TAKING STOCK OF SCIENCE STANDARDS IMPLEMENTATION: A SUMMIT Curated Chat and Resources

DECEMBER 8, 2021

Below you will find the chat discussion for both days of the event. To the extent possible, some of the discussion has been grouped into themes to 'see' some of the discussions that individuals were having.

Additionally, although many of the resources have been pulled out and can be found at <u>this</u> <u>link</u>, some are hyperlinked in context. A special thank you is extended to Rachel Connolly for beginning the curation of resources on the fly.

Chat Discussion

Richard Lahti, Minnesota State Moorhead: Last time I was here (meeting 2) I think I asked about the AAAS Assessment Website. It was still down the last I checked. I have emailed AAAS with no response. Anyone know anything more?

Richard Lahti, Minnesota State Moorhead: Anyone know anything about AAAS Assessment website?

Ted Willard: @Richard I haven't heard anything else since our last meeting **Richard Lahti, Minnesota State Moorhead**: @Ted - Thanks.

Ted Willard: I know that work was being done to move the AAAS Assessment site to BSCS

Amy Stephens: For those who want to share resources today, we have a doc for you: <u>https://docs.google.com/document/d/1JKm2jhbE85Nb4QinfaoogdHEoCsZo9Ep55VdKWYTn</u> <u>Ds/edit?usp=sharing</u>

Heidi Schweingruber: The report Maya mentioned is the Guide to Implementing the NGSS. You can find it here:

https://www.nap.edu/catalog/18802/guide-to-implementing-the-next-generation-sciencestandards

Ted Willard: It takes two I's (Interest and Identity) to see in 3D Bill Penuel (he/him/his): Nice, Ted Trisha Herminghaus: @ Ted, ^^ Philip Bell - UW Seattle, he/him: +1 @Ted Lana LeBlanc: thanks Ted!

Ted Willard: Where will the meeting on April 26th be taking place? Amy Stephens: @Ted, we are looking at Irvine Ted Willard: Thanks

Amy Stephens: Chat question: What is something from the October sessions that still resonates with you?

Sam Shaw: The importance of establishing and returning to a vision for science education

Neil Lundgren: Elementary science implementation.

Colleen Epler-Ruths IU16: There is a lot of work to be done but we have made a lot of headway too.

Philip Bell - UW Seattle, he/him: That people's lives are at stake in terms of science being taught ,Äî Dr. Stefanie Marshall

Betsy Barent: Time in elementary-how can we get movement here?

Rebecca Abbott (she/her): Curriculum as catalyst

Lauren Slanker (MSI) (she/her): Many panelists spoke about the importance of including admin in the PL that their teachers are engaging with.

Jody Dogra: 5D instruction/learning

Amanda Oberski: Connecting classroom science to individual students and communities

Bill Penuel (he/him/his): Dr. Stefanie Marshall and I are still thinking (and writing a reflection paper) about the wish that we couldn't predict implementation by knowing a student's zip code

Lin Andrews: We have a lot of work to do.

Jamie Rumage (she/her): "Improvement moves at the speed of trust" ~Manelito Biag Meg Richard, KSDE: +1 Jamie

Emily Mathews: Levers to engage and consider when implementation

Leslie Stenger: Time!

Dua Chaker: Science education is like a garden

Angela Marie Lyle: The role of science leadership across various levels of the system **Noelle Collis**: Elementary implementation challenges

Amanda Oberski: Connecting classroom science to individual students and communities

2 - Sharon Cates-ID: Elementary challenges and needs.

Ellen Ebert: Improvement moves at the speed of trust!

Michael Cohen: The challenge of finding time for science instruction in elementary school

Suzy Loper: The huge factor of time pressure as a limit in implementing the vision **Jake Foster**: The challenge of moving beyond those already involved in this effort.

Kelly Carey: Lack of Earth and Space Science resources for HS

Julie Contino (she/her): +1 Kelly

Carol O'Donnell: We have accomplished a lot over the past several decades. We need to continue to celebrate what we have learned while recognizing there is more work to be done.

Trisha Herminghaus: ^^Carol O'Donnell

Ted Willard: How many things are the interconnected in making improvements **Elisa Slee**: "A child's zipcode should not affect access to science education" @DrStefLMarshall

Gregory Borman: Coherence

Wanda Bryant: Teachers as leaders, many people are doing the work

Tina M Larson: Each panelist was terrific! My biggest take-away is the need to increase Sci Leadership to promote NGSS in teacher prep and within communities!

Elizabeth A Davis: the need to attend to time AND quality

Susan Ramsey: Support to change practices

Carolyn Higgins: more time for science needed in Elementary school, and these

teachers need more PL to build their confidence

Trisha Herminghaus: Let's celebrate!

Kate McNeill: Edna Tan - "catalytic on-ramps of disruption".

Maya Garcia (she/her/ella): Absolutely @Kate!

Kevin Anderson:nThere are some quality examples of materials, but too few and too little support still... And some grade levels are still very sparse (like HS)

Richard Lahti, Minnesota State Moorhead: I don't understand why NGSS or NSTA or someone can't work with book company to make a GOOD, aligned curriculum. Too many teachers default to the textbook so if the books stink, the fight is lost.

Ted Willard: @Richard, as someone who has worked both at NSTA and as a curriculum developer, I will say that developing GOOD curriculum materials is not easy. It is also NOT a "Field of Dreams" situation that "If you build it, they will come." I chose the option "Tool" for the sligo poll, because educators still need to learn how to use the tools that are developed for them.

Richard Lahti, Minnesota State Moorhead: *@*Ted, but if no one builds it (i.e. none of the major publishers truly align their curriculum to phenomenon-based instruction that works with NGSS) then the standards themselves are meaningless - since too many teachers just use the text **Ted Willard**: *@*Richard I agree. And I'm trying :-)

Peter McLaren: Would love to see the study.

Kathy: Can we get a link to the study referenced?

Maya Garcia (she/her/ella): Link to JSTE Special Edition: https://www.tandfonline.com/toc/uste20/32/7 TJ McKenna (he/him): Study https://journals.sagepub.com/doi/full/10.1177/23328584211024261#.YMphQ3RAP3M.t witter Bill Penuel (he/him/his): JSTE Special Issue on NGSS just cited: https://www.tandfonline.com/toc/uste20/32/7

Maya Garcia (she/her/ella): Horizon Survey Data: http://horizon-research.com/NSSME/

Maya Garcia (she/her/ella): Link to RAND Data: <u>https://edreports.org/resources/article/data-snapshot-k-12-science-instructional-materials</u>

Cary Sneider: The value of STEM integration to motivate students and engage them in using their knowledge of science and math to solve meaningful problems Maya Garcia (she/her/ella): +1Cary

Kevin Anderson: Recent WI survey suggests that 75% of hs teachers are creating their own materials, 50% of ms, and 40% of elementary - I wonder about how effective that is overall...

Stacey van der Veen: The challenge I keep running into with NGSS focused materials is that in order to serve teachers at multiple levels they are often stepwise and focused on the performance expectations rather than on students digging into and creating facility with each of the three dimensions.

Karin Klein: Teachers cannot be expected to develop good curriculum supporting the standards by themselves. High-quality instructional materials ARE difficult to develop, AND can enable high-quality teaching.

Maya Garcia (she/her/ella): Challenge Paper: <u>https://www.carnegie.org/topics/topic-articles/professional-learning-educators/elements-transforming-teaching-through-curriculum-based-professional-learning/</u>

Maya Garcia (she/her/ella): Link to Report: <u>https://www.nationalacademies.org/our-</u> work/design-selection-and-implementation-of-instructional-materials-for-the-next-generationscience-standards-ngss-a-workshop

Heidi Schweingruber: Yes, that workshop was supported with funding from the Carnegie Corporation!

Wendi Vogel, Kent ISD: Many are excited by the OER materials, but often are not supported by a system with PL. It grabs and goes and good luck. This is a HUGE issue in elementary where they are hesitant to do science to start.

Spencer Martin: Agreed Wendi! Tina M Larson: Yes, Wendi! =:(Trisha Herminghaus: ^ Wendi!

Mary Starr (she/her) MMSLN, MI: The structures for PL are in place for many OER - we need ways to encourage districts and teachers to prioritize the time to do the PL.

Spencer Martin: Curriculum quality materials are necessary, but not sufficient for teacher capacity and implementation

Karin Klein: +1 @Spencer

Arthur Camins: We need to discuss the tension between teacher and local investment in instructional materials development on the one hand and time, expertise, and research needed to develop NGSS aligned instructional materials.

Stacey van der Veen: +1 Arthur, and also what is guiding that local investment

Bill Penuel (he/him/his): Link to special issue: https://www.tandfonline.com/toc/uste20/32/7

Jim Short: All of the articles and commentaries are free to download too at the publishers web site that was shared.

Gregory Borman: The consequences of the pandemic have severely affected the ability of teachers to attend professional learning due to schools being short-staffed and the teachers taking on additional responsibilities.

McCarthy, Michelle: @Gregory also the lack of substitute teachers!

Suzy Loper: I think districts that are doing a very thoughtful selection and adoption process of NGSS curriculum materials may be helping drive the market in the right direction. Districts are showing that they aren't fooled by adding the NGSS sticker to the old program.

Connie Campbell: We can only order from our state's approved vendors. To become approved is to agree to sell your product at your lowest price point. If a company does not have that agreement with our state Department of Education then we cannot even look at those resources. So, we (3rd largest public school district in the state) cannot adopt the highest quality instructional curriculum available which meets the needs of our diverse population.

Suzy Loper: @Connie what state are you in?

Connie Campbell: Ohio

Cory Epler: @Connie - I know the Ohio Dept of Education is participating in a networks of states focused on high-quality instructional materials. It may be worth reaching out to the teaching and learning lead at ODE to see if their approach to what ends up on the "list" may be changing.

Cathy Holmes: Connie there is work to help districts select HQIM in Ohio. Contact me so that I can point you to our resources.

Connie Campbell: @Cory We met with ODE in August. We are currently piloting for adoption next year. @Cathy I am currently identifying essential equipment and materials for K-6.

Lydia Hunter: Connie---reach out to me. Lydia.Hunter@education.ohio.gov The list is not of quality vendors, just ones that agree to make materials accessible and not overpriced. Districts in Ohio have local control to adopt curricular materials. We may be able to assist your district in the adoption process or at least clarify the function of that list.

Ted Willard: having a copy of the instructional materials (or a link to them) is necessary but far from sufficient for successful use

Wanda Bryant: HQ instructional materials+pedagogy+book study+teacher inquiry (what happens when I do X? Wow! That worked well! let me try something else new Or how can I fix what didn't work well; refine practice over time with what works

Stacey van der Veen:@Wanda - yes! But this level of professional learning needs support (and time of course)

Wendi Vogel, Kent ISD: Agree Dora! Had this conversation today with a district. Teachers are master tweakers. They should NOT be both curriculum designers and teach. Give them something to tweak, not create.

Kevin Anderson: Agreed, Phil - very uneven...

Spencer Martin: As I talk about teacher capacity building, the most frequent resource I use is Stem Teaching Tools which Phil edits. If you haven't been, you should go. TONS of resources

Stacey van der Veen:+1 Spencer Jessica Thompson: +Spencer & Dora - time for professional learning & critical reflection

Meg Richard, KSDE: Agreed Spencer- they also have great professional development modules on the STEM Teaching Tool site: http://stemteachingtools.org/pd/sessiond

Jim Short: +1 @Dora, teachers more as learning engineers who work with HQIM supported by CBPL to support student learning.

Beth Short (she/her) - Smithsonian Science Education Center: Nice to hear relevance and context being discussed across the panelists, especially as we continue to think about what coherence looks like in student learning.

Maya Garcia (she/her/ella): Absolutely Beth!

Philip Bell - UW Seattle, he/him: Reflective quote,ÄîHow are we doing? "By school age, children have come to expect quite arbitrary and, from their point of view, meaningless demands to be made upon them by adults [in school],Äîthe result, most likely, of the fact that adults often fail to recognize the task of conversion necessary to make their questions have some intrinsic significance for the child."

- Jerome Bruner, The Growth of Mind, 1965

Ted Willard: I'd love to hear folks opinion about the quantity of professional learning needed for teachers as they implement new instructional materials. I think that administrators often have no idea of the magnitude of the support needed.

Maya Garcia (she/her/ella): Sharing more about the NSF funded ACESSE Project: http://cosss.org/ACESSE a collaboration between the Council of State Science Supervisors, University of Washington and CU Boulder!

Philip Bell - UW Seattle, he/him: Some relevant resources on cultural pedagogies in science education:

http://stemteachingtools.org/pd/sessionc http://stemteachingtools.org/brief/58 http://stemteachingtools.org/brief/55 http://stemteachingtools.org/brief/53 http://stemteachingtools.org/tgs/Culture

Tonyea Mead-DE: I worry that the vendor materials are not about students' local community. However, this can be done with lots of pd. Just what Philip is talking about. Sometimes classroom science isn't relevant to students' surroundings or what is going on in the real world of science. Science is messy. **Amanda Collamore**: I think when we are talking about culture, we also need to think about place. What connects students/teachers to science and engineering in Maine is quite different that what might connect students/teachers in Texas.

Kathy: Agree Amanda. What does that look like in instructional materials? **Amanda Collamore**: Kathy, instructional materials should be a start, right? Then the teachers can work to bring in the connections for the students in their classrooms. I think that is something missing in pre-service teacher prep. How do you adapt instructional materials to meet your audience?

Ted Willard: @Amanda, to be just a bit controversial, I would say that instructional materials are NOT the starting point. Teachers need some work before they are ready to take on the challenge of implementing new materials. To channel my former colleague Tricia Shelton, the need the "why" before you can give them new materials.

Brett Moulding: Teacher autonomy is a critical component of professionalism. Many of the teachers I work with modify lessons and make them more relevant to their students to meet the needs of all of their students. The number of teachers describe as developing their own curriculum may reflect this group of teachers that modify curriculum to meet the cultural and place for their students.

Mark Meszaros: @Amanda and Brett. Agree completely. Teachers have to adapt HQIM to their student's needs. Engagement is critical, and the professional teacher is the best person to know how to engage their students.

Lauren Slanker (MSI) (she/her): Rather than thinking about teacher curricular implementation only in terms of fidelity, we need to position teachers as decision makers who can take a national curriculum and make the appropriate adjustments to make their lessons relevant to the students sitting in front of them.

Stacey van der Veen: @Lauren, yes! And we need to support teachers so that they feel knowledgeable enough to be comfortable doing that. I'm working with a group of science coaches in NJ to do this with their colleagues, it's been fascinating **Carol O'Donnell**: Agree with @Lauren

Sam Shaw: Reflecting on the vision for science education present in A Framework for K-12 Science Education, what decisions are made in NGSS design to promote not only high outcomes for all students, but centering the idea that all students have opportunities to learn? What tradeoffs occur in the pursuing both of these goals into implementation?

Steve Jacobs: Hold on here! The answers from the panel are stupendous.....I'm having trouble keeping up with digesting their output. I need time to chew before I swallow. Yikes.

Emily Mathews: LOL- yes @Steve!

Heidi Schweingruber: @Steve -- luckily, the recording of the meeting will be available after the meeting. So we can all review and fully digest. I agree with you. So much wisdom and insight!

Ravit Duncan: The extent to which curriculum materials afford adaptation to local contexts and phenomena also matters. It is not always a trivial change to make.

Kathy:@Ravit-sometimes adapting materials to a local phenomenon is a huge task.

Danny Edelson (he) BSCS: Combine that with the unreasonable number of DCIs to cover and we're just piling on teachers.

Karin Klein: Teachers need to be able to make informed decisions - about IM, about strategies, etc. - Agree, they need the "why", and then the "how"

Beth Short (she/her) - Smithsonian Science Education Center: Yes. As a developer, it is incredibly complex to ensure coverage with depth of every element in a PE. This work is far too challenging for teachers without adequate support and guidance.

Danny Edelson (he) BSCS: +1 for realistic approaches to transition!

Lauren Slanker (MSI) (she/her): +1 Dora!

Heidi Schweingruber: I'm struck by the number of mentions of connecting to pre-service. We had a panel focused on that in October, but sounds to me like we could have also had a discussion of that following this panel. So many interconnections.

Joseph Bellina: it will always be a work in progress

Richard Lahti, Minnesota State Moorhead: If it can't be adapted to local, does that make it not worthwhile? For example, I woke up to negative temperatures this AM. Children in MN grow up with an intrinsic understanding of negative numbers because we live them for 5 months of the year. But where I first taught, in the south, negative numbers might not have such a natural phenomenon $,\ddot{A}^{\text{H}}$ do they not need to know them?

Maya Garcia (she/her/ella): I am looking forward to picking up pre-service again at the beginning of April

James: Asking, can science look to social studies (IB?) to "scaffold" place in materials throughout K12? elementary-home/local, middle school-national, HS-global?

TJ McKenna (he/him): Huge point Dora! We have been working on readability of curriculum in a project for elementary science

Tom Keller: Pre-service is even more 'Wild West' that local control of K-12. **Heidi Schweingruber**: +1000 @Tom Keller **Jonathan Anderson Curley**: Great metaphor!

Richard Phillips - Sumter School District: Teacher autonomy in bundling the standards/performance expectations informs the relevance of the local units.

Bill Penuel (he/him/his): In our work on iHub and OpenSciEd, we gather direct evidence of interest, and center the interests of minorities students and their communities

Ted Willard: We need serious discussions about the capacity of the system to make change. And what are the most efficient paths given their capacity

Bill Penuel (he/him/his): Paper not quite out yet, but out (free) in next few days about our process: Penuel, W. R., Reiser, B. J., McGill, T. A. W., Novak, M., Van Horne, K., & Orwig, A. (2021). Connecting student interests and questions with science learning goals through project-based storylines. Disciplinary and Interdisciplinary Science Education Research. https://doi.org/10.1186/s43031-021-00040-z

Maya Garcia (she/her/ella): Efficient and Effective Ted Ted Willard: Agreed Maya Ted Willard: (if it isn't effective, it isn't efficient)

Jim Short: When you are learning to cook, especially if it's a new cuisine for you, staying close to the recipe may be helpful. After you have more experience, it's easier to modify. Consider the science of baking, you have to be careful how you modify or you may end up with something completely different that is not what you intended.

Jennifer Hicks: @Jim when cooking you also respond to the results

Jim Short: *@*Jennifer, absolutely. cooks taste while they work and teachers see how their students are responding to adjust instruction

Brett Moulding: Jim, You do not need a recipe to make good gravy, but you need to understand the principles of how to thicken gravy and balance spices. Professional cooks and bakers understand the why of a recipe and how to modify it. I think most teachers are professionals that know how to modify instruction to maintain fidelity. Perhaps PD needs to focus on the structure of instruction

Amanda Collamore: +1 Brett - YES! YES! YES!!

Richard Lahti, Minnesota State Moorhead: @Brett. Good point. I cook by taste, play music by ear, and teach almost all of my classes without a textbook to allow me to choose the right phenomena, approaches, etc.

Bill Penuel (he/him/his): Second paper related to how we select anchors (also out in the coming days, not yet available): Penuel, W. R., Allen, A.-R., Henson, K., Campanella, M., Patton, R., Rademaker, K., Reed, W., Watkins, D. A., Wingert, K., Reiser, B. J., & Zivic, A. (2021). Learning practical design knowledge through co-designing storyline science curriculum units. Cognition and Instruction. https://doi.org/10.1080/07370008.2021.2010207

Ted Willard: I sometimes wonder whether we focus to much on a vision of the top of the mountain range when teachers need clearer paths to the top of some of the foothills. James: +1 Ted

Philip Bell - UW Seattle, he/him: It is important to highlight different kinds of anchor phenomena,Äîfrom less to more consequential, from local to global impact. Here's a framework to consider that Enrique Suárez and I developed: https://twitter.com/philiplbell/status/1389401722661994497?s=20 **Wanda Bryant**: Cultural relevance: Michigan State has a unit on the chemistry of hair care products I wish my students could have done in Detroit. Anyone from MSU have a link to this resource? Students preferred units on diabetes rather than how light works

Philip Bell - UW Seattle, he/him: Justice-centered Resources:

Justice-centered science pedagogy: A catalyst for academic achievement and social transformation by Dr. Daniel Morales-Doyle https://www.researchgate.net/publication/320059717_Justicecentered_science_pedagogy_A_catalyst_for_academic_achievement_and_social_transformatio n; https://www.nsta.org/connected-science-learning/connected-science-learning-septemberoctober-2021/sustaining-community; Justice-centered Phenomena http://stemteachingtools.org/brief/67; How can you advance equity and justice through science teaching?

http://stemteachingtools.org/brief/71

Maya Garcia (she/her/ella): I also wanted to send a late congratulations to Okhee Lee on her AERA award: <u>https://steinhardt.nyu.edu/news/okhee-lee-receives-top-award-practice-engaged-research?utm_source=Organic_Social&utm_medium=Twitter&utm_campaign=news&utm_con_tent=T%26L</u>

Wendi Vogel, Kent ISD: HS materials and course sequencing...can of fun worms with so many policy issues, especially with T certifications. Phenomenon are not sitting in silos. #realchallenge

Richard Lahti, Minnesota State Moorhead: This gets at personality, etc.

Richard Duschl: All politics is local and so, too, is teaching/learning. The effort needs to be within schools and classrooms in order to ignite reforms. Educative materials, for sure. But admin and parents need to be onboard as well. Harkening back to a seminal break thought book - The Construction Zone - that stimulate thinking about the complexities of turning schools around through the lens of one elementary school pursuing cognitive approaches to t&L.

Amanda Collamore: +1 Richard - Local/parent buy-in is so important.

Bill Penuel (he/him/his): The JSTE paper by Reiser and colleagues attempts to grapple with the student perspective, and we use exit tickets to measure it from the student POV

Dora Kastel (she/her): Really appreciate Carol's point about coherence. Review is on paper. Reality of what it looks like in a classroom (different classrooms!) isn't the same thing.

Kelly Carey: Decisions around HS curriculum and courses --- resources often drive these decisions in districts. What are the thoughts from the group about order of courses, and should "we" integrate ESS or split Physics and Chem from full year courses and instead do a semester of each. In Michigan we have 3 credits required in science for graduation.

Bill Penuel (he/him/his): Here is how we look at empirically and support teachers in enhancing coherence, relevance, and contribution from the student POV in our iHub work: Penuel, W. R., & Watkins, D. A. (2019). Assessment to promote equity and epistemic justice: A use-case of a research-practice partnership in science education. Annals of the American Academy of Political and Social Science, 683, 201-216. <u>https://doi.org/10.1177/0002716219843249</u>

Amanda Collamore: +1 Carol

Beth Short (she/her) - Smithsonian Science Education Center: Indeed. This is the tension we are always grappling with.

Kevin Anderson: Thinking of coherence for students - I like the Putting Pieces Together Routine from OpenSciEd - <u>https://www.openscied.org/openscied-instructional-model/</u> Meg Richard, KSDE: Thanks Kevin,

Lin Andrews: + Carol. Completely agree as a curriculum developer, too.

Cary Sneider: Jamie's point that coherence needs to apply to an entire 9-12 sequence goes beyond the usual thinking about coherence within a single course. That argues for the important role of teacher-administrator teams at high schools. I would add that afterschool and summer programs should also be included in consideration of coherence.

Meg Richard, KSDE: I think leveraging the routines could do a lot to move the needle with teacher buy-in and autonomy

Betsy Barent: I would love to hear more about what we think the nature of science is

Meg Richard, KSDE: But, I would love to hear more about how we can support districts in adopting professional development around the routines without the concrete curriculum that might not be there yet

Tina M Larson: @ Meg - sounds good! =:)

Joseph Bellina: do you distinguish nature of science from the scientific method

Beth Short (she/her) - Smithsonian Science Education Center: Of course.

Richard Duschl: Nature of Science in NGSS - agree with Carol. It, too, is a work in progress forever and always as new questions from new voices emerge. In our Post-Truth world context though, we do need to examine what one can trust and to what extent.

Jennifer Hicks: @Spencer this is why new teachers need mentors

Ted Willard: @Carol: I think the Nature of Science statements in NGSS recognize a variety of methods. For example VOM-H1 states: Science investigations use diverse methods and do not always use the same set of procedures to obtain data.

Beth Short (she/her) - Smithsonian Science Education Center: For me, I think about the NOS as standardized as an issue.

Wendi Vogel, Kent ISD: @Spencer, yes, and yes again

Kevin Anderson: Good point, Spencer, on the reality of implementation!

Kelly Carey: A big tension occurs between teachers trying to figure out how to "do" the NGSS well, with a "scripted" curriculum.

Mark Meszaros: @Spencer - excellent points

Richard Lahti, Minnesota State Moorhead: NGSS has an explicit appendix for NOS, but our state MN totally ignored that appendix.

Beth Short (she/her) - Smithsonian Science Education Center: Even the 2002 Views of NOS warns about standardizing NOS

Elisa Slee: I have found the teachers love STEM Teaching Tools and that these link research and practice and teachers find them motivating and easy to understand

Lin Andrews: + Cory.

Betsy Barent: Nature of science: How science works, why science matters-I admit I am highly influenced by UCMP-Berkeley's Understanding Science

Kevin Anderson: Agreed, Betsy, like these NOS resources https://undsci.berkeley.edu/

Beth Short (she/her) - Smithsonian Science Education Center: I agree, teachers making sense of NGSS is still very much ongoing.

Betsy Barent: @Beth, have we had enough time to make sense? **Beth Short (she/her) - Smithsonian Science Education Center**: @betsy absolutely not. Nor has there been enough support offered to teachers and schools. **Betsy Barent**: @Beth, agreed.

Anne Petersen: +1 Cory

Vicki Kirk: Cory! Keeping it real.

McCarthy, Michelle: The two "I's" the additional D's should be a natural component in quality teaching, regardless of the discipline

Bill Penuel (he/him/his): In terms of where do we start? What about where teachers want to grow, within the space of the framework? Some relevant work from the ACESSE Project: <u>https://kappanonline.org/creating-system-professional-learning-science-teachers-needs-penuel-bell-neill/</u> Arthur Camins: Well, if equity and social justice are central to all we do, then it is not clear in the current climate that all teachers (and their districts) have the same purpose.

Richard Duschl: Pluralism in the sciences is a huge factor in the evolution and revolution of scientific reasoning.

Spencer Martin: Teaching is an isolating profession yet it MUST be a collaborative endeavor

Sam Shaw: How do comprehensive instructional materials review processes support the continuum of instructional materials development, selection, adoption, and implementation? And, what are some examples of how those processes prioritize and support local needs for equity and social justice through adoption and implementation?

Toby Horn: Sounds like we need Vision&Change for CoEdu faculty???

Heidi Schweingruber: @Toby Horn -- we are in discussions with NSF right now about a consensus study to develop a framework on equitable and effective teaching in undergrad STEM. I think it could go a long way to helping with the higher ed piece! **Toby Horn**: @Heidi Thanks for this info, I am thinking about educating education faculty thru a V&C approach. Sounds from today's discussions that teachers are entering classrooms w/o knowledge or exposure to NGSS.

Heidi Schweingruber: @Toby -- It's an interesting idea. The extreme fragmentation of the teacher prep space really makes this challenging. Definitely a topic for further discussion.

April McCrae: Sometimes, in thinking about "HQIM" I think about how many opportunities those of us focused on building and finding HQIM have to become experts, while those USING the materials are end users with very little interaction with the actual materials

Amanda Collamore: Yes, Cory! I look a lot at how can we bring in Early Childhood educators who are in the most rural parts of our state? Its such a difficult when the closest colleague/mentor is 50+ miles away.

David Grossman: As a HS teacher, I am so grateful for the work that New Visions has done to provide curriculum and to help make the vision of the Framework clearer through that curriculum. Thanks @Dora

Betsy Barent: @David, not in NYC but appreciate Dora so much!

Spencer Martin: Ed Reports has a great brief/blog that they just published a few months ago about HQIM in pre-service teacher education. The pre-service teachers that I teach have appreciated adopting the student hat and then reflecting on the lesson with their teacher hat in some of that realm

Dora Kastel (she/her): <u>https://curriculum.newvisions.org/science/nv-science-team/transitional-vs-nysslsngss-materials/</u>

Beth Short (she/her) - Smithsonian Science Education Center: This is a fantastic tool! Thank you for sharing, Dora!

Mike Heinz: @Beth There are countless books, journal articles and archived webinars to allow for educators to choose their own path. Are educators limited to only making sense of 3D learning during school time? The Framework was published in 2012 and the NGSS in 2013. I would be curious to know how much time is necessary.

Elizabeth A Davis: In case it's helpful for curriculum developers -- my group put forward a set of design principles for educative curriculum materials based on two decades of work. Doesn't solve the problem of density, but could help us at least get the most bang for our buck as we develop and make decisions about incorporating educative features. <u>https://journals.sagepub.com/doi/full/10.3102/0013189X17727502</u> Let me know if you need access.

Mary Starr (she/her) MMSLN, MI: Thanks @Betsy!

Shannon Wachowski: Link to the resource Spencer mentioned: <u>https://nctresidencies.org/wp-content/uploads/2021/08/Preparing-Day-One-Ready-Teachers-FINAL-August-10-2021.pdf</u>

Jill Grace - K-12 Alliance: NextGen TIME: https://nextgentime.org/

Julie Contino (she/her): We use New Visions materials in about 5 of our 12 courses at the AMNH ESRP MAT program for Earth Science pre-service teachers

James: Identifying "Transitional" vs NGSS Designed materials is an important step to keep teachers from clinging to resources.

Dora Kastel (she/her): @James - we need to meet people where they are. We believe it's not all or nothing, so if some places are ready for SOME part of the transition, that's a good step. In many places teachers use a combination of units of transition and fully aligned.

Spencer Martin: Agreed Dora

Shannon Wachowski: Another resource that contains support around critical features of instructional materials design (partnership between NextGenScience and EdReports): <u>https://www.nextgenscience.org/sites/default/files/CriticalFeaturesInstructionalMaterials_July2</u>021.pdf

Ted Willard: I think each of us should take a moment and reflect how much time, energy (and access to expertise) it has taken each of us to get to the point of understanding we are about 3D instruction. At what point will the typical classroom teacher have the time, energy, and access to expertise to reach the point we are? What is really possible in terms of helping them progress in their teaching. This is what I really struggle with these days in trying to plan a way forward.

Stacey van der Veen: @Ted totally agree! Stacey van der Veen: And this is where developing and empowering teacher leaders is so important Tina M Larson: @ Ted, well stated Shari Templeton (she/her): +1 zillion, Ted **Spencer Martin**: Agreed Ted. I have the luxury of coming to sessions like this and learning and pushing my thinking. Teachers have to grade, and lesson plan in their "free" time. We HAVE to take more off of teachers' plates if we want to expect anything to change

Michael Lach: @Ted, +1. We should continue to push for a better system, but also set goals based on the reality of how the current system operates for our students today. **Lindsey Roy**: +Spencer and Ted- Absolutely.

Heidi Schweingruber: +1 Mike and Ted.

Amanda Collamore: +1 Spencer

Betsy Barent: Agreed TED!

Karin Klein: One thing we CAN take off teachers' plates is designing curriculum - by providing modifiable HQIM

Karin Klein: HQIM as a starting point Trisha Herminghaus: ^^Karin Spencer Martin: Agreed Karin. Materials should be developed FOR teachers not done to them

Dora Kastel (she/her): @stacey - I forgot to mention that our teacher leaders are actually ones leading facilitation of our CBPL for the transitional materials, as simultaneously involve them in co-design and piloting the fully aligned materials. None of this work would be possible without them.

Stacey van der Veen: @Dora, that's awesome. Our teacher leaders are in the best position to help their colleagues find entry points and high impact changes, it makes me feel so optimistic

Maya Garcia (she/her/ella): We have also been talking about how our systems of teacher observations need to support this shift as well

Heidi Schweingruber: Thinking about giving teachers access to sessions like this -- we at BOSE would welcome suggestions for how we can take the recordings and rich materials shared here and make them accessible for teachers and PD providers. You can reach out to me and Amy directly with ideas.

John Olson: @Heidi, Good model is Ready Set Science

Heidi Schweingruber: *@*John -- we are developing that kind resource for the new Perk-5th grade consensus study report!

Ted Willard: @Heidi, make a series of 5-minute videos and 15 minute podcasts that take points from reports or summits and put them into bite-sized bits for teachers **Maya Garcia (she/her/ella)**: Love that idea Ted

Maya Garcia (she/her/ella): I like the idea of a podcast

Meg Richard, KSDE: @Ted that's a great idea! I'm hearing a lot of teachers ask for podcasts

Trisha Herminghaus: ++Ted...

Kelly Carey: @ Heidi --- Yes, please. We need the voices and faces of state and national leaders in science to support those that have their boots on the ground leading systemic change.

Heidi Schweingruber: @Ted -- noted and already thinking about who I can get to fund that :-)

Amanda Collamore: *@*Heidi would that be something that would be available on all types of podcasting platforms? i.e. Audible?

Heidi Schweingruber: @Amanda -- I'm not sure. When we first explored the idea of podcasts a few years ago we were told the way to get a bigger audience is to find someone who already has an audience and get them to feature you. But, the thinking has changed so now NASEM is getting in the game. I'll find out what they are thinking of doing.

Karin Klein: Podcasts are something teachers can access WHILE they are doing other things - which is a great way to respect the amount of things they need to do everyday **Amanda Collamore**: I love the podcast approach. I listen to podcasts while driving to and from work.

Heidi Schweingruber: In all seriousness -- I think NASEM is developing capacity to do podcasts. I'm going to try to get us (BOSE and the science community) as a top priority.

Ted Willard: @Heidi, as the academy plans podcasts, I strongly suggest that they think about audiences. Have one that is focused on Science and one that is focused on Science Education. K-12 Teachers will put up with something about Undergraduate education, but they won't subscribe if most of them are about highly esoteric (to them) topics in physics, chemistry, medicine, etc.

Bill Penuel (he/him/his): This is more than an issue of PL to really support teacher learning: Infrastructure that reimagines the school day so teachers are not spending the whole day teaching, but have time to co-plan in deeper ways. Other countries, like Holland, do this. We need to dream in these directions and ask for the resources needed to do it

Trisha Herminghaus: Yes, Bill! Maya Garcia (she/her/ella): +1 Bill Lindsey Roy: +Bill Ravit Duncan: ^^ Stacey van der Veen:@Bill, that's the dream! Richard Duschl: +1 Bill !!

Spencer Martin: Sam and the team at EdReports were instrumental in shifting my thinking away from the idea that materials are bad and limit teacher autonomy and into the idea that HQIM can be a service for teachers and students.

Dora Kastel (she/her): Related to teacher observations - we've worked with leaders/supervisors on connecting Danielson and the SEPs:

https://curriculum.newvisions.org/science/course/professional-learning/evaluating-lessons-and-danielson-look-fors/

Betsy Barent: Dora-meeting Ts where they are at-yes!

Maya Garcia (she/her/ella): Thanks Dora! And to have that model validated and endorsed by state teacher effectiveness processes

Maya Garcia (she/her/ella): I'd also love to see how it links into principal leadership programs

Dora Kastel (she/her): Agreed Maya. It was the START of that work. We also created this observation/coaching tool, which has also been really useful: <u>https://docs.google.com/document/d/10J82veeREyj0MAIunGdXGa-AmfFspvxll9EARwLbBas/edit</u>

Neil Lundgren: As a K-12 teacher I feel so lucky to be here, and I wish more boots-on-theground teachers could participate in discussions at this level. Meg Richard, KSDE: @Neil yes!

Kelly Carey: Michigan is also a local control state....and I appreciate the option to select curricular resources. However, there is a lack of explicit recommendation from our state for HOW to go about resource selection, PL to support implementation, anticipated timeline,etc. HS teachers seem to voice the greatest resistance to change. Some district science leaders feel "voiceless" about leading the change.

Mary Starr (she/her) MMSLN, MI: @Kelly Carey - feel free to reach out to me and we can help you connect with state and national initiatives starrm@mimathandscience.org

Jennifer Hicks: @Carol and states have to begin their review by identifying those materials and there is a tension between curriculum vendors and developers.

Richard Lahti, Minnesota State Moorhead: @Kelley - if we can't get an NSTA endorsed curriculum, then having state support - even a blog where we could all post our equip rubrics and people could read each other's reviews first as a starting point, just like when we buy anything from underwear to electronics on Amazon.

Kevin Anderson: @Carol - agreed, students need to do REAL science and engineering, then they'll identify as scientists and engineers. Not being told about scientists or science...

Maya Garcia (she/her/ella): That would also allow us to engage teachers in weighing in on the sessions

Maya Garcia (she/her/ella): Or do more teaching engagement rather

Meg Richard, KSDE: The loss of @NGSNavigators and Margaret Sullivan was substantial.

Bill Penuel (he/him/his): Vertical coherence, yes, @Cory!

Maya Garcia (she/her/ella): Thanks for sharing that Cory!

Amanda Collamore: Cory, I'd loved to see how that policy is built if you're willing to share.

Richard Duschl: Quality assessments +1 Cory - Performance assessments that help teachers make instructional moves

Maya Garcia (she/her/ella): @Cory and @Jamie can both panelists share links to your policies for IM adoption or selection

Lindsey Roy: Cory- I worry about a missed opportunity for districts in NE being able to use ESSER funds for Science Education when such limitations exist to the reports at

this point. I've heard many choose not to use ESSER funds for science since there are such limited reviews available right now

Carol O'Donnell, Smithsonian Science Education Center: Want to just echo @Spencer: "Sam and the team at EdReports were instrumental in shifting my thinking away from the idea that materials are bad and limit teacher autonomy and into the idea that HQIM can be a service for teachers and students."

Dora Kastel (she/her): @Carol - I think even though the slido didn't reflect this, that many teachers DO still see materials as bad, robbing them of autonomy etc. so that's why we want to start with NextGenTIME to help them see the potential **Maya Garcia (she/her/ella)**: +1 Carol

Cory Epler: Here is Nebraska's guidance for selection science instructional materials: <u>https://nematerialsmatter.org/science/selection-process/</u>

Lauren Slanker (MSI) (she/her): +1 Spencer

Cory Epler: @Lindsey -- They aren't missing an opportunity. What we have seen happening is they are actually calling our office for conversations and discussions before they make that purchase.

Cory Epler: @Lindsey -- They aren't missing an opportunity. What we have seen happening is they are actually calling our office for conversations and discussions before they make that purchase

Cory Epler: It's actually really opened up great conversations, especially about HS science materials (since there are no reviews)

Maya Garcia (she/her/ella): +1 Cory

Lindsey Roy: Cory- awesome!

Gregory Borman: In NYC the District Science Team evaluated elementary and middle school curriculum with the participation of our elementary and middle school science leadership teams (about 20-25 teachers and admins each). These teams were trained in using the Equip rubric and then were facilitators in the professional learning for teachers as we launched the curriculum programs- having teachers facilitate the sessions gave more "street credit."

Mary Starr (she/her) MMSLN, MI: @Gregory - we have done similar work in MI in preparing Ts and leaders with knowledge of EQUIP

Kelly Carey: @Phil, Would love a STT on the tensions for HS science around the NGSS physics and chem PE's as compared to long list of previously 1-D recall standards.

Shannon Wachowski: High School reviews are coming! And we can't do it without amazing educator reviewers. Please pass along to your networks. <u>https://drive.google.com/file/d/1Q3t9XfitN-</u> <u>AkL6mGgPUdOcOiYRRHCNd2/view?usp=sharing</u> **Spencer Martin**: As someone who has done a EdReports review, I couldn't recommend it more highly.

Maya Garcia (she/her/ella): +1 Spencer

Kate McNeill:+1 Spencer. Brining in admin.

Amanda Collamore: +1 Spencer - Admin and school boards need to understand the value of the implementation; as do parents/taxpayers

Gregory Borman: Yes Spencer- we finally got access to the district superintendents in NYC and that is our plan- we also need to reach out to parents as principals listen to both the suits and the parents.

Beth Short (she/her) - Smithsonian Science Education Center: +Phil here. Global issues grounded locally offer incredibly powerful phenomena

Philip Bell - UW Seattle, he/him: +1 Beth!!

Christa Haverly, she.her.hers: Educators in environmental education have been grappling with SSIs for decades, integrating science education with social science education with advocacy and action tools

Philip Bell - UW Seattle, he/him: Some Climate Learning Resources: <u>http://stemteachingtools.org/sp/climate-learning</u>

Colleen Epler-Ruths IU16: Pennsylvania is almost at the point of adopting new science standards. We have added a fifth domain - environment and agriculture.

Elisa Slee: + Climate science/social justice

Richard Lahti, Minnesota State Moorhead: I think NGSS itself is a bit of a wall. In the old MN standards had the NOS standards separate from the content standards, and I always tried to make sure every lesson had 1 from column A and 1 from column B, but they could be combined in infinite numbers of ways with the best local phenomena. But NGSS dictates which NOS goes with which Content, even if your local setting has a better combo.

Ted Willard: @Richard NO! NO! NO! NO! NO! Teachers can mix and match elements (including NOS) any way they want to during instruction **Richard Lahti, Minnesota State Moorhead**: ted - I am at lahtiri@mnstate.edu.

Carol O'Donnell, Smithsonian Science Education Center: Well said @Christa! "Educators in environmental education have been grappling with SSIs for decades integrating science education with social science education with advocacy and action tools"

Carol O'Donnell, Smithsonian Science Education Center: SSI = socio-scientific issues

Kevin Anderson: Some of our districts are on the third literacy materials adoption since NGSS was published - with no new science materials in that time.

Colleen Epler-Ruths IU16: PA is about to adopt updated standard. We have added a 5th domain - environment and agriculture

Arthur Camins: In the current climate we need parent advocacy for science education that address climate, equity, and social justice

https://www.dailykos.com/stories/2021/11/15/2064367/-Tell-It-to-the-School-Board-We-Demand-Science-and-Care

Maya Garcia (she/her/ella): Arthur you are correct Tina M Larson: @ Arthur - we are working on that in MI. =:)

Toby Horn: How cognizant/fluent are college of education science faculty in NGSS?
Kevin Anderson: @Toby - sometimes not so much, and that's an ongoing challenge.
Jennifer Hicks: @Toby some but not enough
Tom Keller: @toby - my experience is that it varies widely
Melissa Braaten (she/her/hers): @Toby, I'm wondering who you are envisioning as
College of Education faculty - I suspect that the teacher preparation world is so
fragmented that we couldn't make a sweeping claim about teacher ed. faculty, but many
of us are deeply involved in supporting pedagogical, curricular, and assessment shifts in science education.

Maya Garcia (she/her/ella): We can connect with Admin, but as Cory is mentioning they are only a piece of that community structure that can influence implementation efforts

Kelly Carey: @Heidi - In the vein of curriculum, a challenge we are facing is course pathways for HS and pre-reqs for AP courses. I would love for grander / national support in tackling this from a research perspective.

Amanda Collamore: +1 Cory - absolutely! especially in locally controlled areas where parents/taxpayers need to support the funding of the implementation.

Philip Bell - UW Seattle, he/him: Our climate network learned a lot about navigating the political dimensions of climate change from this book: https://www.dukeupress.edu/how-climate-change-comes-to-matter

Gregory Borman: It was for us Carol!

Jennifer Hicks: @Carol agreed

Christa Haverly, she.her.hers: +1 Carol - I'm doing research now on teachers' learning in the review of curriculum materials

Maya Garcia (she/her/ella): Christa, do you have anything you might share with us in resources :)

Maya Garcia (she/her/ella): We also can lean on our informal partners in the state to support these conversations

Christa Haverly, she.her.hers: @Maya, not yet - we're presenting at NARST on the paper, still writing, though

TJ McKenna (he/him): We partnered with the Bigelow Lab for Oceanic Sciences on an Oceans, Climate Science, and Big Data pathway for MS & HS teachers. We focus on moving to explanation oriented vs answer oriented work and approaching data analysis as a conversation rather than a task <u>https://www.ngsx.org/programs</u>

Wanda Bryant: Piloting a unit is a great professional learning opportunity. Spencer Martin: Agreed Wanda Spencer Martin: WITH time for support and reflection Karin Klein: +1 Wanda!

Arthur Camins: Yes. I worry about the impact of handing off instructional materials review to national groups.

Ted Willard: Teachers need some PL to be ready to consider new (and different) curriculum materials

Spencer Martin: Also agree Ted

Kelly Carey: There often is PD provided for the LAUNCH of curricular materials. But the ongoing, strengthening and maintenance of instructional routines is lacking for most materials.

Heidi Schweingruber: @Kelly -- Good note for us. Maybe we need a deep dive on these pathways questions. We've also been thinking about the transition from secondary to post-sec. I've heard too many anecdotes that secondary science teachers sometimes pushback on NGSS by saying "that won't prepare the students for college".

Karin Klein: Just like it is for students, experiencing is more impactful than reading about, or listening to

Meg Richard, KSDE: And we all have to work together to get them that access; the opportunities are there but how do we work together in a coherent way to make sure they have the intended reach

Elisa Slee: Yes, @Carol "Teachers as learners is critical"

Ted Willard: Otherwise, without some PL, they just want to materials that let them teach the way they have been teaching

Maya Garcia (she/her/ella): EE providers and Museums have played a huge role in supporting implementation efforts, elevating conversations around place based phenomena. Many of these organizations also support PL, so as we are thinking about Ed Prep and Preservice teachers we need to also ask the same of our informal partners

Toby Horn: Vision and Change for faculty educating science teachers. <u>https://visionandchange.org/</u>

Spencer Martin: Other curriculum developers on here that are doing awesome things: Ted Willard (Discovery), Victor Sampson (ADI), and more I'm sure I missed

Ted Willard: @Spencer. We try at Discovery Ed

David Grossman: And we need to examine how we wield the term "fidelity" with regards to the implementation of HQIM.

Kevin Anderson: @David - yes, fidelity is a vacuum, especially at elementary with math and ELA materials sucking up all energy. Especially with biased studies paid for by publishers - fidelity needs to be examined - https://dpi.wi.gov/science/elementary/when-how#flexible

Spencer Martin: I prefer the term integrity to fidelity with materials

Sam Shaw: Shout out to all the teacher educators present today (and not present)!

Janelle Johnson (she/her): +1 Dora about getting on the same page

Spencer Martin: We want the PE met, but it can be modified, never "dumbed down"
David Grossman: @Spencer. . YES or fidelity to standards as opposed to fidelity to the scripted words in the curriculum.
Lin Andrews: @Spencer. LOL. I feel you.
Jen Lewin (she/her): +1 Lin and Spencer

Amanda Collamore: I had a great experience where we created curriculum that we taught to our colleagues and were able to receive fantastic feedback. This process allowed us to be active learners in our curriculum adaptations

Toby Horn: UG physics edu started RTOP, UG Bio edu started Vision and Change, CC Biotech started Bio-Link.

Mary Starr (she/her) MMSLN, MI: I think publishers generally are only providing PL at the beginning but many OER materials have ongoing PL programs. It is challenging to get the commitment to the time to implement that PL. @Heidi @Kelly

Kelly Carey: @Heidi --- Yes. This concern is also voices from parents and community stakeholders. What are college / university admissions "looking for" may be different than the type of student /learner a professor would desire to have in class. This is a great disconnect.

Matt Krehbiel: Districts that are implementing HQIM w/ transformational professional learning can invite Teacher Educators to attend as participants and learn along with teachers.

Joseph Bellina: How about the science content courses that pre service teachers take and what pedagogy is used there.

Elizabeth A Davis: We have a course on Teaching with Curriculum Materials in the elementary teacher ed program at the University of Michigan. Such an amazing class for preservice teachers, to learn to see HQIM as a tool -- it's not cheating to use them -- and HOW

to use them well! Melissa Braaten talked about their work at Colorado on using CM in elementary teacher ed, in the October sessions.

Carol O'Donnell, Smithsonian Science Education Center: ++++1 Betsy! **Melissa Braaten (she/her/hers)**: Thanks, Betsy D. We use analytical tools to help PSTs examine high quality materials (often alongside the lower quality materials available in the multiple districts where teachers are student-teaching).

Jennifer Hicks: Districts need to invest in ongoing PD.

Toby Horn: Are the 40 states that have adopted NGSS including 3-D in teacher licensure exams?

Tina M Larson: Whoa Toby - what a question!! =:o **Julie Contino (she/her)**: @Toby - NY has altered science teacher exams to reflect developing an NGSS lesson with 3 dimensions.

Maya Garcia (she/her/ella): What this might be elevating is that we need more intentional conversations between preservice and the rest of the field so we are all informed about the shifts

Kate McNeill: Preservice courses and experiences can also be very different for elementary versus secondary. The backgrounds, desires and interests of those two groups can also be very different.

Ravit Duncan: + 1 Kate **Ted Willard**: +1 Kate

Maya Garcia (she/her/ella): Well said Cory

Amanda Collamore: +1 Cory - agreed!! Curriculum courses are about creating curriculum does not allow for adaptations from HQIM.

Maya Garcia (she/her/ella): +1 Melissa

Heidi Schweingruber: In BOSE we've talked repeatedly about the challenge of preservice and really want to figure out how we can help from our national positioning. It is a REALLY challenging landscape.

Toby Horn: +1 Heidi

Dora Kastel (she/her): Teacher educators, PL providers, and Administrators/District leaders ALL need to those immersive experiences (student hat)

Ravit Duncan: Preservice contexts also need to take into account preparation for high stakes evaluations like edTPA and their expectations. Which focus on design rather than adaptation.

Maya Garcia (she/her/ella): Exactly Ravit! It is complex! Missy Holzer:+1 Ravit! Julie Contino (she/her): @Ravit - edTPA does not require design, you are totally allowed to use existing curriculum! **Kevin Anderson**: If there is a district doing amazing, coherent K-12 work in science, I'd love to go visit (maybe after pandemic). It could be a CSSS field trip!

Beth Short (she/her) - Smithsonian Science Education Center: I think the work that the Smithsonian Science Education Center is doing a great job of thinking carefully about how we can develop phenomenon driven learning. We are also doing a webinar series about developing and teaching for NGSS.

Wendi Vogel, Kent ISD: Following @NGSS_tweeps will have some really great models on varying levels too. Last week was Denver PS, this week is system level in CT. Heidi Schweingruber: +1 Wendi

Kate McNeill: This district in Massachusetts is doing amazing work around OpenSciEd https://www.the74million.org/article/curriculum-case-study-a-massachusetts-town-boostsstudents-stem-learning-by-letting-the-students-do-the-talking-its-real-life/

Carol O'Donnell, Smithsonian Science Education Center: Great model in NY outside of Syracuse using Lesson Study for PL experiences focused on NGSS Curriculum: <u>https://www.ocmboces.org/</u>

Tonyea Mead-DE: NGSX has been very positive in DE with our teachers and administrators before looking at materials.

Amanda Collamore: @Cory, if you're willing, I'd love to connect outside of this format to discuss some of the policies you have in NE to help have State level guidance with local control leading the final implementation.

Cory Epler: @you bet, Amanda! Shoot me an email: cory.epler@nebraska.gov

TJ McKenna (he/him): +1 Cory! I just came out to Nebraska for the NATS conference and it was a truly wonderful group

Ravit Duncan: Agree, yet many places do push their students to design from scratch even if they do not really have to. Perhaps more of a perception, not really a requirement.

Melissa Braaten (she/her/hers): For those of us working on questions about teacher preparation, two things would be really helpful: 1) funding and resources for developing more meaningful teacher prep experiences and researching those experiences, and 2) more shared vision/ practice with schools/districts who are equally responsible as teacher educators for our preservice teachers. Doing teacher preparation on a shoestring budget and in constant dissonance with surrounding schools limits what we can accomplish as teacher educators.

Beth Short (she/her) - Smithsonian Science Education Center: Please join us for our series if you'd like. <u>https://www.carolina.com/knowledge/2021/09/27/webinar-series-making-sense-of-three-dimensional-science</u>

Meg Richard, KSDE: It's the power of collaboration in Kansas- I only continue the work of Lizette B, Matt K and Greg S.. It's teamwork for the dream work

Kevin Anderson: @MelissaB, the educators that came out of your courses are amazing - my Q is how we translate your level of expertise to other teacher educators across the state (and beyond)...

Lin Andrews: @Maya. I wish I could come to breakout. I have to go back to work. PS: Been trying to contact you, but unsuccessful so far.

Maya Garcia (she/her/ella): Huge thanks to Sam Shaw and Jessica Henderson-Rockette for their work on that panel!

Amanda Collamore: Thank you for putting this together. I would love to have these kind of discussions on a monthly basis. Maybe a panel discussion each month. I have learned so much between today's discussion and the discussion held in October.

Toby Horn: *ⓐ* Heidi. I wonder if a Vision and Change model could be developed among the now many programs that grew out of the TEACH programs? (Sorry I don't remember the fellow who started the model at UTAustin (he was an NSF rotator-math edu).

Philip Bell - UW Seattle, he/him: On that last question around exemplary work, I wanted to add that BSCS Science Learning is doing awesome instructional materials and professional learning work. It has been a pleasure learning more about the depth of that work as a board member. You can learn more here -- http://bscs.org

Sam Shaw: Yes - thanks, Jessica Henderson-Rockette from Instruction Partners for your collaboration on this panel and selection of the questions for response. Can't wait to work with you again in the breakout session on IM, along with Christine Cunningham.

Mary Starr (she/her) MMSLN, MI: In the questions window there is a question about curriculum being used in teacher preparation. I just want to put out there that in many places teacher preparation is VERY different from what we might have experienced. Far fewer teacher candidates are being asked to create a unit from scratch or design a lesson sequence. Just like what we have encouraged in changing science learning in K-12 classrooms, many teacher preparation programs have changed their expectations.

Amanda Collamore: @Mary, I think that really varies depending on where the teacher is taking their pre-service courses. I very recently (last 3ish years) took a curriculum course and methods courses where we were required to create curriculum and were not given HQIM to potential adapt.

Paul Zachos: Attainment of the standards

Philip Bell - UW Seattle, he/him: Assessments should be one layer of interaction that shape the intellectual relationship between teachers and learners.

Carol O'Donnell, Smithsonian Science Education Center: That the experiences and the assessments of performance align.

Heather Johnston: Assessing while learning. Immediate feedback for both student and teacher.

Ellen Ebert: Student sense of self-efficacy and self-motivation to engage with their own curiosity about the world around them.

Betsy Barent: Their curiosity and confidence in their ability to make sense

Tina M Larson: I think a S assessment experience should make them feel just at least a bit more empowered to understand the world they live in! =:)

Bill Penuel (he/him/his): All students see themselves as knowers and doers of science, and have opportunities to express those identities

Neil Lundgren: I value students understanding that science is a process, there is no "done". There is always room for improvement, revision, new ideas, innovation.

Kevin Anderson: Appreciate starting with vision! I wonder whether there are any good resources around student portfolios, which to me can align very well with identity in assessment...

Kate McNeill: Rich student sensemaking about relevant phenomena and problems

Bill Penuel (he/him/his): Students experience science as personally relevant and focused on investigating questions of concern to them and their communities

Arthur Camins: Students making sense of their own thinking is the heart of assessment. It is integral to instructional materials design.

Charlie Thompson, LPI (she/her): Assessment for and as learning, students should be consistently engaging with new material and updating their priors, practicing science/skills, and should see assessments as relevant to their interests, goals, and self

Kevin Anderson: Do all states have a clear vision for science learning? <u>https://dpi.wi.gov/science</u>

Lindsey Roy: @Kevin- Nebraska Ethos- <u>https://www.education.ne.gov/science/</u> Maya Garcia (she/her/ella): Colorado Resources: <u>https://www.cde.state.co.us/postsecondary/perfassessment</u> Maya Garcia (she/her/ella): Calibration Protocol: <u>https://www.cde.state.co.us/sites/default/files/docs/postsecondary/Calibration%20Protoc</u> ol_%20Hybrid.pdf Maya Garcia (she/her/ella): Validation protocol:

https://www.cde.state.co.us/sites/default/files/docs/postsecondary/Validation%20Protoc ol.pdf **Maya Garcia (she/her/ella)**: Final resource for CO Performance assessment work: <u>https://www.cde.state.co.us/assessment/coassessmentlitprog</u>

Mark Meszaros: Scientists learn by doing, failing, learning, failing, and slowing making sense of what they are researching. Assessments should help students understand where they are in this process.

Cary Sneider: I value student voice in response to open-ended engaging assessment items

Richard Duschl: Polishing and extending ideas, questions, consideration of forms off evidence and 'what counts' as a plausible pathway forward.

Heidi Schweingruber: Not to be nitpicky, but the "Developing Assessments for the NGSS was BOTA and BOSE! We were in the mix!

Heidi Schweingruber: BOTA = Board on Testing and Assessment; a board at NASEM that no longer exists April McCrae: ++ Heidi that report was a blueprint for what to do

April McCrae: ++ Heidi...that report was a blueprint for what to do....

Kate McNeill: I used this tool from the Task Annotation Project in Science in my methods class yesterday. Great 2 pager around equity and assessment - <u>https://drive.google.com/file/d/1V9EITtsFWVAb-</u> hTuCqX3LdZquFPWnZNC/view?usp=sharing

Elisa Slee: I like this task because it's apparent that the students are actually learning in the process of doing the task.

Heidi Schweingruber: +1 Elisa

Rachel Connolly: Can you share the link to the resource/portal?

Amy Stephens: @Rachel:

https://docs.google.com/document/d/1JKm2jhbE85Nb4QinfaoogdHEoCsZo9Ep55VdK WYTnDs/edit?usp=sharing

Cary Sneider: The task that Jim showed is good to assess scientific thinking. I'd like to see an extension related to how they would apply their insights to engineer a healthier garden. What's the goal of using the chemical? What's the advice to Liz given their findings?

Shari Templeton (she/her): @Cary – agreed

Peter McLaren: +1 Cary. The SEPs used by the students in the audio clip are transparent but I would like Jim to comment on how the crosscutting concepts were used in the task to helps the students focus in on the aspect(s) of the phenomenon used in the task?

Arthur Camins: If science is about sense making of the natural world, then assessment is about making sense of student sense-making. So, rather than designing external "assessment" tasks, would it be better to focus on ensuring that instructional materials make opportunities for student reflection, and guidance for teacher interpretation and feed back to students in its design.

Tina M Larson: @ Arthur - sounds like good idea for formative assessments leading up to a summative one. =:)

Arthur Camins: Got it. But then time is an issue since they rarely have time to complete their instructional sequences.

Ted Willard: I am wishing I someone had put together a set of bingo cards ahead of the panels today. "Anchoring Phenomena" would be filled in several times. ;-)

Philip Bell - UW Seattle, he/him: Love that extension idea, @Cary! It would be a great segue to ecological caring practices (through an engineering frame).

Tina M Larson: Small groups could each have a different "INVESTIGATIVE" phenomenon to work out, then share w/whole class to work on deeper understanding of 'ANCHORING" phenomenon - love it. =:)

Peter McLaren: +1 Tina. Using analogous phenomena that relate to the core idea(s) used in the lesson or task provides rich opportunities for discourse and sense making by making connections between the reacted but different phenomena to the core ideas. **Tina M Larson**: Thanks, Peter! I love opportunities to permit Ss to think their thinking is valued, whenever they can feel they're contributing something of value! (Even joking around as they do it!). =:)

Amanda Oberski: @ Peter - the CCC for LS2-2 is "Patterns: Patterns can be used to identify cause and effect relationships." The students are discussing cause and effect as they work through "increase because, \ddot{A} ¶ decrease because". The Learning Performance they were being assessed on did not include multiple ecosystems (part of the PE where patterns could be applied), just focused on constructing an explanation that describes the patterns of interaction in her backyard

Kelly Carey: I would love for the collective vision for assessment to be a process and not an event that happens. Kids say, "I have a test today..." But they don't say, "I have a lesson/lab today."

Amanda Collamore: +1 Kelly

Jill Wertheim: @Alec so glad you are all filling that gap!

Kevin Anderson: @Alec, how are you designing the toolkit to make sure it's effective, even if it's not based in the curriculum that a district/school is using? Melissa Braaten (she/her/hers): I appreciate what Alec shared about short-cycle assessment processes. My local school districts where I work with student teachers and teachers have said explicitly that teachers shouldn't bother with classroom assessment and should instead wait for the results of long-cycle, external assessments. This has been one of many frustrations of trying to support the shifts from the Framework and NGSS.

Wanda Bryant: Don't bother with classroom assessment is MYTHICAL

Amanda Collamore: Angela, YES! We need to help break down the siloes

Philip Bell - UW Seattle, he/him: Love the vision @Angela just put on the table. Funds of Knowledge is described in Ch11 in the Framework. People may not be as familiar with the more recent Funds of Identity concept, Åî which is a really powerful move to be making. Here's one paper on that concept:

https://www.researchgate.net/publication/262637825 Funds of Identity A new conce pt based on the Funds of Knowledge approach

Maya Garcia (she/her/ella): Well said Angela, we are working to connect our rural science educators across communities

Melissa Braaten (she/her/hers): @Bill, Maya, and Angela: Is any of this Colorado work taking place in the K-5 space? I am not seeing evidence of it in the 8 districts where I'm working so I'm wondering if there are some holes in the system.

Maya Garcia (she/her/ella): It is focused on HS for the most part Melissa Bill Penuel (he/him/his): @Melissa: Definitely holes in the system. Our project is Grades 6-12 focused

Maya Garcia (she/her/ella): READact issues

Maya Garcia (she/her/ella): But we are working to launch some Early Science work (PK-2)

Melissa Braaten (she/her/hers): Ok, thanks. More work to do.

Maya Garcia (she/her/ella): Absolutely Melissa

Bill Penuel (he/him/his): One approach CU-Boulder and BSCS are collaborating on is supporting rural educators in learning to develop 5D assessments: https://stemforall2021.videohall.com/presentations/2097

Bill Penuel (he/him/his): My colleague here Melissa Braaten, and colleague Kerri Wingert, are also teaching as part of an online master's certificate here at CU to support assessment leadership in science for equity: <u>https://www.colorado.edu/education/academics/graduate-programs/teacher-leadership/graduate-certificates-teacher-</u>

leadership#Leading%20for%20Change%20in%20Science%20Assessment%20Practice

Bill Penuel (he/him/his): If April McRae is here from DE (or others), I know they committed to K-12 PL in assessment

Ted Willard: We will not run out of things to work on. Tina M Larson: LOL Ted! =:)

Maya Garcia (she/her/ella): DC PLD's (Performance Level Descriptors): <u>https://dc.mypearsonsupport.com/plds/</u>

Peter McLaren: If you can google it it is probably not a phenomena. Stephen Pruitt (2012) Maya Garcia (she/her/ella): +1 Peter

Heidi Schweingruber: In informal conversations I've had with teachers, I'm often struck by the really wide range of ideas they have about what assessments means and needs to look like. I feel like the national emphasis on large-scale assessments broadly has done damage to the assumptions people make about what is assessment is and should do.

Ted Willard: Link to that complexity framework please

Maya Garcia (she/her/ella): Can we share the link to that TJ

Maya Garcia (she/her/ella): <u>https://www.nextgenscience.org/taskscreener</u>

Bill Penuel (he/him/his): Aneesha and Miray's tool: <u>https://files.eric.ed.gov/fulltext/ED603610.pdf</u>

Maya Garcia (she/her/ella): <u>https://www.achieve.org/our-initiatives/equip/tools-subject/science/task-annotation-project-science</u>

Bill Penuel (he/him/his): Task complexity tool adapted by MI (don't have the MI tool): <u>https://files.eric.ed.gov/fulltext/ED603610.pdf</u>

Heidi Schweingruber: I can't put a question in the Q&A, but I would love to hear panelists talk about how they address this kinds of conceptions about assessment as they work with educators.

Kelly Carey: I would also like to add that TJ has been SUPER transparent about the process for developing the state assessment as an item cluster assessment --- and has even facilitated workshops to support teachers in thinking about 3D assessment.

Ravit Duncan: I also wonder how identity and interest show up in conversations around assessments

Trisha Herminghaus: TJ, your words regarding a test worth teaching to echo those of George Hein, longtime science educator

John Olson: I have been trying to shift the discussion from "assessments" which implies tools to evaluation of learning which is often done informally with probing questions. What skills do teachers need to do this?

Kevin Anderson: +1 John Maya Garcia (she/her/ella): absolutely John! Tina M Larson: @ John - good idea to try to articulate what skills teachers need to do this. =:)

Heidi Schweingruber: BOTA and BOSE report! :-)

Ted Willard: While I fully endorse the idea that state assessments can't do everything, I think we have to be very clear that whatever a state assessment looks like will greatly affect what teachers and district admins thing all assessments look like. We cannot get away with thinking we can tell them to do one thing in their classrooms while the state assessment does something else. They won't hear that message.

Linda Cook: I absolutely agree, Ted!

Maya Garcia (she/her/ella): BOTA and BOSE report Jim is referencing:

https://www.nap.edu/catalog/18409/developing-assessments-for-the-next-generation-science-standards

Bill Penuel (he/him/his): ACESSE Resource A addresses four common models of assessment in systems, as a way to get teachers thinking about different kinds of assessment: <u>http://stemteachingtools.org/pd/sessiona</u>

Peter McLaren: Well designed, 3D State Science Assessment MUST signal the instructional shifts happening at the classroom level. If there is a disconnect the potential for discord within the system is great.

Linda Cook: Exactly, Peter! If state or district assessments are not written as 3-D, then we cannot expect classroom practices and classroom assessments to be 3-D. Maya Garcia (she/her/ella): Agree! I think having a coherent system of assessments with the state level assessment being one of them

Bill Penuel (he/him/his): One recommendation (often ignored) in the BOTA report is that we said states cannot test all the PEs every year, as that would undermine the vision

Heidi Schweingruber: +1 Bill -- pivoting to thinking about systems of assessment is so important.

TJ Heck (She/Her) Michigan Department of Education: @Bill - True! That is where bundling and matrix sampling comes in!

Heidi Schweingruber: @Bill -- and also, if I remember correctly, matrix sampling students to track school/district progress. Bill Penuel (he/him/his): Yes, @Heidi

Maya Garcia (she/her/ella): Yes Bill

Kevin Anderson: Honestly, I think we have a decent state science test, but I'm not clear that it (on its own) has had any discernible impact on practice.

Maya Garcia (she/her/ella): What is the purpose of science assessment? Ted Willard: @Maya We should think about the purpose of our assessments? How radical!!
Maya Garcia (she/her/ella): We need to shift mindset around the purpose of assessment among our leaders as well
Maya Garcia (she/her/ella): There is a level of tunnel vision that has developed with regard to accountability systems
Ted Willard: Absolutely Maya
Shari Templeton (she/her): Couldn't agree more, Maya!

Linda Cook: Sometimes the school administrators undermine efforts for improved science instruction of they do not see a direct connection to the state science assessment.

Bill Penuel (he/him/his): Research behind different models of assessment is here to support more practice-focused assessment that is connected to students' identities: https://kappanonline.org/design-principles-new-systems-assessment/

Maya Garcia (she/her/ella): I think science is further ahead in this discussion than our math and ela counterparts

Richard Duschl: Great overview of the decadal dynamics that hove forged our understandings around BOTH Performance and Summative Assessment

Heidi Schweingruber: Great question about grading in the Q&A. I feel like the conversations I hear and see around grading often reflect the ways that the "new" approach to science assessment just doesn't fit well with our old systems/approaches.

Kelly Carey: @Heidi --- this is a question we are diving into now as we look at 3D assessment data.....much to be learned!

Victor Sampson: What is being done to limit systematic bias in assessment tasks, especially when asking students to make sense of related phenomena that people might be more or less familiar? Related, what is being done to increase the likelihood of making a valid interpretation of student performance on these tasks?

Ravit Duncan: +1 Victor, good question. Linda Cook: Great questions, Vic. Susan Berg: +1 Victor

Bill Penuel (he/him/his): @Victor: One thought is this is a design challenge to be considered up front, and then actually assessed in terms of giving students what they need to know to have access to the task. One framework we are working with is Caitlin Fine and Erin Furtak's SAEBL framework to help us think about this: https://www.nsta.org/science-teacher/science-teacher-julyaugust-2020/saebl-checklist

https://www.insta.org/science-teacher/science-teacher-juryaugust-2020/saeor-checkfist

Maya Garcia (she/her/ella): What TJ is naming around engaging more diverse communities in the design and development process is super important in the development at all levels, but yes certainly at the state level

Philip Bell - UW Seattle, he/him: Thank you for those powerful insights & guidance, TJ!

Tina M Larson: Everything TJ said about Bias Sensitivity - fist bump! =:)

Arthur Camins: A major source of inequity is difference in how students (and teachers and administrators) understand the purpose of assessment. Many see it as judgment, rather an opportunity to figure out how to improve their learning. So, starting in the classroom, teachers' perspective about assessment and classroom culture need to part of a strategy for improving how assessments get used.

Heidi Schweingruber: +1 Arthur

Trisha Herminghaus: Thank you Daniel!

Kevin Anderson: I second (third) the need for more resources around effective and equitable grading in a 3D environment

Betsy Barent: @Kevin I fourth and fifth that

Kelly Carey: TAPS and SAEBL resources can be added to the list of assessment: <u>https://www.nsta.org/science-teacher/science-teacher-julyaugust-2020/saebl-checklist</u>

April McCrae: That is a very strong argument for systems of assessments--recognizing that one assessment does NOT serve the purposes of all levels of the educational system.

Kevin Anderson: @Jim - Same challenge in pre-packaged curriculum materials (link to this morning) - need more resources on adapting to local contexts.

April McCrae: Large scale assessment monitors the macro level, assessments to monitor student-level understanding should very proactively be focused on contextualized learning and understandings

Heidi Schweingruber: So many issues to unpack here from the classroom to large scale, to systems, to grading. Maybe we need a whole meeting just on this!

Rachel Connolly: +1 Heidi Kip Bisignano: @Heidi...Agreed! Maya Garcia (she/her/ella): Absolutely Heidi Rachel Connolly: +1 Heidi

Maya Garcia (she/her/ella): Wondering about the range of discussions we are having around assessment. often we have discussions about large-scale and classroom assessment separately, but as we think about coherence across the system as Angela has named

Linnea Gibson: A real challenge are the standards based grading pushed within science.

Bill Penuel (he/him/his): Qualitative feedback is key!

Tom Keller: Maine had a fairly mature "Local Assessment System" but the governor killed it due to the state NEA saying it was too much work

Bill Penuel (he/him/his): Paper Jim is referencing: Shepard, L. A., Penuel, W. R., & Pellegrino, J. W. (2018). Using learning and motivation theories to coherently link formative assessment, grading practices, and large-scale assessment. Educational Measurement: Issues and Practice, 37(1), 21-34. <u>https://doi.org/10.1111/emip.12189</u>

Philip Bell - UW Seattle, he/him: This conversation makes me wonder how we are doing as a community shifting social / political currency to more contextual / classroom / ecologically valid assessments (as compared to state / large scale assessment given the diminished contextual possibilities that have been described).

Bill Penuel (he/him/his): ^^@Phil

Ted Willard: Big issue, but it is NOT going to go away as something that has to be addressed

Bill Penuel (he/him/his): Love the idea of focusing on the micro-systems, TJ!

Victor Sampson: We really need to give students more opportunities for peer review, critique, and revision in the classroom. This promotes a shared understanding of what counts and promotes growth over time.

Maya Garcia (she/her/ella): +1 Vic

Bill Penuel (he/him/his): Really great book on grading:

<u>https://www.heinemann.com/products/e10951.aspx</u> (by an English teacher, but their biology teacher spouse uses the system in my daughter's biology class)

Richard Lahti, Minnesota State Moorhead: TJ asks who is grading serving, so many people use grades, not to mention that how we grade (especially with so many schools going test blind) is now the sole determination of scholarship qualification, at a school like Northern Michigan.

Ted Willard: *(a)*TJ, while I am not saying that I disagree with your statement that grading doesn't serve parents, I think most parents think it does serve them. Which is part of the issue.

TJ Heck (She/Her) Michigan Department of Education: @Ted - I agree...this is where assessment literacy needs to move beyond "how it was when I was in school" **Tina M Larson**: Yes @ TJ - if grading elevates the S, then parents, higher ed institutions, and community would be served also, no? =:)

Ted Willard: I'm more and more wanting to think about progressions of understanding and of practice for different communities: Teachers, Admins, Parents, Community

John Olson: Since teachers have the best pulse on student understanding, perhaps district level data should come from teachers.

Trisha Herminghaus: ^^John! Peter McLaren: Love that idea John Olson!

Maya Garcia: Comments or thoughts about the Pre-K report out? Feel free to add them here Maya Garcia: And any questions you might have in the Q and A

Deborah Batzer: Our county is using The Creative Curriculum with our preschools and we are finding excellent outcomes.

Ellen Ebert: Andres, super helpful information. We have also witnessed that we underestimate our early childhood learners and what they are able to do.

Amanda Collamore: The age levels for ECE are birth to 8 and the push down into grades K and 1 and even more to push down into PK is a real challenge. The PK explorative and observational learning practices in birth to PK should be brought back to K & 1.

Philip Bell: Great synthesis! Thank you. It also strikes me that outdoor preschool efforts represent a powerful model that should be informing K-12 #SciEd in terms of place-based investigations, connections to nature, etc.

Maya Garcia: That certainly came up in discuss Phil! Katherine Culp: +1 Phil

Maya Garcia:+1

Amy Stephens: As a reminder, if there are any resources you want to share, here is a space:<u>https://docs.google.com/document/d/1JKm2jhbE85Nb4QinfaoogdHEoCsZo9Ep55VdK</u>WYTnDs/edit?usp=sharing

Ted Willard: I'd like to emphasize the need for building teacher capacity both BEFORE and AFTER the selection of instructional materials. Teachers play an important role in the SELECTION of materials (which they should), but it is important that they understand a need to change instructional practices in order for them to embrace instructional materials that support those practices.

Kate McNeill: TIME is also in the "Instructional Practice" summary. You will see it again!

Tina M Larson: Love the "education for parents/taxpayers"! =:)

Carolyn Higgins: never enough time (and time= money in districts where teachers get paid to attend PL)

Maya Garcia: Great session on integrated approaches in the PK-5 report as well

Bill Penuel (he/him/his): We need a new federal program like Eisenhower, MSP, and programs like Local Systemic and State Systemics to make progress in providing Ts with adequate opportunities for sustained, coherent PL

Maya Garcia:+1 Bill Ted Willard: +2 Bill Heidi Schweingruber: @Bill I'm talking with an interagency working group tomorrow and I'm going to make that very pitch! Mary Starr (she/her) MMSLN, MI: +1 Bill Sam Shaw: Go Heidi!

Carolyn Higgins: Bill- that would be amazing Philip Bell: +1 Bill // Fabulous, @Heidi! Jill Grace - K-12 Alliance: YES Bill and Heidi! Arthur Camins: Go for it, Bill! Stacey van der Veen: Heidi that would be incredible... Bill Penuel (he/him/his): Yay @Heidi! Tina M Larson: Go, Heidi! =:) Carolyn Higgins: Heidi +100 Katherine Culp: +1 Bill and Heidi! Also so important to learn from the past. What can we do to make change stickier, more comprehensive and inclusive? Kevin Anderson: Agreed, Bill, but we need better structures for sharing learning from those often small-scale PL groups. In WI, the learning was great for 20 teachers in pockets, but never systematically shared or made sustainable in meaningful ways.

Lizette Burks (she/her/hers): +1 Kevin!

Bill Penuel (he/him/his): @Kevin: The most lasting changes were in my experience ones where states and districts developed infrastructures for teacher leadership that then lasted even after the funding ended. Agreed that small scale PL is not the answer, needs to be systemic
Mary Starr (she/her) MMSLN, MI: Agreed @Kevin and also some systemic way to make sure funds and resources reach the currently under-funded districts. Kevin Anderson: @Bill - right, I learned about states doing that - ours would not consider that approach...

Ted Willard: It is truly amazing what we have done in the last decade with so little funding Maya Garcia: Don't bring that up Ted... then they will use that as an example

Toby Horn: BBB!!! Eisenhower stopped the year right around when I started teaching in '85!

James Emmerling: materials that support student navigation of our current realities - selecting trusted sources of information, understanding impacts of technology, etc.

Stacey van der Veen: I know I'm a broken record - but Teacher Leaders are a huge part of that infrastructure!

Bill Penuel (he/him/his): Even a decade after SSI funding ended, South Carolina and Alabama, for example, were still offering sustained PL (albeit at a lower frequency)

Maya Garcia: Is it legislated funding supporting that Bill? **Heidi Schweingruber**: @Bill -- while we were working on the Call to Action a couple committee members pointed out how important those systemic initiatives were for building lasting capacity in states and regions.

Bill Penuel (he/him/his): The SSIs and LCSIs were NSF-funded projects. Not sure I know the history of where they started

Bill Penuel (he/him/his): Congress or NSF)

Mary Starr (she/her) MMSLN, MI: In Michigan the MMSLN started as part of those science funding programs and 30 years later we are still here (although in a different configuration.)

Tina M Larson: @ Mary - I first joined the "Oakland County Science Committee" in 1983! =:)

Tina M Larson: I love the frequency of the word "ROUTINE" in your summary! =:)

Toby Horn: IMO, a crucial value of NGSS was that so many K-12 teachers wrote the standards. Teacher voice continues to be crucial for assessment & practices in the classroom AND for structuring teacher preparation.

Stacey van der Veen: What Sara just said about localization is part of the tension I hear in these conversation - we need the support of national initiatives (and funding) but these initiatives have to be adaptable to the local context

Bill Penuel (he/him/his): ^This is an irreducible tension, we really have to live with it, and design-for and resource for it.

Lauren Slanker (MSI, Chicago): +1 Stacey! And provide teachers with PL to support that adaptation!

Amanda Collamore: +1 Stacey - we lose buy-in if localities feel they lack control Heidi Schweingruber: @Stacey and Bill -- The Call to Action explicitly called out this tension and tried to signal ways for policy makers to move policies forward in ways that can support local and regional adaptation

Bill Penuel (he/him/his): Link to Call to Action: https://www.nap.edu/catalog/26152/call-to-action-for-science-education-building-opportunity-for-the

Wendi Vogel: To add to the vision needed, we also need to figure out how to make science a value within a system

Stacey van der Veen: +1 Wendi. Science was too easily thrown to the side over the past year in some of our local elementary schools

Kate McNeill: 2 minute video with this young woman, her teacher and a couple of her classmates. If you ever need a smile!

https://www.youtube.com/watch?v=RPi2sbU3uBY&list=PLSLDxqPb5NQkcfRYh6c64Jj5LgB 7swRk7&t=170s

Amy Stephens: Both the Promising Futures report and the EL STEM report elevate those ideas!

Amy Stephens: EL STEM: <u>https://www.nap.edu/catalog/25182/english-learners-in-</u><u>stem-subjects-transforming-classrooms-schools-and-lives</u>

Amy Stephens: Promising Futures: <u>https://www.nap.edu/catalog/24677/promoting-the-educational-success-of-children-and-youth-learning-english</u>

Amy Stephens: Brilliance & Strengths: https://www.nap.edu/catalog/26215/scienceand-engineering-in-preschool-through-elementary-grades-the-brilliance

Elizabeth A Davis: @Jennifer -- the Brilliance & Strengths preschool - elem report reviews a few wonderful ones in chapter 7!

Jennifer Hicks: thanks @Betsy.

Tina M Larson: I appreciate having all this documentation of quality collective thinking and experience from Science Leaders all ever the country!! =:)

Amanda Collamore: I think I would love to see more on successful policy development at the State level that could be mirrored/adapted for other states?

Heidi Schweingruber: @Amanda -- great idea! Maya Garcia:+1 Amanda Jennifer Hicks: +10 Amanda Tina M Larson: Yes, Amanda, and in a convincing format quite readable for & sharable with state legislators. =:) Amanda Collamore: @Tina, agreed! Larisa Schelkin (USA): @Amanda - I second that!

Kate McNeill:@Sam. I agree. Time and professional learning are both so important.

Arthur Camins: What strategies can we use to position assessment, especially formative (kids using assessment to advance their learning) as central to equity?

Ted Willard: I continue to wonder what the true capacity of the system is for change **Shari Templeton (she/her)**: @Ted -- especially coming off a pandemic and folks wanting to return to "normal"., aka status quo

Bill Penuel (he/him/his): Ted, a question we could ask is: Where has education made changes system-wide, and what were the conditions for that? There are examples of things that are picked up, and also infrastructures (the National Writing Project) comes to mind that are both local and scaled. We have to look outside science for examples

Shari Templeton (she/her): +1 Bill

Heidi Schweingruber: @Ted -- I think there absolutely is capacity for change. But, more and more I think that some of the changes are so profound that we can't only talk about them in our science/STEM space. We are asking for across the board changes in the system. Many subject areas are headed in a similar direction. We have to join forces, not compete with one another.

Tina M Larson: Yes, Heidi - join forces. =:)

Amanda Collamore: +10 Heidi - this goes back the importance of the removal of siloes

Lizette Burks (she/her/hers): +1 Heidi, will help school leaders as well with coherence.

Christine Salloom: Professional learning needs to be a part of our jobs, not some volunteer or lower paid optional activity. Right now it doesn't matter how much we pay, teachers don't have the bandwidth for anything 'extra'

Kevin Anderson: And, we honestly need to extend these conversations to other disciplines. My social studies colleagues, for example, are nowhere close to where the science community is on assessment.

Amy Stephens: I have been struck by how we need to continue to learn more about and highlight existing work around the development of our leaders and how to provide supports for them to support our educators in providing equitable science learning opportunities

Amanda Collamore: +1 Amy

LeeAnn Mikkelson (she/her): What is the purpose of the US educational system?

Heidi Schweingruber: Also, we won't get system change if we never reach decision-makers and education leaders who aren't already in the science/STEM "club"

Amanda Collamore: Absolutely! Stacey van der Veen: Yes Heidi!! **Philip Bell**: I'm left wondering if we have collectively thought enough about "what to leave behind" post-pandemic as opposed to getting back to "normal." What can we move away from? What should we move towards? e.g., there was a lot of place-based, local investigations by youth (often with their families) last year during remote instruction. Did we as a science ed community hold onto that productive shift?

Stacey van der Veen:+1 Phil, we're having the same conversations here Amanda Collamore: +1 Phil Trisha Herminghaus: +++Phil Larisa Schelkin (USA): +10 @Phil Lizette Burks (she/her/hers): Would love to see a padlet/document with those collective ideas @Phil. Bill Penuel (he/him/his): My answer to Phil's question is here :-): https://kappanonline.org/possible-futures-equitable-assessment-penuel/ Philip Bell: +1 Bill

Amy Stephens: You can find all resources on the project page: <u>https://www.nationalacademies.org/our-work/taking-stock-of-ngss-implementation-a-summit</u>

Andres Bustamante: The early childhood space is such an interesting one because science is way underrepresented (or absent) but there are so many things that ECE does really well like family and community engagement, hands on exploration and inquiry, play-based learning. I see such potential in building connections between early childhood and K-12 science learning spaces. I think both contexts have much to learn from each other :)

Heidi Schweingruber: +1 Andres Elizabeth A Davis: +1 Andres! Elisa Slee: Yes, @Andres Shari Templeton (she/her): Absolutely, Andres! Tina M Larson: Yes, Andres, b/c Science is EVERYWHERE in the ECE! =:) Amanda Collamore: +1 Andres - I started my career in ECE and I utilize the practices I learned in my curriculum development for K-12 - I was taught to always ask "what's your goal?" in any activity/curriculum development