Date: August 31, 2021
To: Day One Project
From: Pennsylvania Statewide STEM Ecosystem
Re: STEM Policy Memo

The Pennsylvania Statewide STEM Ecosystem (PSSE) is pleased to present this policy memo which is based on a stakeholder survey implemented in winter 2021. The survey collected data from 160 of stakeholders, comprised of a diverse sampling of professionals working as principals, teachers, formal and informal STEM educators, consultants, program managers, heads of professional development, school counselors, superintendents, assistant superintendents, and more. This memo is intended to help inform and guide the Biden/Harris administration as the administration designs and implements policies pertaining to STEM Education.

Summary

Based on the stakeholder survey, the Pennsylvania Statewide STEM Ecosystem (PSSE) recommends four distinctive priorities to guide the Biden/Harris administration's vision for STEM Education.
1. Ensure diversity, equity, and inclusion in STEM education with a focus on race, gender identity, socio-economic status, ability, and geographies.
2.   Encourage the integration of STEM content across disciplines such as art, history, literacy, in both formal and informal learning environments;
3. Invest in high quality, accessible professional development for teachers and other STEM educators; and
4. Support initiatives that provide young people with a strong understanding of and access to the multitude of STEM careers and career pathways.

By ensuring that all citizens have equitable access to high-quality STEM education, encouraging the integration of STEM fields with arts and humanities, working to ensure that educators are provided with opportunities for STEM professional development, and promoting a broader understanding of and access to possible careers in STEM, the administration is poised to create sustainable and impactful change in STEM education.

Challenge and Opportunity

The following paragraphs highlight the top four STEM priorities, including challenges and opportunities, as selected by PSSE survey respondents.

Ensure diversity, equity, and inclusion in STEM education. Every child deserves to receive high-quality STEM instruction, regardless of factors such as socio-economic status, ability, geographies, and other factors that may limit access to STEM learning opportunities and limit opportunities to excel in STEM fields. Despite efforts to expand equity and inclusion in STEM, an imbalance remains in in who has the privilege of seeing themselves represented in STEM education and STEM careers. In Pennsylvania in 2020, only 13% of the post-secondary

degrees in computer science and 9% of the degrees in engineering were awarded to students of color.[1] Only 11% of students taking Advanced Placement Exams (AP Report Card) in were black and Latinx students.[2] In comparison to their white male counterparts, women and people of color remain underrepresented in many STEM-related careers throughout the United States, with women accounting for only 15% of engineers and architects, and Latinx and black individuals accounting for only 8% and 9% of total workers in STEM fields respectively.[3]

The switch to remote learning at the onset of the COVID-19 pandemic underscored just how limited access to broadband and computing technologies is in some Pennsylvania communities, and how this can hinder learning. The School District of Philadelphia, for example, serves so many students who lack access to laptops and internet that, following school closures due to COIVD-19, the schools, city, and businesses had to work together to create a program to provide over 35,000 students with free technology and broadband access to make virtual learning plausible.[4]

Encourage integrating STEM content with other disciplines. STEM disciplines are often depicted as existing in their own distinct academic sphere, separate from other subjects that are traditionally more aligned with the arts and humanities. While this may highlight the extent to which these fields relate to and inform one another, it can also prevent a full understanding of the integral role that STEM research, knowledge, and methodology play in many other fields of study. This creates knowledge silos in which a more fluid exchange of information and ideas could be advantageous. Educators may not feel adequately equipped to showcase the interconnectedness and overlap that naturally exist between these different subjects, reinforcing and perpetuating barriers between disciplines and inhibiting students from achieving a more holistic understanding of STEM topics, STEM-related careers, and the role STEM plays in the world.

Invest in professional development for in school and out – of – school time STEM educators. Survey respondents felt that lack of time, money, and resources hindered their ability to participate in adequate professional development. To ensure that students are receiving the knowledge and skills that they need to succeed, it is crucial that educators have access to high-quality professional development opportunities. By investing in professional development for teachers, out-of-school-time providers, and educators, and by ensuring that all educators feel confident in their abilities to teach STEM topics and incorporate best practices into their existing curricula, the administration will make a direct investment in the future of our nation as a leader in STEM education.

[1] Education Commission of the States – Vital Signs
[2] College Board - 2020 Report Card

[3] Pew Research Center- STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity
[4] Generocity- Bridging the Digital Divide: An Equity Saga

<u>Support initiatives that provide an understanding of and access to the multitude of STEM careers and career pathways.</u> When young people plan for their careers, it can be difficult to conceptualize exactly what kind of jobs exist, as well as the steps they need to take to get there. At the same time, there are currently a wealth of STEM jobs that employers are finding difficult to fill. To help close this gap, it is important to expose children to the wide variety of different professions that exist within STEM fields, and provide them with examples of tangible actions that they can take to actualize their goals of developing a successful career.

Plan of Action

Surveyed stakeholders proposed the following types of solutions to address these important challenges.

<u>Ensure diversity, equity, and inclusion in STEM education.</u> To increase diversity, equity, and inclusion in STEM education and STEM careers, the administration should invest in programs that work to engage more young girls, people of color, and other underrepresented populations in STEM activities to help foster an interest and an investment in STEM. It is also crucial that federal funding is distributed to schools in an equitable manner so that students from all socio-economic backgrounds have access to STEM programming.

During the COVID crisis, sites in Pennsylvania such as Propel Charter Schools and the Sunrise of Philadelphia strove to provide accessible, inclusive, programming by offering virtual and in-person Out-of-School-Time programming, starting at 7 AM each day. In these programs, youth of all backgrounds were given access to technology and real-world learning experiences, wraparound Social and Emotional Learning (SEL) activities, STEM programming, and service-learning.

The administration should also provide technology and technological training to schools, educational organizations, and families living in communities where access may be limited. The City of Philadelphia's PHLConnectED program, which united the city, schools, Google, and Comcast to provided free internet and computer access to low-income students presents a model for how the administration can work with other stakeholders to make education more equitable for students without access to technology.

<u>Integrate STEM content with other disciplines.</u> With the recent popularity of "STEAM" (including arts in STEM curriculum), a number of programs have already begun to integrate STEM learning with other subjects, taking a more interdisciplinary approach to instruction. The administration should strive for a model of education that acknowledges the natural overlap between different fields of study. This can be achieved by investing in initiatives that provide non-STEM educators with training on how to effectively integrate STEM programming into the work they already do, and in programs that braid together different disciplines in their programming.

NEPA STEM Ecosystem has mentored several districts in how STEM learning and STEM concepts blend smoothly with content-area priorities. Working with their local intermediate unit, NEIU 19, the Ecosystem provided STEM field trip experiences to over 1000 5th grade students who had historically scored low on state testing in ELA and Math with hands-on robotics and cryptography experiences to reinforce important math concepts and create practical applications for the math and ELA concepts the students needed to learn in order to score proficient on state testing.

<u>Invest in professional development for teachers and other STEM educators</u> The administration should work to ensure that school districts, OST providers, and other STEM education institutions have access to the funds and resources needed to provide educators with regular, high quality professional development. This professional development should directly integrate science and engineering practices of current researchers, scientists and engineers in collaboration with R1 academic institutions and/or research and development sectors of business/industry. It is also critical that non-STEM teachers have access to the professional development needed to successfully integrate STEM topics into their own teaching.

Penn State Center for Science and the Schools is a leader in transforming precollege STEM education, contributing to the university's land-grant mission in a 21st-century context by leveraging the research being done at Penn State. CSATS works with Penn State scientists and engineers to develop, implement, assess, and disseminate outreach programs for educators to 1) engage in research problems and phenomena 2) implement best practices of scientists and engineers into curriculums, and 3) develop authentic research activities and experiences for precollege students. To learn more, visit: https://www.csats.psu.edu/.

The Philadelphia Education Fund's "Teacher in the Workplace" initiative provided formal and informal educators in the area with opportunity to visit local energy industries and participate in STEM curriculum development workshops, explore STEM careers and career pathways, and create a sustained community of practice.

<u>Provide an understanding of and access to STEM careers and career pathways</u> The administration should provide youth with a comprehensive, easy-to-understand landscape of the types of jobs and career pathways that are available within STEM. This can be accomplished by promoting and investing in a curriculum that incorporates career planning into formal and informal learning environments. This programming should highlight the variety of different pathways that are available to achieve a fulfilling career and articulate the different steps students can take to achieve their desired careers. It is also critical that youth have the opportunity to network and explore different types of STEM careers by investing in partnerships between schools, OST providers, business and industry, and STEM Ecosystems.

One example of such a network already operating in Pennsylvania is the Career Ready PA Coalition, which connects K-12 educators, STEM professionals, businesses, military, workforce, and post-secondary education stakeholders to share best practices, resources, and professional development opportunities that will arm students with the knowledge and skills they need to plan for their future careers.

Remake Learning Days Across America is an innovative learning festival for families and youth. Taking root in 17+ regions, these hands-on and engaging events are designed for kids of all ages at libraries, schools, tech centers, museums, play spaces, community centers and more every April and May. The Pennsylvania Department of Education joined Remake Learning Days in their first annual Career Ready PA Backpack Challenge. The Career Ready PA Backpack Challenge is an opportunity for students to obtain artifacts for their career portfolio by participating in festival events with PA Remake Learning Days events. Pennsylvania hosted Remake Learning Days across several regions and ecosystems including: ENGINE of Central PA, Northwestern PA, PA SEED in Southeastern PA, and Remake Learning in Southwestern PA.

Conclusion

In conclusion, the Pennsylvania Statewide STEM Ecosystem (PSSE) hopes that the Biden/Harris administration will consider the priorities recommended above and act to address these items. Although we have listed them separately, each of these issues are intrinsically intertwined, and positive change made about any of these topics will organically strengthen and reinforce efforts that address others.