have at least one question in Slide I'm going to take facilitator prerogative and based on some of the things we listen to this morning about moving forward questions. I'll start with answers from Andre and Michelle. But then, Tiffany, you can also chime in it's kind of a double question, but it's really trying to push on specifics of how you've been advancing the work around equity and justice on the ground in your States. and I wondered if you could identify the biggest leverage points you found like where you've seen the most success. I already heard instructional materials and some discussion of professional development, so you could add one to that, or you could describe what's needed in those for biggest leverage. And then I also wanted you to mention. I think Stephanie Marshall raised this. Who did you need in the room like Who are the critical people you need to have in the room to be advancing this work? Who can really get purchased in schools and districts and at the State level. So i'll start with Andre and Michelle. What if you can jump in and then give to to me a chance to reflect. You can take any piece of that, Andre.

André DeLeón, NV (he, him, él): Well, one thing at first I want to amplify something that the Tiffany said in regards to I I I wasn't going to talk about the cross cutting concepts, but you said everything a lot better than I had it written in my notes, Tiffany, that i'll just say plus one plus one plus one plus one to that. And the other thing, too, is that we have to wrap ourselves, wrap our heads around the reality that we really we're living in a reality that we have people literally walking in off the streets to teach science. And so we have to. We have to work to support that reality of that. And then the third thing you know, and that kind of I I hope I address your question, Heidi. I want to talk further in regards to talking about how we added social justice t0 0ur criteria category t0 0ur root break in regards to revealing instructional materials, and this was something that we went around and around on it. We we landed on 5 criteria within our social justice criteria where we look at accessibility, where we look at, does an instruction material provide multiple opportunities for students to access the material that it seeks to teach, and then the next criteria is connections where the material has to make 3, and and we start off with 3, because maybe it's a School House rock thing, but they have to make at least 3 real life connections that address the culture of the students in which they're teaching and then tagging on to that is being culturally centered where it provides a diversity of language, culture, traditions, beliefs. values, customs, artifacts, etc., that are included with any instruction, and sales that reflect the students background, and then the pen ultimate equity Where there is it it? A lot of instruction. Materials are teacher, focus where they drive it, and the equity in this process needs to be that there has to be opportunities for it to be student driven, and it has to be specific in addressing students who come from historically underserved backgrounds and say: and so I can create a a a culture culture, free, stereotype, free all those things that serve as barriers for students to access the material. and then the last criteria in that is to voice where

students have an opportunity to put their voice in the instruction material and share their ideas and learning experiences with this, their their teachers and students that are in that classroom.

Heidi Schweingruber: That's great. Thank you, Michelle. Do you have anything related to that or or other aspects of my question?

Michele Snyder: Yeah. So i'm going to highlight the what Tiffany off, Dr. Neil said. That standards are just a small piece, and standards can be developed and written in a very authentic and inclusive process. But I have seen that the that process oftentimes it's negated because legislators and other who really should be in the room to answer your question, and school administrators and school superintendents are not in the room, and so they simply go along with what is being told to them, and said to them, and quite frankly, there are inaccuracies to answer Danny Edelson's question. We've been asked to script the words equity and inclusion from our standards. And so that's a that's a major Ask. and that is not an ask by teachers or the majority of our educators, and I agree. Our students, and especially our parents, need to be in the room they want. They know what they value. They know what they need. If they don't. I am very eager to inform those parents in those those students what they need to know and be able to do to persevere in the climates that we are in in the workforce, and you know, in the workforce here in Arkansas we have left so many workers behind. because we have not included our Delta students, and our black and brown teachers are not coming int0 0ur profession. And so it really is speaking to that upper level, and we just can't break that ceiling of what's being dictated, and what's being put out as far as instructional standards Go

Heidi Schweingruber: right, Thank you. Tiffany, I'll let you add. And then we're going to go to questions inside. Oh.

Tiffany Neill: yeah, I think Heidi, to your question. I think I would. I would respond with the Montreal I've tried to abide by in this many years of State Government work is that it really is about the people there are policies. There are programmatic efforts that myself and I know many of my colleagues are very proud that we've been a part of in our States, but Really, I think the space where all of us on the call can be thinking about ways to impact continuous improvement. It's through the people in our States and through the professional learning experiences. So whether it's State Science supervisors, whether we. you know, have opportunities for many of the researchers to continue to share their research with us and help us push on our own beliefs and understandings, that level of work of working alongside people who are in those roles. It it has just a tremendous impact on the way that they operate in their role. Stay today, whether it's some of the work we've done like in access, where we provide real structure tools for leaders to think about how they put together committees. and ensure that traditionally marginalized voices are not only present, but elevated. or whether it's through professional learning experiences that we do with educators in our State, who then end up on the Standards committees who then end up on the instructional material adoption committees who end up on the Assessment Development Committees. It's really that work that I think over the last 10 years or so I I believe, has made the biggest impact. It is those learning opportunities with professionals in the field, education leaders and and educators in the classroom, and I've always been extremely grateful for the National Academies. A consensus report that compiles that research together, so that we can think about it so that we can use it. But I also believe that there are many. many of our young researchers voices who have yet to be heard, and i'm hopeful that that will be a space in the future, where many of us in the field can gather those resources, have professional learning experiences, and also provide them for educators in the field who are serving in many of these leadership roles.

Heidi Schweingruber: Fantastic. Thank you, Amy. Let's go to a side of question. I'm. I'm. Taking license and moving the start of the breakout group so that we can get t0 0ur slide. Oh, questions.

Amy Stephens: How often are your elementary school teachers allowed to teach science per week? And how long are the periods? How often are they able to integrate engineering practices.

Michele Snyder: Okay, i'll take that one. So in K 2 most of the time. Not at all. There are a a collection of innovative schools in the State of Arkansas, who I and a core team are supporting to implement STEM integration and a STEM focus in their classrooms in their schools, and also to incorporate those communities. And so in those schools we have. seeing that there is engineering in kindergarten, and those kids are walking through the hall, and they're chanting the engineering design cycle, and they understand what STEM is. But there are not enough schools who are going for this who are focusing on STEM, and because, quite frankly. They're overwhelmed with so much else, you know, when you think about the the one day that a student is tested, and that day ends up being a. D. Or an f grade for a school, it's devastating for that community and for those students and those teachers. And so there's got to be a systems change about state assessment systems and school assessment systems that incorporate those engineering design and those those high quality tech integration pieces, and that you're using science in the context to learn how to read and to learn how to count. But it is by far, not enough here. In the state of Arkansas we've got some great innovators, and you can see in their test scores that they that is effective. But then there are other schools who are really really struggling to do this STEM integration work, and they still have high poverty students. I bilingual students, and so to struggle to get the beyond those F. And the ratings really takes over all the other processes that are going on in the school.

Heidi Schweingruber: Thank you, Andre. Did you have anything to add

André DeLeón, NV (he, him, él): nothing that I just echo and amplify it. When I think about teaching of science, especially in the first, second, third, fourth, and fifth grade, it's almost kind of like an underground movement. The the the teachers that do it do it very well, but they also do it in spite of the conditions in which they are. They they have to deal with. Which Michelle addressed. Very well.

Amy Stephens: curious about what institutions organizations groups can do to support you in your respective States to justify why justice needs to be front and center, and science as a whole. Can colleges of education play any role in supporting you?

André DeLeón, NV (he, him, él): Yes. yes, and yes, one of the things that is not put out there. Enough is the I. I call it the endgame like what it. Why are we doing this? And the the payoff is, you know, post, you know, Post Secondary LED, which that often comes in the form of for law students higher education. And if you are doing this, you know it's kind of like the way we used to do science right? But K. 12 was separate from Higher LED Science, and the 2 never met, and we were able to bridge that. But we have to show that when a student walks out of. Yeah. You know their K. 12 situation moves on to their life. After that, all these things that they learned about equity and justice in their content areas and including science, are going to be important and applicable to their life after. So I I think 2 things, you know, get out there and say we want our science because one of the things is that science is the perfect application for the proficiency that Ela and Mathematic see to have. That's the proving ground right, and we need that message to get out there. And then we also need to get the message that equity and and and social justice and science. Education is something that will, it is, will be important not only in higher LED, but also the different walks of life that our students will undertake after they leave high school.

Heidi Schweingruber: Thank you so much. Michelle or Tiffany.

Tiffany Neill: How do you? I was just gonna add on to a couple of things, Andre said one. I would just ask our our researchers, and I know. Henry asked this question, and we've worked together on some of this before, but a lot of times. The research that is so valuable for us is a hard to pay. Well that we can't access. and the other thing I would say is that the language, the research language is often a barrier for many of our practitioners, and even for us in State government. I jokingly say this, and and Bill, being on the line, will know this, and Sam shot as well in our very first coi meetings for access, or the first few Sam and I, who was at the State Department of Education in in South Dakota. We would have a back channel chat because we were trying to figure out what some of the words meant that our colleagues were saying on the call, and we were supporting each other with sort of other papers. We could read to help us understand. And I would just say that the research is so great. Dr. Marshall, I've used some of your your, your research recently with principals, and it's very digestible and easy to understand. I would just say things like practitioner briefs are very important, and ways to really get us that data that, and that research not behind a paywall would be extremely helpful.

Michele Snyder: Thank you, Tiffany, for calling that out, Michelle. Did you want to add school leaders and administrators. It's a hard group to get in the room. They are distracted, and there's other big, but you know problems and things and challenges that they're trying to solve. But I would second that the tools for communicating with leaders helping them understand what integration is, and what it looks like to, and and how a rewarding it can be for everyone to to be engaged in that type of teaching and learning. So I would second the need for more tools and professional learning, and you know I always think of my Brett molding. He says you don't have professional development without professional learning, and if you're not going in the classroom, and really tackling all of those strategies and all of the best practices. It just isn't going to be as effective as the research is telling it is

Heidi Schweingruber: awesome. Thank you. So i'm going to pivot us to the small groups. These are opportunities. One of the presenters will be in each of the rooms we've kind of, I mean. I've done a little back channeling on the fly to do a little regrouping, because we didn't have quite as many people, as we thought. I think that might be the day after a 3 day weekend, and Marty Gras getting on our way. But so what we want to do is create an opportunity for you guys to really talk to each other and dig in. As I noted. these discussions will not be recorded. We want it, or want this to be a safe space where you're sharing. We want you to start with introduction, so maybe 10 min to go around and introduce each other. So you know who's in the conversation? We're doing random assignment. Many of you may already know each other, but there's new people in the mix. And then we're making sure we're distributing the panelists and presenters and discussions. The panelists and presenters will be the facilitators of the group, and they are going to do report out at the end. So we'll record that report out. But it'll just be the panelists who've already been public. But we also gonna ask you if you want to. When you're done, you can share ideas in the chat that you heard from your discussions. When we come back out i'll repeat these instructions. What we're going to ask you to talk about in the small group given what you've heard, what you've learned, and also your own experiences. What do you think are some of the things you could? We could move forward in the near term for achieving, to moving toward equity and justice in the context of science, education. And then what about that forward looking sort of longer term? Maybe bigger lifts are things that we would also want to be looking toward or starting to work on now. So what are our maybe quick when short-term things the incremental piece we were talking about and then, what's the more visionary long-term piece. All right, Amy. I'm going to take turn it over to you to add whatever I missed in those instructions, and then to put people in their groups, and the groups will go till 1

45 Eastern time. So that's quarter of the next hour wherever. You are. So that's going to be about 35 min. Amy.

Amy Stephens: so i'm about to throw you into rooms gently. I will give you a 5 min warning before we regroup, so you won't get whiplash. and I will see you all back soon.

Heidi Schweingruber: Thank you so much for your engagement and good conversation. And hopefully, maybe people met at least one new person. Maybe maybe we're not at that point with this community, but we're trying to expand. Who's in our who's in our conversations? So we had lined up the facilities in the groups. Now we ended up re-jiggering the group so there may be people that it may have been a little jostling for position, and that for that facilitator role in some rooms. But hopefully you guys figured it out. And so we set this up for those facilitators to report out. But at the same time we would love to have people if you, as an individual. Have some things that you observed, or thoughts that you'd like to share reflections in general. Please feel free to put them in the chat as we're doing all of these reflections. So I'm going to go to what was called Room 2. The potential facilitators in that room were Andre, Alberto and Tiffany. I'm not sure how you decided he was going to be that the facilitator there I was saying. It might be Andre, but I don't know so i'll, I'll let you guys arm wrestle for who's going to report out from that room? Well, I find that very funny, because I started out saying I think I was assigned as a facilitator. But was anyone else in the group assigned that and everybody?

Tiffany Neill: They said. No. We figured that since Tiffany spoke up first for that that we would rebate silent and let it run by that. But leveraging as a community, the cross-cutting concepts more creating more guidance, resources, and professional learning, around those to really move towards equity and justice and science education and and leveraging those cross-cutting concepts we spent a fair amount of time focusing on elementary again, and really thinking about incremental changes, maybe even around the way we talk about elementary and connections t0 0ther dishes, disciplines rather than the integration just really helping folks think about how natural they are t0 0ne another, and the skills and the the content with a long term goal of just one day, seeing elementary for this natural connection to be just a part of the fabric of elementary instruction. we talked about continuing the need incrementally to continue to provide resources that push boundaries for teachers put those in teachers hands. We also spent a little bit of time just talking about equity and social justice, and how in groups that we're in, that it had that those terms, the ideas, what people may be thinking about with equity and social justice and science, education may not be coherent. and how there should be some inattentional efforts to help groups come together and have discussions to create or craft coherence. If we are to do this work together and move forward. We also talked about the need for tangible examples for practitioners, as was shared by many of the researchers this morning and pointing out from our wonderful classroom teacher the need to to develop those in conversation with teachers. we did admit that it's hard to think about incremental progress towards justice, and we recognize the geographic challenges that exist right now. but also recognizing the need to not leave out certain geographies because of political climate, because good work could continue to be done, and they just look different. One of the other powerful things that this group pointed out was perhaps the need to stop writing for each other, and what was discussed about that was really thinking about the work that could be done. Educative work in our communities to help community members and families become the advocates that we so desperately need for science, education. Right now. another long term change really start talking about science a little differently science, education from teaching science to allow students to discover science and bring in their broad and vast experiences into that learning. And then, lastly, incremental and long term the need to not only think about efforts for our under Serge, but also, perhaps, are really underserved, particularly our migrant student populations, and in many ways. Our conversations related to special education services have not come up today as well.

Heidi Schweingruber: What a rich conversation that's fantastic! Thank you, Tiffany. Anyone from that group want to add anything, do I strongly suspect? No, but let me just give a chance.

André DeLeón, NV (he, him, él): No, I think Tiffany did a great job. I mean, I think what we all landed on is that equity and learning. Language transcends content, and we we need to help our science. Educators make the transition from being science teachers to being those vehicles that address equity and language learning, using science as that lever.

Heidi Schweingruber: Yeah, Well, well, said i'm going to shift to room 3. I believe, Danny, you might have been on the hook as a facilitator on that one, unless you parlay that to someone else.

Daniel Morales-Doyle: No, that's me. I think I will do my best to summarize what was a really rich conversation. I I think that the overarching theme which Tiffany hit on a little bit. and did a much better job. I think, summarize that. I'm going to be able to. What is the polarization, and just how different doing this work is in different places right now. and strategies for dealing with that that are effective and yet not compromising too much of what we mean. This idea of how do we avoid getting kicked out of rooms and removed from conversations while not compromising our principles in politically hostile climates, basically was was one of the big themes. and now we can work across. I together, I think, a little bit across places where we don't have those kinds of challenges, and in those where we do. There was a a strong thread around all of the pressures and attacks that teachers are under Where there's lots of places where teachers are literally afraid of not only having their license or revoked, but even being arrested. And so then we had conversations around different ways to create space for teachers from sort of high level policies and initiatives that can create space to grassroots at organizing that can kind of create solidarity that make teachers feel protected. And in community with each other. you know. So we talked then along those lines a lot about the incentive structures in the work of teaching and in in the field of education, in terms of what kinds of work teachers are invited into and encouraged to do, not only through words, but by opportunities to be involved in meaningful work and in to be incentivized to do the work that we've been talking about in our meeting today. We, you know. So some of the other things that are connected, that we talked about our subtle shifts from using words that become taboo and and forbidden, like equity to using words like community based or place based and situating work in hyperlocal ways that can sometimes avoid raising the record flags by connecting the work directly to the struggles that people on the ground in those communities are facing. Yeah, I there was other points, but I think that's the best at this moment that I can do, and maybe some others will will want to revise or fill in some of my gaps.

Heidi Schweingruber: That's awesome. That's awesome, and really resonates, I think, with some of what Tiffany, said i'll invite anyone in that group to add things that were raised. and that discussion that you wanted to add. All right. I'm going to move on to what was room for Henry. I think you were the facilitator in that room.

Enrique/Henry: Yeah, thank you. Well, first of all, I I I was really excited to hear all of it. The the different kinds of work that that folks brought to the table, you know, all the way from connecting with out of school. our curriculum to initiatives that fund as as we discussed there. it it just shows the the dimensions of the Comp. And the complexity of the question, and I think that again it just it was a. It was a really nice reminder that that there are synergies that exist, that we should all be working towards with that kind of a prioritizing working. Okay. I think that the the the conversation was primarily around the the the the the role of curricular materials and instructional materials, and their relationship to instructional strategies and professional learning, both in the midterm and the long term. You know, I think that the there was kind of a growing consensus that, having high quality, instructional materials is really kind of like the

backbone of how we're going to be able to do a lot of this work all the way from. you know, like reminding people that there are standards out there reminding folks that there are. you know, curricula other than have embedded, or or as high quality or or kind of like a on route to being becoming high quality. but also recognizing that while we may not be wanting to emphasize this sort of like an approach to fidelity of implementation, thinking a little bit more about the integrity, to the curriculum integrity to the standards that opens up possibilities for teachers and districts and school buildings to adapt these back phones or this particular material into their own context. So like not the tomorrow. From what Danny was just saying now about the the hyper locality of of the implementation of the adaptation. So you know, maintaining those opportunities for communication between curriculum developers, professional professional learning providers. these kind of like clearing houses that that check for quality as well as communities in the local communities is is important for deciding on the guiding principles. So this some Chris that was mentioned with the work that she's doing of how the district can create these guiding principles that can, then the then the the constraints, and there is assigned constraints, if you allow me, and within which the curriculum can be adapted and then implemented so that it's not adopted wholesale. It's not about a pacing guide. It's not about it becoming a schedule through which we can deprofessionalize teachers, but instead. not asking them to develop lessons from the ground up when they are already overworked and underpaid. So I, you know, I think that some questions kind of like remain, or you know I I I've pose a question in the, and I think that we were starting to wrestle with it. What does it mean when the the curriculum developers represent kind of like some kind of homogeneity, or represent sort of like a dominant group? So how do we make sure that when we're developing curriculum it's not like the Nrc. Framework that it ends up being Chapter 11, where equity is kind of like left for the end. But instead, you know, recognizing that it's just part and parcel of the work that we do, and everything in the classroom. But I think again like we. We all came up with some interesting strategy, both long term and short term. that we can address some of these questions. So a pretty, insightful conversation, and I was sad that it didn't go for another couple of hours.

Heidi Schweingruber: No, that we would have gotten tired after another couple of hours. But I agree with you, and that's part of what we want to carry from these conversations to that June meeting when we will hopefully have a blend of looks online and in person, and can dig in. So this is, I hope, just the start of leaving this into all of our discussions about moving forward room. 5 was Michelle, I believe, the facilitator for that one.

Michele Snyder: Yeah. So we we talked about instructional materials. and the representatives in the room spoke about like States. They're crafting language to meet the needs, and you need specificity of what language can be used and cannot be used in districts across the country. I appreciated that we talked about how these curriculum developers have a privilege and responsibility to get it into the classroom and to get it down to that bottom level and really spread what is out there, and how to use it, and through professional learning. But that's the same. And to really bring it up into the critical mass. I I appreciated Nsta and Lawrence all of science talking about how they're trying to scale this up and watching the chat. I appreciate the work that's being done to the infiltrate high school as a high school science teacher, I I completely agree, Steven and and all of you saying that it is a different beast in high school, but it needs to have some change as well. We talked about the fact that districts do ask for research. and but I appreciated Bill saying that it may not be the research and the language of our researchers, but the responses I mean the relationships that they have built, and I appreciate that because I leverage the relationships that access has helped me build as a State leader over time, and likewise other entities. So I greatly appreciated that. And so then we've really went back, and Danny lost kind of spoke about this. There's no teachers. So without teachers we are going to really see this play out in the next. Here, I mean, it is a critical problem, and without teachers who have, I mean here in Arkansas the majority of science. Teachers are.

They come in? They're not trained in a university setting. They're a second career. They go through a couple of weekends of pedagogy and safety training, and they have no idea about standards and pedagogy and all of the great research space things that are out there. And so that is a big big problem that hopefully people on this call and others can help us solved. But in talking about what we're going well, I appreciated that we could leverage some of this zoom and virtual hybrid communications that we do, and to try to get into those districts in the communities that have no teachers. and perhaps bring that that experience t0 0ur students and our parents. If we don't educate our parents on the value of science and STEM, you know, I I I think we're leaving a big component out of of who we can utilize to to grow this over time. And we do need data. I I would love to have some snapshots of what's working. Well, look at this school with project based learning that has effectively sustained professional learning for teachers, and and what that cross-curricular. you know, structure can really do for for learning for kids. So we still need that.

Heidi Schweingruber: a chance to see if anyone had anything else they wanted to put on the table from that group, so i'll open that upfrom a sales group, and anyone from Henry's group or the things you really had hoped would get put on the table from that discussion. That didn't make it. and I know some people are using chat to good effect to do that. But does anyone want to voice them All right? And then to move to what was Room 7? That was Tia and Stephanie and I don't know what you guys did about. I'm wrestling for facilitations. I don't know who's gonna report out there.

Tia C. Madkins (she/hers) UT Austin: Thankfully, Stephanie was very kind to mostly facilitate the our our small group time, because I was eating my lunch so wasn't talking as much. But I took a lot of notes for us. I'll share out. We had some great conversations, one just thinking about power structures and thinking about how those influence change. And we thought about short term long term, but also really quick. like we've seen a lot of the anti fill in the blank legislation that's been happening across the Us. That's been happening very quickly, and so we need to have. We are thinking about quick responses as well. Helen brought up a good point around. Why, we're seeing all of the backlash like. Why are people responding in certain ways? And we were starting to have a conversation around, whether or not that's related to like, who's in charge? Who's who's kind of dominating this, the the conversation, or whether or not things are working, and people are unhappy about that or something different. We also talked about in relationship to those power structures and all of that legislation around teachers. And how scared they are, particularly pre-service teachers! Right Those were just getting ready to g0 0ut into the field. and being just very concerned about what can happen to folks. We also had conversations around valuing voices and building from those voices in order to amplify them in their perspective, and thinking about co-design and co-creating things, and that led us to returning to the question from earlier around. Community versus standards we landed on. We can't really, I think, definitely use a a beautiful phrase. We really can't just entangle them. We need to be doing both right. So if we had to choose one, we could. But actually they work in in concert. And then we talked a lot about. I think the majority of our conversation was around accessibility to research, right for really people taking up best practices and thinking about what's actually out there, and the applications for future research, policy and practice. And so we spent some time talking about repositories, and just the need for more open access to materials. Things that are very pify, things that are very tangible for both practitioners policymakers, but also for researchers. We can't just keep talking to each other physicists. And so we were thinking about what that might look like I shared with our group that you T. The library system does a really good job of sharing our preference to make them open access for people. So anyone who has who can go t0 0ur library's public site could actually download our work. And so that's one way to work around the paywall right if that's allowed by the journal that you're publishing, and that every journal allows that. So just thinking about more ways to get the

work out there and not using all the jargon, so that people are actually starting to take up these ideas. I will stop there and let anyone else to

Heidi Schweingruber: anyone from that group. What amazing conversations! There's a lot of action in the chat. I wanted to give folks any opportunities if they want to elevate something they're seeing there, or add on doesn't. Have to be something you discussed in your small groups. But is there something you'd like to raise as we take the conversations here, and move forward. as Amy and I and our Board on Science Education are thinking about what we're going to do, and particularly in the June, meeting the next 2 meetings, but also building on this things that you'd like to elevate and leave us with. And then there are still a couple of questions in slide that i'm gonna leverage. But I just wanted to hear of people wanted to share anything or anything.

Danny Edelson (he) BSCS: A couple of things that came out in our breakout group that i'm not sure where it's. Prominent in the report back was both Tiffany and Ellen Ebert from their roles in the States. talked about how powerful the standards were. The the and and the framework were in in a new initiating might be an overstating it. But moving forward, these conversations about equity, inclusion at the time that the framework and standards were were released at it. It's easy to. but this is me editorializing now on what they said it. It's easy for us t0 0verlook, or the significant impact that they had, particularly in in the current times when we're seeing more and more political headwinds that that make it difficult to to act on equity and in inclusion, but that there, there's something to to me. There's something to be said there for the potential of standards and the role that standards have played in building forward motion here, and I I i'm an advocate for the fact that standards should be subject to research at all times and rather than just. And and the next version of standards ought to always be in our minds, even if it's a 15 0r 20 year timeline between the time that one standard document is written in and in the next, and I think there's an opportunity here to say Yes, it it could be influential. And as as we heard today also, they can have problematic language in them that holds them back. But If we are deliberately working on those things on an ongoing basis we can have. we can do research on what different ways of writing things would be, or how things could be changed in future additions, and and what impact that might have on po policy conversations if we treat revision of standards as a research based process rather than a last minute policy process.

Heidi Schweingruber: Thank you, Danny and I. I wanted to. That connects, I think, to a question that was in slide. And then i'm gonna go to Ted and Matt about. Is it feasible to do a set of reviews of the standards and framework from different critical perspectives. I actually think that goes hand in hand with some of the conversations earlier today, but also some of what Danny is suggesting. There is a way to move forward in a learning way. so that we're not thinking of this as a static document. And then you just have a a community collaborative conversation to create new standards. But we're gathering all kinds of evidence that could inform. And I still also believe we're expanding the community who's going to then be involved in a next generation. I felt like that message this morning was super Important is bringing more people to the conversation to that are representative of grassroots. I think I'm going to go to Ted, and then Matt and others are absolutely welcome to make some comments.

Ted Willard: Yes, I'm. What I wanted to emphasize and build off of, and some of the things that I've heard here is we've talked a little bit in some cases, I think this aspect of there are these standards. And then there's also this sort of community, and I want to really sort of emphasize the aspect of that. The standards are a product of a community.the and that in some ways this aspect that we've had standards adopted, you know, developed, and then adopted a, and there, in either fully adopted or adopted in partial ways across the country, has really couldn't place this aspect of having a national community. A national conversation about what we, as this broad community want. Now the standards aren't perfect, the process that developed them

wasn't perfect. Nothing is perfect there, and always sort of ways to improve it. But I think a lot of people on this call are aware of how many people were involved in that process. and in making the standards come into play and and developed, and I think the key aspect as we move forward. And i'd like with Danny, and said about a process of of of improving standards evolving standards. The you know research base, but it's also a community based aspect to it. And how do we make that community as inclusive as possible? How do we create stronger bonds? There's a lot of people who felt like the standard just came to them when there were plenty of opportunities to be involved in the development standards, but they, for various reasons, either weren't aware of it or didn't appreciate the importance of getting involved in the in those situations. And how do we make them more part of the conversation? Moving forward.

Heidi Schweingruber: Matt put his hand down. Or did you know you're going next? Put your end down all right. I'm going to go to Henry.

Enrique/Henry: Thanks, Heidi, and i'll lower my hand here. Yeah, I think that it's so. We find ourselves, I think, in an interesting contradiction where we both like, recognize, and the Sanders have a lot of power in terms of shaping what happens in classroom development and professional learning, and all that kind of stuff. And at the same time I yeah, I don't know. I guess I like I mentioned. You know, kind of like, jokingly. It's like they're in my mind. It's it's. I I understand all the effort that went into and putting the the entrepreneur together, and the end Tss: so like. I don't, wanna you know I don't want to but mouse the folks who are kind of like involved in that. But but again, like. maybe if there. Some people have been in the room, maybe, like the Equity Chapter one have been Chapter 11, right like maybe the Ngss. Would have a little bit more explicit. you know, kind of like connection to equity, or than just sort of like leaving it in the Appendix and the dependencies on the end, You know. As as I mentioned, you know, at least in my field of of science education, the folks who were involved in in in crafts, the framework. We're the ones who we're reminding that they're telling us we're trying to convince, as that you know, the list. Language of science is really the thing that you know by the what we should be doing. So I I I don't, I mean I I don't know I I tend to be on the Reverend, so I don't hold sacred housing that way. But you know I I again like. I just think that we should be pretty cool of Of what's there. Maybe there is an opportunity for a 2 point. All I don't know again, if sort of like we holding I I agree that it's a moment at least for me. I'm. I'm very risk averse. So I it feels very tenuous or or not that through the right timing to like, come up with you standards when there's legislation being asked about not teaching scientific theory. So there's a really like a deep political mistrust or or so, you know. I I I get the the hesitancy. But but I think that you know I don't. I don't think that the people who are in the room then maybe, are the people who are in the room now, and the decisions that were made back then I mean our understanding is a field. What equity was back then, you know, if you read a lot of the pieces that we're publishing jars. we're very sometimes deficit perspective, you know. I guess, in like, you know, that Kate the Ss. T. I mentioned in in her history and her overview. that these are kids who come with the efficiencies and apps that we need to address, and that's what kind of like God transmitted in the in the framework or in the in the Ngs, and to the standards, you know, and intentionally or unintentionally. So. Yeah, I I don't know it's a it again. It can be. We have to call those 2 things together. If they're gonna have power. Then we need to make sure how it is that we're going to be leverage that power to like open up, and probably open conversations that are not wanting to be had

Heidi Schweingruber: absolutely, and i'll just observe that those tensions that you named are exactly why we thought a series of conversations like this needed to be at least a first start really opening up, and I very much believe that when you know better, do better in a decade later, we know a lot more. So it's a time to to sit with that and think about ways forward mindful of. I mean, I will. From a personal perspective we hear a lot from a lot of researchers about. We

gotta just redo the whole thing, and I I almost never hear that from folks on the ground. I think, because of some of the sensitivities about the politics and the realities of what it takes to launch a whole new set of frameworks in a State standards and state. but I felt like today we were talking about a lot more sort of in between the middle space of where we can be pushing despite the flaws we know exist, and what came out a decade ago, so that that's why we wanted t0 0pen up these conversations, Henry. Exactly those tensions, and to give them light.

André DeLeón, NV (he, him, él): Yeah. Something that in the Vk reminds me of is that if we had that, if you know if if we do better in looking around the table and seeing who is not at the table. then maybe we're not playing leapfrog language Where? Oh, you know people are uncomfortable with equity. So now we'll call it culturally inclusive, or community, base or whatever, until they catch on to that, and that we have to keep moving. I I think, if we have a a a wider diversity at the table, a diversity of voice at the table, then we can very be very clear about the language. What we mean by the language we use as opposed to just changing it every time people get offended by it.

Heidi Schweingruber: I will Say, I've heard reflected that the community that was able to think together about the vision and the framework, and then how it was instantiated, and the Gss. And other State standards that just that ability to have a common conversation was a huge leap forward. And now I think we're at a moment where we're saying, okay, let's let's push some things into that conversation from some people who haven't been in the conversation in in more authentic ways. Tiffany.

Tiffany Neill: Yeah, I just Wanna follow up on this conversation about about standards a little bit, and I think I appreciate so much what Henry had to say. Sorry I have to plug in my computer. but I would also encourage I'm seeing a lot in the chat box, for example, Alberto, just recognizing that in your State. It appears that they are not even reaching out to you, or or having you a part of the processes for these decisions. as a a well known researcher in science education that makes it both angry and sad. But I I think I would encourage for our researchers on the call today. I think it could be beneficial to to really understand what the process at a State level in particular is like to adopt standards and the level of stakeholder engagement you have to have, and just how challenging it is to pass standards that have any semblance of what you want from the beginning as the leader of that process with the stakeholders you have involved, you know, in the writing process involved the level of conversations, negotiations, educative experiences, focus groups. I mean, it is all consuming for one t0 2 years at a state level. And I just I wonder if, just as I don't fully understand, maybe a researcher perspective all the time, and what steps you all have to take to let's say, get an article published, or get your work out there. I think it could be beneficial to better understand what and how challenging that standards adoption process is. And I will also say that we have recognized any of our State Government positions that we have not had the voices at the table that we should. But I also think it would be helpful in this advocacy work with our researchers for our researchers to to maybe understand that process. It's probably felt like a black hole for many folks, or or some sort of on tangible set of processes

Heidi Schweingruber: Any other folks. We have the schedule 2 3, but Amy and I don't feel like we have to push it. If there's not additional things to push in the conversation. We are going, as I said, to post this, and we're gonna figure out a way to provide some kind of transcript, or you know, written document that people can have access to and can use. I hope that you'll continue building if you made new relationships here on leveraging those to move equity and justice work forward. And then we're gonna have another conversation digging into learning and teaching. And then in June, hopefully, many can contribute. And then the June meeting is where we feel like maybe we'll be able to make some concrete next steps, and ideas about how do we move forward? In addition, I do. We have at least 2 people on this call on this committee. We are

doing a study on Equity and Pre. K. 12. Some education, which I hope will also support, provide some insights and guidance on moving. But I don't have more reflections to share. But I just want to thank everyone. So much for your camera and fantastic insights and the work you d0 0n the ground. I do want t0 0pen it. If there's anyone who has something they wanted to share. But Hasn't had an opportunity.

Ted Willard: I mean, could I make a tiny plug for any one here who is going to be at the Nsca Convention in Atlanta we will have a set as a a session. That will be a panel discussion about 10 years of the next generation. Science standards. and that'll be on Thursday afternoon if you're going to be there. We would love to have you in attendance.

Heidi Schweingruber: Thank you so much. If anyone has any concerns about portions of their comments or things that we're in chat being made public last. Know? Because we can certainly do editing ahead of time, like. If this conversation, for example, is something people end up feeling like I'm not sure. I'd like that posted we can. We can share that with this group and not post it publicly. The 2 panelists sessions we had told folks ahead of time. Those would be public, so let me know on the side. If there are any concerns. I know particularly state people and folks in political positions, as we know it's a tough time to be pushing this stuff forward. So thank you all so so much.