Exploring the Afterschool STEM Educator Landscape: Challenges, Needs, and Opportunities

September 2025

AFTERSCHOOL STEM HUB

Afterschool Alliance

ABOUT AFTERSCHOOL STEM HUB

The Afterschool STEM Hub, a project of the Afterschool Alliance, is dedicated to ensuring that all young people have access to high-quality, meaningful, and youth-centered STEM learning experiences in their afterschool programs. We are a coalition of youth program leaders, researchers, and STEM education advocates working at the intersection of practice, research, and policy to advance investment in afterschool STEM programs. More information is available at afterschoolstemhub.org.

ABOUT THE AFTERSCHOOL ALLIANCE

The Afterschool Alliance is a nonprofit public awareness and advocacy organization working to ensure that all children and youth have access to quality afterschool programs. More information is available at afterschoolalliance.org.

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I. BACKGROUND

In the past 15 years, afterschool science, technology, engineering, and mathematics (STEM) programs have become an essential pillar of the STEM education ecosystem. STEM engagement is widespread in afterschool programs now, with 73% of parents[1] saying their students' afterschool programs offer STEM learning. Moreover, more than 70% of parents[2] report that STEM learning opportunities are important when selecting their child's afterschool program. With students spending more than 80% of their waking hours outside of school, afterschool programs are recognized as crucial partners[3] in STEM education, offering engaging STEM enrichment experiences that support and enhance their interest and participation in STEM.

Photo credit: The STEM Connection's STEM Future Leaders Program, Indianapolis

Research shows[4] that high-quality, afterschool STEM learning opportunities can improve academic outcomes, increase college and career readiness, and foster workforce skills in high demand, such as critical and creative thinking, resilience and flexibility, and curiosity and lifelong learning. High-quality afterschool STEM programs engage students in joyful, hands-on, real-world projects that offer innovative ways to practice STEM skills outside of a mandated curriculum. This makes STEM more accessible and enjoyable and helps build fluency, much like immersing oneself in a new language. An 11-state research study[5] showed that among nearly 1,600 youth in 158 afterschool programs, more than 70% of students reported positive gains in their attitude towards STEM, their STEM identity, STEM career knowledge, and 21st-century skills, including perseverance and critical thinking. The authors highlight that consistent engagement in inquiry-based afterschool STEM positively affects STEM career interest and further participation in informal STEM activities.

While nearly 6 million[6] students take part in afterschool STEM programs, for every student in a program, there are at least 3 more waiting to get in. Access inequities remain in geographies, populations, partnerships, and educator preparedness. As the importance of STEM in society and the workforce continues to grow, attention to afterschool STEM educator recruitment, preparation, and retention must be prioritized to ensure that all youth have access to consistently high-quality programs.

Leading afterschool organizations and research entities such as the Afterschool Alliance, the National Afterschool Association (NAA), and the American Institutes for Research, have been building awareness about the needs of afterschool educators in recent years by surveying the needs of the field and seeking policy changes to support increased professionalization. *The Power of Us Survey*[7] report, released in April 2025, provides a baseline understanding of the national afterschool workforce and how professionals can be better supported. The afterschool field has also been developing afterschool educator-specific credentials and certifications, such as the NAA's National Youth Development Credential[8] and STEM Facilitation Micro-Credentials[9], and the Afterschool Alliance is showcasing workforce solutions[10] exemplars in various contexts.

Additionally, recognizing the support needed for programs to provide high-quality STEM learning, Overdeck Family Foundation has commissioned the National Institute on Out-of-School Time to research[11] strategies for sustaining the afterschool STEM workforce. As that research report will be ready in Fall 2026, we present this interim report as a STEM addendum to the extensive work already underway to support and sustain the afterschool workforce more broadly. We hope it serves to inform critical conversations on how we can strengthen and build capacity of afterschool STEM educators so that all youth can access high-quality afterschool STEM.

TERMINOLOGY

- **STEM:** science, technology, engineering, and math
- **STEMM:** science, technology, engineering, math, and medicine
- **STEM background:** having an academic degree and/or professional work experience in a STEM field.
- **Afterschool STEM educator:** a person who guides STEM learning activities for K-12 students in afterschool, summer, and other out-of-school programs. The person may or may not have professional experience or an academic degree in a STEM field.

Photo credit: The STEM Connection's STEM Future Leaders Program, Indianapolis

Afterschool STEM is Key to Achieving National STEM Workforce Priorities

A World Economic Forum report[12] reveals that, ahead of technological literacy, the top skills identified as being in high demand within organizations are analytical and creative thinking, resilience, flexibility, motivation and self-awareness, curiosity, and lifelong learning. Afterschool STEM programs are uniquely situated to help youth build these critical skills in tandem with the technical STEM skills, as programs offer many youth an entry point for meaningful STEM engagement, which further sustains their interests in pursuing STEM careers or using STEM for good citizenship. Supporting and increasing investments in afterschool, summer, and other out-of-school time STEM is an effective way to reach a multitude of young people who would otherwise be left out.

Photo credit: The STEM Connection's STEM Future Leaders Program, Indianapolis

The most recent *Federal Strategic Plan for Advancing STEM Education and Cultivating STEM Talent* (released November 2024), the STEMM Opportunity Alliance's *National Strategy for Equity and Excellence in STEMM*[13], and the *Vision for American Science and Technology (VAST)*[14] report all converge in envisioning a near future in which our nation's STEM workforce needs are fulfilled and reflective of all our communities. Each of these reports and strategies proposes to fulfill this vision by ensuring every young person can be inspired in STEM and access STEM career pathways.

To better understand the issues, we explored the key question of what additional support, beyond core programmatic needs, afterschool educators require to provide high-quality STEM programming for all youth. This report sheds light on what afterschool program leaders, educators, and youth say they need so afterschool programs can provide enriching STEM experiences that invite young people into the world of STEM.

II. RECRUITMENT & RETENTION OF AFTERSCHOOL STEM EDUCATORS

Across all our data sources, challenges around recruiting and retaining high-quality program staff were the most discussed recurring theme. But we also found some examples of programs acting creatively to solve some of the challenges they face.

Challenges & Needs

Program leaders highlighted the significant challenges afterschool programs face in recruiting and retaining high-quality STEM educators, primarily due to non-competitive salaries for STEM-proficient staff. One of the other major barriers to recruitment and retention of afterschool STEM educators is overall job satisfaction, with many practitioners saying that the lack of benefits and limited paid time off do not make afterschool roles viable careers. Furthermore, many afterschool roles are part-time, forcing staff to juggle multiple jobs, which also makes retention difficult.

Practitioners report that even if starting salaries are comparable to other fields, wages for afterschool STEM positions often stagnate. This career stagnation, along with limited opportunities for professional growth and paid professional development (PD), is frequently tied to the grant-funded nature of these positions, where proposals often lack provisions for annual raises or staff benefits. Unfortunately, the burden of finding program coverage and catching up often discourages staff from taking needed time off for personal matters or PD, exacerbating retention issues.

There is also no clear workforce pathway for becoming an afterschool STEM educator, which can lead to a skills gap or mismatch to the needs of afterschool STEM programming. For instance, STEM professionals who want to work with youth may not have the requisite youth development or

OUR DATA COLLECTION INCLUDED:

(a) semi-structured interviews with 11 afterschool STEM program providers and practitioners;

(b) 3 semi-structured focus group discussions with afterschool STEM program practitioners (each group consisted of 4 to 7 practitioners);

(c) a focus group discussion with 8 afterschool STEM professional development (PD) providers;

(d) 3 focus group discussions with 16 youth afterschool STEM program participants; and

(e) questions about STEM in afterschool as part of the Afterschool Alliance's program provider survey[15] (n = 1,247 providers, representing more than 9,200 program sites in 50 states and the District of Columbia) conducted during the fourth quarter of 2024. All participants live and work in a variety of states and communities across the U.S.

teacher professional skills. According to one program provider, "If you study computer science or are a farmer and are passionate about working with young people, there isn't a clear pathway to do that in the afterschool space. Someone will apply for a job with them and have great experience in the STEM topic of interest, but have little experience working with young people. But there is a special skill set to effectively work with young people and communicate with them. There is thus a gap in training." There is also a need for program staff to reflect the identities and backgrounds of the youth they serve to ensure effective youth engagement.

> *"Being able to keep up with good staff means being able to offer them opportunities for growth—the two are intertwined."*
>
> –PROGRAM PROVIDER

Meanwhile, educators with teaching and positive youth development backgrounds often do not have experiences with STEM content and practices that would enable them to feel empowered and confident stepping into STEM-specific afterschool roles. Hence, many of them feel intimidated and hesitant to facilitate STEM learning experiences.

A lack of predictable staffing and financial resources prevents effective internal succession planning, making seamless transitions difficult. According to one program's director of operations, "we need someone side by side in all the roles, so that when one person leaves, the next person can take over. Right now, we just don't have the personnel or financial capacity to truly make that happen." Given the ubiquity of the challenge of staffing, programs acknowledge that turnover must be part of their organizational planning, which diverts resources away from more program-enriching efforts.

Additional challenges for some afterschool STEM programs include cultivating productive relationships with school districts, as there are often no central policies or mandates for school districts to work with afterschool programs. They report feeling that they sometimes work as islands and have to find ways to build bridges to complement young people's academic needs and offer other support where they need it most.

Creative Solutions

Faced with significant challenges, some programs are innovating new ways to succeed. We spoke with 6 afterschool programs, from various regions within the U.S. and that work with various age groups of youth, that are implementing creative solutions to staff recruitment and retention. These solutions include addressing PD and career growth needs, providing adequate benefits for staff, supporting educators' autonomy, recruiting college students to work in their programs, and fostering community partnerships.

Addressing Staff PD Needs. Afterschool STEM educators have unique PD and career growth needs. They need general PD on supporting youth (e.g., behavior management, supporting positive youth development, health and safety, CPR, etc.), and they may also need STEM-specific skills and PD to feel confident leading STEM-focused programs. By providing deeper and more applicable PD opportunities, educators will be empowered to be successful in their roles and poised for professional growth opportunities. Providing these opportunities for career growth and increasing job satisfaction improves the recruitment and retention of educators. (The PD needs of afterschool educators are explored more deeply in Section III of this report.)

Building Opportunities for Staff Well-Being into the Program Model. By pre-authorizing and pre-planning weeks for staff time off, programs can prevent burnout and improve long-term retention.

Supporting Educators' Autonomy. Afterschool STEM educators often feel that the content they have to lead is not flexible and does not allow them to draw on their skills and interests. Offering educators more flexibility and autonomy in customizing their programming increases ownership over their work and deepens the connection to their work, supporting staff satisfaction and retention.

Recruiting Young Educators. Maintaining relationships with program alumni fosters a sustained sense of connection to the program that inspires them to future employment. Partnerships with local colleges and universities are also an effective way to recruit college-aged staff who are in STEM career pathways.

Fostering Partnerships with the Community (Including Schools). Facilitating strong partnerships with schools, businesses, and community organizations help to streamline students' learning and engagement while supporting afterschool educators. Partnerships with local STEM businesses and professionals provide both material and intellectual resources to support programming. For instance, businesses and STEM professionals can donate cost-prohibitive supplies for experiments and provide technical and real-world knowledge to support and enhance the curriculum.

CREATIVE SOLUTIONS SPOTLIGHT:

The Gary Comer Youth Center, Chicago, IL

The Gary Comer Youth Center excels at recruiting and retaining afterschool STEM educators by fostering a supportive working environment and empowering staff. They strategically recruit former program participants, hiring alumni who return as managers or instructors after gaining external work experience. The Center actively supports these young professionals in their ongoing education and career goals, seeing them as both educators and learners.

Photo credit: Gary Comer Youth Center

To retain staff, the Center offers a variety of professional and personal development opportunities, including 3 annual all-staff development days covering youth development, HR, leadership, and specific subject areas. They actively seek funding for PD through grants and partnerships, such as the agriculture team's participation in Future Farmers of America. The Center embraces the idea that staff may move on, viewing turnover not as a negative, but as an opportunity for their alumni network to grow and refer new talent.

A key to retention is the Center's commitment to staff flexibility and autonomy. Educators have the freedom to customize programs, fostering ownership and connection to their work. They have cultivated a culture of appreciation and continuous growth, ensuring staff feel personally invested. Crucially, leadership actively listens to staff feedback. For example, in response to concerns about the difficulty of taking time off, the Center is implementing dedicated "self-care" weeks, encouraging staff to avoid meetings and take intentional breaks. This proactive approach ensures staff are physically and mentally well, ultimately enabling them to better serve the youth.

III. PROFESSIONAL DEVELOPMENT NEEDS OF AFTERSCHOOL STEM EDUCATORS

Drawing from the body of evidence already noted about the need for consistent, high-quality PD in STEM facilitation and STEM practices, we explored the PD barriers and needs of afterschool STEM educators. The key questions we sought to answer included:

- What is the true cost of accessing high-quality STEM-specific PD for afterschool educators?
- What does high-quality, impactful PD look like?
- How do afterschool programs currently invest in STEM-specific PD for their program staff?
- Why do some programs not invest in STEM-specific PD?

To explore these questions, we convened a PD working group of 8 afterschool STEM PD providers. We held a focus group, conducted individual one-on-one interviews with afterschool program leaders, and included questions about why programs do or do not invest financially in STEM-specific PD for their educators in the Afterschool Alliance's program provider survey conducted during Fall 2024.

Hidden Costs & Barriers to Accessing STEM Professional Development

There are a variety of online and in-person learning opportunities to help educators facilitate STEM, as well as frameworks defining quality STEM learning experiences, such as the Dimensions of Success[16] tool. But the program providers and practitioners we spoke to described limitations in their ability to utilize these resources.

When asked to list the most significant barriers to participation in STEM PD, nearly all mentioned time and funding. Because afterschool programs do not necessarily have the same structures in place as schools regarding substitute teachers, it is very difficult for afterschool educators to dedicate time

> *"The unique challenges to rural educator professional learning are the geographic isolation and limited resources (access, time, and money). We are all searching for solutions on what can help. At this point, I can't help but think that re-envisioning community connections and programs can be the biggest help, as well as advocating, being explicit and open about the challenges present."*
>
> –PROGRAM PROVIDER, RURAL, NY

throughout the year to their PD. Additionally, afterschool programs tend to remain open during school closures to support families, making it even more challenging to participate in PD that may be held during classroom educators' school breaks. Access can become even more difficult for programs in remote and rural areas with limited in-person PD opportunities nearby and limited personnel to fill in program needs. In addition to funding restrictions and time constraints, some programs and educators are simply not aware of available STEM PD opportunities.

Programs need to not only hire and pay a substitute educator, but also ideally pay for their staff member's time, travel, and accommodations to participate in PD so they do not need to use personal time to invest in their professional growth. According to one program provider, establishing a shared structure with the local school system might be helpful in finding substitutes. Costs associated with PD registration fees and learning credits can also sometimes be prohibitive and need to be supported by the program's budget.

Finally, regulatory or grant-related mandates frequently prioritize non-STEM PD, such as facility licensing requirements, forcing programs to allocate limited time and budget away from STEM-specific development. Program providers also need to prioritize fundamental skills of youth safety and well-being, such as classroom and behavior management, mental health awareness, facilitation skills, CPR, first aid, social-emotional learning, and others.

> *"Our program falls under the division of regulated childcare. Employees must have 15 hours of professional development each year. This professional development must all be approved by the cabinet. There are not enough STEM options."*
>
> –PROGRAM PROVIDER SURVEY RESPONDENT

Photo credit: Beyond School Bells, Nebraska

> *"When we have professional development opportunities for staff, we find that they need more baseline needs met (i.e., supervision, community/ relationship building, professionalism) before exploring deeper into STEM."*
>
> –PROGRAM PROVIDER SURVEY RESPONDENT

Structure & Format of High-Quality Professional Development

When asked what format of PD works best (i.e., in-person, virtual, asynchronous learning, group-based, self-paced, etc.), the interviewees said that online, self-paced courses tend to better accommodate their limited time and funding. If there is sufficient internet connectivity, online opportunities also provide accessibility in rural areas. However, even though online and self-paced opportunities might be more accessible, nearly all agreed that the ideal learning environment is communal and in-person, with hands-on experiences and opportunities to meaningfully engage with other educators. There was a consensus that a hybrid option, with virtual and in-person PD experiences throughout the year, would be ideal. One suggested model is to provide at least one in-person PD experience per year, followed by periodic virtual sessions and check-ins to improve and adapt programming through peer-coaching.

Photo credit: Science Center's FirstHand Program, Philadelphia

> *"Professional development shouldn't be just one disconnected experience. We try to use a blended model with in-person time, online self-directed learning opportunities, and videos in staff meetings. The goal is to have a professional development experience in person, 2 to 3 experiences in staff meetings, periodic self-directed online trainings, and 4 months later, another in-person workshop."*
>
> **–PROFESSIONAL DEVELOPMENT PROVIDER, NEBRASKA**

Types of Professional Development Needed to Support High-Quality Afterschool STEM

The types of PD that STEM program practitioners are seeking include much of the same training necessary for high-quality afterschool programs in general: positive youth development, classroom and behavior management, trauma-informed practices, and integrating youth voice and choice. However, afterschool STEM educators also need PD to enhance their STEM facilitation skills, such as making STEM inclusive and incorporating universal design principles. In some cases, they may also need specific STEM content and technical skills.

Nurturing the educators' STEM identity

Since many afterschool educators facilitating STEM programming do not have a STEM background, investments are needed to help them establish their own STEM identity. As one focus group participant explained, when adults believe they're "bad at math," it negatively influences their students. Investing in building the educators' awareness of their STEM identity and confidence in STEM is necessary to support sustainability in STEM programming and retain educators.

CREATIVE SOLUTIONS SPOTLIGHT:

Texas Tech University, Texas

Texas Tech University's Whitacre College of Engineering runs an Outreach & Engagement program, utilizing "Outreach Raiders"—undergraduate engineering students specially trained to deliver developmentally-appropriate STEM activities. These Outreach Raiders facilitate Jr. Engineering Clubs for K-12 students in the surrounding areas, providing hands-on robotics and engineering opportunities.

Beyond sparking interest in engineering among youth, the Outreach Raiders also mentor afterschool educators, helping them build confidence and proficiency in facilitating engineering learning. This engagement with youth and informal educators has a dual benefit: some undergraduate engineering students develop an interest in teaching and mentorship, potentially leading them to consider education as a future career path while continuing their involvement in afterschool programs. As an incentive, these undergraduates receive a $500 scholarship per semester.

Photo credit: Whitacre College of Engineering at Texas Tech University

Making STEM relevant for youth

Moreover, since a unique and valuable feature of afterschool STEM is providing an inclusive space where all young people can experience STEM as it relates to their interests, needs, and priorities, afterschool educators need to know how to ensure programming is relevant to the student population they work with, address any underlying personal biases regarding who belongs in STEM, and create an environment in which the educator leads with questions and inquiry rather than feeling they must always know the correct answer. Promoting these mindsets requires PD where the educators can learn how to create fun, inviting interactions and allow youth, especially older youth, to be co-creators in their STEM learning.

Designing and implementing age-appropriate STEM programming

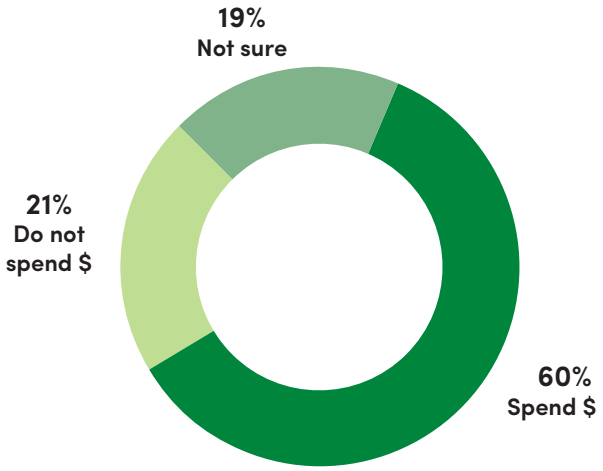
Youth engagement skills and the level of STEM knowledge needed vary based on the age and grade level of the youth educators serve. Program providers acknowledged that learning how to have a varied approach for different grade-level audiences in STEM is very important.

- High-quality programs for elementary to early middle school youth need to focus on building interest, confidence, and identity in STEM, in addition to nurturing STEM engagement with students' families, to sustain their interest in STEM. When working with younger youth, another key skill is learning how to make STEM fun and interactive.
- When working with middle school students, educators need to be aware of STEM career opportunities so students can engage in STEM career exploration experiences. Educators also need to consistently present middle school youth with examples of STEM professionals who look like them and reflect their backgrounds so they continue to feel a sense of belonging in STEM.
- Educators working with high school students may need to prioritize external resources and networks of support to connect the youth to STEM work-based learning experiences, internships, and apprenticeships. It may also be important for educators working with older youth to make connections between STEM and community issues youth care about to help them see its relevance and gain confidence in applying STEM knowledge to solve meaningful, real-world problems.

There was also a general consensus that quality afterschool STEM programming should be standards-aligned and connect back to what youth are learning in school. This emphasizes the need for educators to have supportive relationships with schools across all ages.

Impacts of Investment in STEM Professional Development

60% of programs that offer STEM **spend money on STEM PD for staff**



The Afterschool Alliance's program provider survey revealed that 74%[17] of afterschool programs offer STEM learning opportunities. Of these, the majority (60%) pay for their staff to participate in STEM-specific PD. Of programs that do invest in STEM-specific PD, 37% say it definitely or somewhat helps them recruit and retain staff and improve program quality. Programs that invest a higher amount (>$5,000 compared to <$1,000) in STEM PD report seeing better returns on staff recruitment and retention.

Programs typically assess the outcomes of STEM-specific PD by measuring youth engagement. 52% report measuring youth STEM identity development, 38% report measuring youth feelings of confidence in their STEM abilities, and 36% report measuring changes in youth attendance in STEM programming. Some programs also measure educator outcomes, with 39% reporting they measure their educators' sense of confidence in their own STEM abilities.

Results from the interviews and focus group discussions corroborate these survey findings. Metrics programs use to measure the success and utility of PD include outcomes for:

- Youth (e.g., more youth feel engaged positively in STEM and comprehend the relevance to their own lives, including in possible future career connections);
- Educators (e.g., they feel more confident in their ability to facilitate STEM, they remain in the position longer); and
- The program (e.g., youth feel more drawn to the programming, the program reaches more youth).

21% of programs responding to the survey do not dedicate specific funds for STEM-related PD. The reasons they offer for not setting aside funds for STEM-specific PD include:

- Utilizing free STEM-specific PD when available, such as through networks and coalitions, free online opportunities (i.e., Click2Science[18]), and other free resources.
- Leveraging existing partnerships and collaborations, through which staff PD is already paid for. Partnerships include local school districts (for instance, programs staffed by school-day teachers may not need to invest in STEM PD if their educators attend school district PD opportunities), local museums and science centers, colleges and universities, STEM businesses, and other community-based partners.
- Educators leading their STEM programming are either certified teachers who teach STEM during the school day, college students majoring in STEM, or STEM professionals/retirees who all either receive their own STEM-specific PD experiences or have specialized expertise through their personal careers or daily lives. (Note: An added benefit to having school-day teachers work in afterschool programs is that they can receive PD through the school district and as part of their normal school PD requirements.)

THERE IS NO SUCH THING AS FREE PD

It is important to note that where there are PD resources available at no cost to educators and programs, the research and development, marketing and distribution, and maintenance and availability of these resources have been funded through public or private grants. Continued financial investment in the development, revision, and sustainment of quality PD is critical and necessary, especially if the intent is to decrease the cost barrier for programs and educators.

CREATIVE SOLUTIONS SPOTLIGHT:

South Carolina Afterschool Alliance, South Carolina

The South Carolina Afterschool Alliance, in partnership with the University of South Carolina, offers a "Beyond the Classroom" course. This program trains undergraduate college students to teach STEM, 21st-century skills, and entrepreneurship in afterschool settings. The course provides comprehensive training in curriculum, positive youth development, and facilitation, along with coaching, mentorship, and free background checks. Open to all students, not just education majors, it allows them to work with youth based on their interests.

Undergraduate students commit 60-90 hours per semester to afterschool programs, where they teach lessons and engage with younger youth. This initiative provides college students with 3 college credits to compensate them for their work and training. The model significantly aids afterschool programs in recruiting and retaining staff, ensuring youth have access to high-quality STEM experiences and valuable near-peer mentors; an impressive 99% of participating undergraduates are hired or offered positions within the afterschool programs after their participation in the course. This university relationship also enhances technology access for afterschool youth, as college students leverage their own experiences with technology to champion similar opportunities in programs.

Photo credit: South Carolina Afterschool Alliance

Photo credit: South Carolina Afterschool Alliance

PROGRAM SPOTLIGHT:

STEMarts Lab, New Mexico

STEMarts Lab is a STEAM-focused initiative that empowers youth aged 14-25 through immersive learning experiences blending science, technology, engineering, arts, and mathematics. Collaborating with leading scientists, artists, and technologists, program participants co-create cutting-edge multimedia installations showcased at museums, festivals, and global events. The Lab frequently hosts guest speakers and subject matter experts, drawing from a vast network of professionals in arts, sciences, and technology, some of whom are STEMarts Lab alums.

Photo credit: Malu Tavares, for STEMarts Lab

The organization's mission is to prepare young leaders for the workforce by offering real-world experience in digital media, emerging technologies, and space science, while fostering critical, creative, and ethical thinking. STEMarts Lab uniquely emphasizes artistic, scientific, and humanistic literacy, which develops the capacity to critically reflect on and engage with the ethical, cultural, and societal dimensions of science and technology. This empowers youth to consider the impact of emerging technologies on humanity and the natural world, fostering empathy, and equipping students to navigate and contribute meaningfully to our complex, interconnected world.

Photo credit: Malu Tavares, for STEMarts Lab

Through its Ambassador and Apprenticeship programs, New Mexico youth receive hands-on workforce training, along with stipends. Many participants transition to become paid contractors on the STEMarts creative team, gaining valuable career-ready experience in project management, collaboration, and innovative technologies on global projects. STEMarts Lab prioritizes bridging digital divides and engaging rural and underserved communities, connecting youth with opportunities that inspire curiosity and prepare them for meaningful futures through mentorships, apprenticeships, and global partnerships.

Continuous Support Needed in Addition to Professional Development

Afterschool STEM educators do not always have formal training with STEM content or experience with STEM careers, making it vital that they have access to resources and can collaborate with STEM professionals. A collaborative relationship ensures that they can work together to create an inclusive environment that reflects the tenets of positive youth development while also offering robust STEM engagement. The importance of such collaborations was also reflected in our conversations with young people, detailed in Section IV.

The importance of continuous PD such as educator mentorship, coaching, and support (including community-building opportunities) was also a consistent theme in our conversations. While nearly all interviewees agreed that PD experiences are best when situated in communal contexts centered around peer support, they acknowledged that, because of limited budgets and time, it is often easier to access PD in online and self-paced formats. In these virtual, asynchronous formats, it is ideal for there to be an ongoing community of practice that provides educators with peer support and opportunities for continuous learning and improvement.

Finally, investments in PD must be tied to opportunities for professional growth, whether through credentialing, wage increases, or opportunities for certification that help them progress and grow in their careers. Some potential and specific incentives for participation in PD are described in Table 1.

Table 1. Suggested Incentives for PD Participation

Incentive	Example
Credentials and "micro-credentials"	• NAA's STEM facilitation micro-credentials can be used for resume-building to demonstrate that the individual leads high-quality programming
Annual licensing	• Build partnerships with state and local agencies so PD hours contribute to licensing requirements, where relevant (e.g., teaching, childcare)
Career advancement	• PD participation contributes to salary increases • PD participation contributes to career and title advances
Monetary compensation	• Funding to pay for staff's full salary while participating in PD • Funding to pay a substitute program lead while in PD, if needed • Compensate staff for travel, accommodations, resources needed to participate in PD, and resources needed to implement what they learn in programming

PROFESSIONAL DEVELOPMENT SPOTLIGHT:

Afterschool Coaching for Reflective Educators in STEM (ACRES)

Photo credit: ACRES Project

ACRES is a free to use coaching program that builds knowledge and skills so afterschool educators can confidently facilitate STEM learning for all youth. [Note: The program is able to be offered for free due to a combination of government and private grant funding of more than $3,000,000 that has supported the research and development, infrastructure capacity, and scaling of the model.]

ACRES coaches convene small cohorts of afterschool educators virtually for 3 sessions. Participants are introduced to a skill and spend time experiencing and practicing the skill among peers. Participants then return to their program to implement the strategy and record their use of the skill in action. The educators then share their video in subsequent coaching sessions and receive feedback from peers and an experienced coach.

The model recognizes that educators learn best by watching themselves and each other as they practice new skills in a safe setting with a skilled coach. ACRES training covers key focal skills, such as facilitating science practices, making math engaging, nurturing STEM identity, making career connections, and elevating youth voice and choice. ACRES has also been a key PD provider for afterschool educators who facilitate STEM in rural areas.

CREATIVE SOLUTIONS SPOTLIGHT:

Beyond School Bells, Nebraska

Photo credit: Cardinal Community Learning Centers, Nebraska

Beyond School Bells in Nebraska has established a unique peer-learning and training model to bring engineering design thinking to elementary and middle school students in rural afterschool programs. This initiative fosters collaborative partnerships between schools and universities, enabling high school students to lead afterschool engineering clubs, with direct support from college students majoring in engineering or related STEM fields.

Both college and high school students are integral to this innovative staffing mechanism. College students receive training in mentorship and engineering facilitation, providing year-long guidance and curricular support to their high school counterparts. In turn, high school students gain facilitation skills and learn effective strategies for engaging younger peers. All participating college and high school students are compensated for their time training, mentoring, and leading afterschool clubs, fostering hands-on STEM learning and building crucial STEM, collaboration, and leadership skills across age groups.

Opportunities for Making Professional Development Accessible

As the afterschool field strives for increased professionalization, addressing educators' content-specific STEM needs is crucial. Many program providers and practitioners are already testing, refining, and implementing strategies to increase access and time for STEM PD, including budgeting for paid staff PD.

For instance, one of our interviewees was the STEM coordinator for multiple program sites. She works with her program leadership to integrate regular, bite-sized doses of STEM facilitation PD at their weekly staff meetings. Another program provider stated they try to include staff PD in their operating budgets and intentionally set it aside in grant proposals. They also leverage partnerships so that, whenever possible, PD costs can be shared with partnering organizations, such as collaborations with their Future Farmers of America[19] chapter and TRIO[20] programs.

STRUCTURAL SUPPORT: STEM CIRCLE ADVISORY GROUP

One afterschool program participated in a STEM Circle Advisory Group with a local Indigenous college offering many STEM degree programs. Initiated by a college professor, the Circle connects STEM mentors and resources from the college with educators across K-12 grades who facilitate STEM learning. Through a peer-learning process, the mentors review lessons created by the educators, provide feedback and ways to incorporate STEM learning, and make connections across disciplines.

When asked what is most helpful to encourage staff to participate in PD and support their continued growth afterwards, interviewees suggested the following:

- Find ways to maintain a fabric of support, such as through continuous mentorship, coaching, and network building, to ensure staff support in implementing what they learn in PD.
- Build connections to intermediaries, such as the 50-state afterschool network[21], to stay abreast of the most relevant PD opportunities and to have a peer network for continued peer and technical support.
- Facilitate opportunities to participate in PD with school-day teachers, which can build ongoing peer support, while ensuring afterschool STEM effectively complements school-day learning.

IV. YOUTH PERSPECTIVES: NEEDS AND RECOMMENDATIONS FOR AFTERSCHOOL STEM

Too often, young people are left out of conversations that impact their lives and shape their futures. Afterschool STEM programs ultimately want to offer all youth high-quality STEM learning experiences. To ensure that programs are designed and implemented with youth perspectives and needs in mind, the Afterschool Alliance's STEM team holds quarterly focus group discussions with small groups of young people.

Photo credit: Science Center's FirstHand program, Philadelphia

For this report, we collected and analyzed the insights we have gathered from youth about what they want from programming to inform the skills and expertise the educators need to design and implement high-quality afterschool programs. Focus group participants ranged in age from 15-17 years and came from across the United States, representing California, Pennsylvania, New Mexico, South Carolina, Texas, Florida, and Arizona. We translated their ideas into key recommendations and considerations for programs and educators designing STEM experiences for youth.

> *"I wish adults knew that we don't like to be lectured... Sometimes we want to learn through projects, we want to learn through discovery, we want to learn through ways that we can actually be doing something instead of just sitting there taking notes."*
>
> –YOUTH FOCUS GROUP PARTICIPANT

Youth focus group participants all agreed that high-quality STEM education experiences (and education in general) should include project-based, real-world, experiential learning opportunities. They should include hands-on components, opportunities to learn in groups, and time for repetition and practice to build the STEM skills (and confidence) youth need to succeed and persist in these fields.

We summarized focus group members' insights on designing effective STEM education experiences and preparing afterschool STEM educators into recommendations in three critical areas—design of programs, preparation of educators, and improvement of STEM education.

In designing afterschool STEM programs, youth believed that programs should:

- Support critical thinking skills
- Encourage project-based learning
- Engage youth in hands-on learning
- Offer opportunities for learning in groups
- Allow youth to broaden their perspectives and explore varied interests
- Include opportunities for youth to learn from each other
- Be fun and engaging

> *"I think that educators really need to know how to create a sense of interest and wonder, especially in younger children."*
>
> –YOUTH FOCUS GROUP PARTICIPANT

In preparing afterschool STEM educators, youth noted that educators:

- Should, above all else, be skilled in making programming fun and engaging for youth
- May benefit from subject-matter PD or expertise, but this is secondary to making programming engaging
- Should be able to create high-quality curricula (or have access to high-quality curricula)
- Should be prepared to support different learning styles, especially to facilitate hands-on and project-based learning

To improve the future of STEM education in afterschool programming, youth believed that educators:

- Need to know how to engage both older and younger learners, adapting programming as necessary for different ages
- Need to facilitate connections with role models, including those who look like the young people and come from similar backgrounds
- Should foster interdisciplinary skills, linking STEM disciplines with one another and to subjects outside of STEM
- Should prioritize foundational and accessible experiences, including providing more introductory experiences

Youth expect program leaders to actively support their STEM pathways by providing access to mentors and work-based learning opportunities. They also want to build social capital by connecting with STEM professionals and exploring various STEM fields. As one young person put it, "It's not always about what you know, but who you know," highlighting the importance of networking for future success. Another youth emphasized the challenge of finding opportunities, stating, "Opportunities can be so hard to find for young people who aren't already connected and made aware of them. I had to do a lot of self-advocacy to be able to participate and engage in STEM opportunities."

V. LOOKING AHEAD: EMERGING OPPORTUNITIES IN NATIONAL STEM EDUCATION STRATEGIES

Within the first few months of his administration, President Trump sent a letter[22] to the Office of Science and Technology Policy (OSTP), asking the office to explore how the U.S. can lead in emerging technologies, revitalize the nation's science and technology enterprise, and ensure scientific progress and technological innovation improve the lives of all U.S. citizens. However, the OSTP Director's three priorities for promoting U.S. technological leadership do not include an intentional investment in STEM education. It was striking that the OSTP Director acknowledged,[23] "There is nothing predestined about technological progress and scientific discovery." His statement highlights that if federal investment does not include our nation's in-school and afterschool STEM educators as essential partners to advance science and technology capabilities, the nation risks not only being predestined for stagnation, but actually falling behind competitor industries abroad.

The Vision for American Science and Technology (VAST) report states that "nurturing STEM abilities in all individuals, regardless of their career paths, is essential. STEM skills and STEM literacy are increasingly vital to everyday life, as they support informed personal and community decision-making on matters ranging from health and finances to privacy and environmental stewardship." To comprehensively nurture STEM abilities in all our youth, we cannot rely solely on the formal school day. We do, however, have a solution readily available that can help lift the growing burden placed on the hours our youth spend in school.

A recent report developed by the National Academies of Sciences, Engineering, and Medicine titled, *Scaling and Sustaining Pre-K-12 STEM Education Innovations*[24], describes the role that afterschool, summer, and other out-of-school time programs play in supporting STEM education improvement efforts and how partnerships between K–12 and afterschool settings can enhance connections to support STEM teaching and learning through resource development. The report concludes that afterschool spaces "not only provide opportunities for learners to engage in pre-K–12 STEM education innovations but also are important spaces for their development."

To lead in STEM innovation and STEM education, it is crucial to create a framework of support for our afterschool STEM educators. Establishing the infrastructure to (a) adequately attend to afterschool educators' professional growth and the viability of this career path, (b) build their confidence in facilitating STEM regardless of formalized STEM training, and (c) set them up to successfully facilitate informal education curriculum and workforce pathways will ensure that all youth can gain the STEM skills, knowledge, and identity that have been proven to result from participating in afterschool programming. These outcomes are key predictors of STEM career participation[25] and readiness to engage[26] as a productive member of a STEM-literate society. The recommendations that follow support this overarching goal.

VI. POLICY RECOMMENDATIONS TO SUPPORT A ROBUST AFTERSCHOOL STEM WORKFORCE

We build on the foundational recommendations laid out by the National Afterschool Association's *Thriving Workforce Initiative*[27] and the Afterschool Alliance's *Afterschool and Summer Learning Workforce Policy Recommendations*[28] to offer the following recommendations to make progress on this pressing issue. These recommendations derive from the analysis presented in this report and our longstanding engagement with STEM educators and program leaders nationally.

Recommendations for Congress & the Federal Government:

1. Ensure afterschool educators have consistent access to high-quality STEM-specific PD. This is especially pertinent for programs in rural areas, which often do not have easy access to partners and PD opportunities.

    - Enact legislation and implement policies that focus on the recruitment, retention, and PD of afterschool STEM educators.

      This can include using existing grant programs or creating a new grant program to comprehensively support afterschool educator workforce recruitment and retention. Such efforts might establish PD scholarship programs for afterschool, summer, and other out-of-school time STEM program educators, and could be coordinated by state and local intermediary organizations. Leveraging the infrastructure that regional and local intermediaries (such as the 50-state afterschool network) already provide, such efforts would enhance formalized, state-wide afterschool STEM support structures. Existing infrastructure can support such efforts and promote coordination and collaboration between afterschool, summer, and other out-of-school time STEM programs, STEM professionals and STEM industries could be valuable partners and might provide wrap-around support for afterschool STEM educators and the youth they serve. Such efforts can incentivize the development of multiple, centralized peer support structures to ensure sustainability in accessing quality STEM PD.

- Create opportunities for joint PD between school-day, afterschool, summer, and other out-of-school time STEM educators by amending Title II of the *Every Student Succeeds Act (ESSA)* to explicitly state that funds can be used to provide PD to staff working in afterschool, summer, and other out-of-school time programs. Additional appropriations can accommodate this inclusion. A dedicated funding stream can also be created to enable school-day teachers to collaborate with afterschool educators by creating school and afterschool STEM learning teams.

- Include afterschool educators and afterschool programs as eligible grant recipients in any federal legislation that supports educator PD in STEM and emerging technologies.

  President Trump's Executive Order, *Advancing Artificial Intelligence (AI) Education for American Youth*[29] prioritizes funding to ensure educators can engage youth in AI. The reauthorization of the *National AI Initiative Act of 2020* should address issues raised by other pieces of legislation, such as the *NSF AI Education Act* and the *LIFT AI Act*, to support youth AI engagement and complementary educator PD. Afterschool educators must be included as eligible recipients of these and other opportunities for funding PD to realize the national imperative of advancing AI for all youth. In addition to the costs of accessing or attending PD, these funding streams must include salary coverage for time spent participating in PD, all travel and accommodation expenses, compensation for substitute educators, any necessary credentialing and certification fees, and resources and tools needed to implement what they learned into their programming.

- Fund the development of high-quality and scalable models for afterschool and summer STEM professional development.

  Include a priority in discretionary grant competitions including the Small Business Administration's Small Business Innovation Research (SBIR) program, the Department of Education's Education Innovation and Research (EIR) grant program and other relevant Institute of Education Sciences (IES) and National Science Foundation (NSF) investments.

2. Invest in research and development across federal agencies to identify high-quality PD models that have been proven effective for afterschool STEM educators and determine the best methods to scale such models.

- Address the PD needs of afterschool educators in the implementation of the *2025 National AI Research and Development Strategic Plan.*[30]

- Create an Interagency Working Group on afterschool STEM to study, make recommendations, and provide robust support throughout every federal agency to ensure sustained and evidence-based investments in the PD needs of afterschool STEM educators.

  The working group, consisting of all the federal agencies that have a mission of supporting scientific research and developing the talent needed to achieve their mission, can serve as a liaison to support the sustainable financing of evidence-based PD models like *Afterschool Coaching for Reflective Educators*[31], which helps with rural program accessibility, and *Imagine Science*[32], which works to build collaborative partnerships. Continued investments will ensure they have the resources to build capacity and reach more educators, as well as consistently revise and update the training curriculum. Investing in adaptive PD curricula is crucial to ensure afterschool programs can prepare youth for an evolving workforce—particularly as these programs are often better positioned than formal classrooms to respond quickly to technological advances without extensive curricular revision procedures.

  The working group can also support a landscape study surveying models of PD for afterschool STEM and their associated outcomes, including their direct impacts on educators, youth, and the programs. They can also commission a study to quantify the cost of quality afterschool and summer STEM learning programs. The study should include the cost of targeted PD required to offer high-quality, topic-specific programming, such as STEM, AI, quantum, biotechnology, and other emerging industry trends.

3. Incentivize STEM businesses, industries, and professionals to partner with afterschool programs.

- Community-based partnerships between local afterschool programs and STEM businesses can support afterschool educators, particularly those serving low-income populations, by providing them with technical STEM support and resources. This can be accomplished through business tax incentives and federally sustained cost-sharing agreements that allow STEM professionals to spend paid time in programs. For STEM businesses that contract with the federal government, these partnerships and the resources necessary to support them can be included in funding contracts. These partnerships can be further sustained by building out platforms and centralized databases similar to the Community Share[33] human library.

- Include the *Youth Workforce Readiness Act*[34] in a reauthorization of the *Workforce Innovation and Opportunity Act*.

  The Youth Workforce Readiness Act establishes a competitive grant program, through the Department of Labor's Employment and Training Administration, for national, youth-serving, out-of-school time organizations supporting youth workforce readiness. Through career-connected programming and incentivizing community-business partnerships, these investments will help increase opportunities for youth to build STEM knowledge and skills, while connecting to critical real-life work experiences and learning opportunities.

- Include the *Students Working for Communities Act*[35] and the *Students Helping Young Students Act*[36] in a reauthorization of the *Higher Education Act*.

  The *Students Working for Communities Act* fosters and expands college student opportunities to participate in community service, including working in afterschool programs[37], under the Federal Work-Study Program. *The Students Helping Young Students Act* specifically incentivizes college students to work in afterschool programs. While being compensated via financial aid for their time, college students can provide both near-peer mentorship and guidance for older youth in programs, whether they are participating or leading programs. College students also bring curricular support for STEM topics, tutoring support, and mentorship

to youth interested in attending college. For college students, placements in afterschool and summer programs help them gain experience in teaching, youth development, and service, while developing leadership and communication skills.

Recommendations for the Afterschool Field:

4. Enable meaningful opportunities for career growth, such as through translatable and recognizable credentialing and certifications.

    - Through partnerships, collaborations, and national strategies, expand support for and build awareness of industry-recognized credentials, such as the *National Afterschool Association's STEM micro-credentials* and digital badges and *PEAR's Dimensions of Success Observer Certification*. Educators should be able to use these credentials gained through PD experiences not only to enhance the quality of their STEM programming, but also to advance their careers in afterschool and STEM education.

5. Support multiple pathways to participation in the afterschool STEM workforce.

    - Establish and support organizational policies and guidance that enable individualized staff hiring mechanisms to alleviate the staffing pressure for content-specific programming in areas like STEM. Formalizing partnerships with institutions like universities, professional associations, museums, science centers, and others could bring in college students, experts in the field, and STEM retirees to work part-time in afterschool and summer programs. Employment in afterschool can also be a pathway to becoming a STEM teacher, as college students in STEM degree pathways and experts in the field gain experience working with students. Building such partnerships is thus a win-win for students both in and outside of the formal classroom.

6. Connect and collaborate with the broader STEM learning ecosystem.

- By building connections and networking with the local, regional, or national STEM learning ecosystem, programs will become aware of STEM resources—PD, curriculum, mentors—that can support staff and STEM programming. While direct funding and time capacity are still essential, tapping into local and regional resources, such as the STEM Learning Ecosystems Communities of Practice, can provide networks of support for staff facilitating STEM programming.

Recommendations for Funders:

7. Funders (both public and private) should consider the full funding needs to support sustainable programming, which includes STEM PD as well as wage growth and benefits for program staff.

- When awarding multi-year grants, build in annual increases to meet the annual rise in cost of living and to accommodate wage increases for staff investing time in PD and quality improvements.

- When PD requirements are tied to a grant, ensure the timing and cost are accessible for the grantee, such as by including the cost of PD as an additional award amount above the original grant request.

- Provide flexibility for mandated PD to include skills in STEM facilitation and disciplinary practices, especially if the program's intent is STEM engagement. Funders can work with programs in identifying relevant PD that integrates STEM and the fundamental staff PD needs in youth well-being and safety.

- Invest in research on the design and development of STEM PD for afterschool educators, and regularly translate and distill the findings to inform evidence-based practices that support afterschool and summer learning programs.

  While investments have been made in designing various PD programs, we do not yet have a body of collated evidence that outlines the highly recommended practices for designing and developing PD to support afterschool and summer STEM educators.

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