Joint Statement from NSTA/NSELA/CSSS on OSTP STEM Education RFI - Fall 2020 - Draft

The current Presidents and other leaders from the National Science Teaching Association (NSTA), National Science Education Leadership Association (NSELA), and Council of State Science Supervisors (CSSS) came together to discuss the OSTP STEM Education RFI and determine common points of interest in this area. We provide the following answers to select RFI questions as a joint statement of our organizations, building on insights from our members across the country. These responses are also attached as a pdf.

Sincerely,
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Future Opportunities in STEM Education

1. COVID-19 Related Digital Barriers

Access to broadband continues to be a top digital barrier. Districts are providing hotspots, putting hotspots in community areas, and working with ISPs to provide internet access to families who cannot afford it, but the barriers are only partially overcome. Many families do not have access to sufficient cell service or broadband in their homes and do not have means for students to go to community spaces for access. Access to devices in general, and devices that can effectively manage online learning with multiple people in the household on the internet, is a concern for many families as well. Where schools have 1:1 devices, sustainably managing them is also a challenge. Finally, students with different abilities continue to struggle to find the accommodations they need.

Digital learning platforms could be better. They require ongoing training for families and educators to be able to use effectively, with some being more user-friendly than others. Educational resources designed for an online environment could also use further investment. There are still limited options that fully align to the research-based *A Framework for K–12 Science Education* (hereafter referred to as the *Framework;* National Research Council, 2012), which 44 states currently use as the foundation for their science standards.

2. New or Existing Educational Programs

There continues to be a significant need for instructional materials that are designed specifically to support the vision for science education that was described in the *Framework*. The commercial market remains dominated by instructional materials that focus on the acquisition of scientific knowledge and the development of isolated skills. This design is misaligned with the current approach to teaching and learning in K-12 schools. The current approach centers science investigations and engineering design. When investigations and design are at the core

of science instruction, all students engage in the three-dimensional learning described in the *Framework for K-12 Science*. Centering investigation and design in instructional materials provides greater opportunities for historically marginalized students to learn rigorous science. Notably, high school science courses particularly lack materials aligned with this vision.

Much of the currently available instructional materials fail to leverage currently available technology. Virtual field trips, virtual interactive science investigations and design, interactions with community partners, and the opportunity to engage with out-of-school education partners are all important components of modern science instructional materials that are not widely available to students. More opportunities to co-design these experiences with out-of-school partners would be welcome.

There are a few examples of open-access, high quality science instructional materials available that exemplify science instructional materials being designed to meet the demands of the *Framework*. These include:

- inquiryHub: Research-based Curricula Supporting Next Generation Science,
- Next Generation Science Storylines, and
- OpenSciEd

3. Positive Experiences and Innovation

Many educators are creatively pushing science out of the classroom and lab to better involve students, families, and communities. Sometimes, when schools or community organizations provide students safe materials to explore relevant phenomena at home, it is easier for them to engage in their own sensemaking that is tied to their family and community, rather than look to the teacher or classmates for the answer.

Many educators have connected students to citizen science initiatives, which provide local and meaningful science opportunities for students. Federal agencies could do more to develop and share student opportunities to collect and analyze real scientific data.

Many organizations, from states' departments of education to national education groups to regional service agencies, have supported educators in the shift to virtual instruction. This proliferation of learning and learning networks has been a significant positive for educators and for building community. Our organizations, in partnership with several colleges and universities have been working tirelessly to create learning experiences that prioritize equitable access to high quality science learning opportunities. The Global Pandemic has created a demand for learning experiences that are equitable, accessible, and adaptable to multiple settings including remote learning, blended learning, and in face to face settings.

Federal efforts to support communities may be too distant to be as effective, but there may be ways to support these connections on a more local level. While a wide range of networks support teachers in this social media era, quality and coherence are sometimes lost amongst

the sharing of what is quickly useful in the moment. There is a need to create a system that organizes and supports these distributed networks of educators.

4. Challenges with Online Learning

The greatest challenges include the aforementioned lack of access to broadband internet, variable access to teacher learning that is relevant for the current environment, and effective instructional materials for online learning. Education systems often do not have the capacity to support sufficient educator learning, particularly in each subject area, so educators are left to fend for themselves. Additional funding for ongoing professional learning is critical, particularly for educators serving higher needs populations.The federal government could also share examples of innovative, sustained professional learning systems that link to community partners and provide nimble resources based on evolving needs.

A new challenge being faced by educators and students is online learning fatigue. Not only is there the need for educator training on online materials, but also how to effectively and equitably engage students in meaningful asynchronous learning off the screen.

Many school districts across the country are limiting learning time in subjects beyond mathematics and English/Language Arts, particularly at the elementary level. Equitable time allotment becomes a major issue for science and STEM.

Teacher shortages, especially in rural and urban areas, are becoming even more of an issue as educators leave the field early due to COVID-19 concerns and burnout with implementing new modalities.

While take-home kits can provide increased access to lab-based science learning, educators worry about liability issues. This liability concern means some districts are unwilling to send home materials or allow teachers to encourage use of at-home materials. Federal monies could support the development of clearer safety and liability guidelines. Common safety guidelines from which curriculum developers are held to and from which legal counsel for school districts to make decisions for their use would alleviate some of the concerns that limit the use of instructional materials in home settings.

5. Areas for Professional Learning

Equitable instruction is a significant need for professional learning. Educators need support in meeting the needs of all learners and ensuring all students are meeting objectives. But, accomplishing that goal requires system-level shifts; administrators need further guidance and support on how to create equitable systems for learning for all students. Further, there are frameworks for effectively designing learning opportunities for youth, such as SAMR, but educators need learning on how to use these types of ideas to best harness technological tools. Additionally, research suggests that professional learning connected to effective instructional

materials is particularly impactful -- developing materials that can be used flexibly online and in-person, along with the training to use them, is critical.

Teachers struggle the most with a blended classroom, where some students are in-person and some are online. Support for that maximizing that type of learning would be welcome. Further, educators need more than training on how to use particular technologies; they need to know how to use those technologies to support effective student dialogue, assess meaningful learning, and provide actionable feedback to students. The federal government could fund studies on the best methods of hybrid and online learning and instructional technologies to enable adaptation to emergency situations like COVID or natural disasters.

Teacher training programs particularly struggle right now with providing any field experiences for students, even with virtual classrooms. IHEs could use support exploring innovative solutions to this challenge. IHEs could also use funding to determine how teacher preparation on the use of technology in the classroom could be enhanced. Most teachers are not prepared well in this area. With many teachers being trained through alternate routes, assurances of effectiveness becomes even more important. IHEs must be part of a full ecosystem of coherent and ongoing learning.

6. Data and Information

Large-scale assessment, like high-stakes multiple choice tests, are a terrible idea during COVID and should be rethought in general beyond COVID. As seen through the last 20 years, they have little impact on educational systems. While they have importantly highlighted achievement gaps, real systems change has not been a result. Tracking achievement gaps is important moving forward, but that can be done through assessments with a more limited scale and scope. Local and actionable systems of meaningful student learning data should be supported (see National Academy's report, *Developing Assessments for the Next Generation Science Standards*).

It would be useful to know what is being taught across the country in terms of science and STEM throughout K-12 grades. These subjects are particularly important for developing student identities by the end of elementary school, but that is where they are most often scaled back. This has implications for student engagement and persistence in STEM pathways at the secondary level.

Beyond the COVID era, the Federal Government could provide better systems for tracking longitudinal outcomes of students. With students leaving states and regions, it is difficult to collect and use post-secondary outcome data.

Develop STEM Education Digital Resources

9. Types of Web-Based Resources Needed

There is an ongoing lack of instructional resources that meaningfully integrate grade-level, standards-based ideas across all STEM subjects. Effective engagement with science or mathematics concepts, or both, tends to be missing most often. Further, materials are put forward as truly “STEM” but are not -- vetting continues to be a major challenge.

While packaged curriculum materials can support effective and equitable instruction, there is an ongoing tension between widely applicable materials and adaptation to local needs and phenomena. That adaptation process is critical, as is supporting educators in seeing the connection between local,culturally-significant phenomena and a broad range of standards that relate to it. Culturally-affirming and sustaining practices, possibly because they can be locally dependent, are less likely to be part of available materials.

Additionally, elementary learning in particular often hyper-focuses on literacy and mathematics. There is a need for more quality science and STEM resources (as well as social studies resources) that clearly demonstrate gains in literacy and mathematics learning as well.

11. Resource Categories

Useful categorization includes subject, topic, and grade band. Links to elements of the National Academies Framework for K-12 Science would be useful, as 44 students use standards built from this document. It would also be helpful to have categories for local and regional phenomena.

Engage Students Where Disciplines Converge

24. Connections to the Federal STEM Education Strategic Plan

While our work clearly aligns with the goals and pathways of the Federal STEM Education Strategic Plan, the use of this document or changes because of it have been limited to date.