AFTERSCHOOL STEM QUARTERLY RESEARCH REVIEW

Photo credit: Wyoming Afterschool Alliance

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AFTERSCHOOL STEM HUB

Hello!

Welcome to the Summer 2026 Issue of the Afterschool STEM Quarterly Research Review (ASQRR). Published by the Afterschool STEM Hub, the ASQRR brings you the latest and most relevant research from the field of out-of-school time (OST) science, technology, engineering, and mathematics (STEM) education. The ASQRR connects practitioners, policymakers, and advocates with findings that matter.

This edition shines a spotlight on a critical and underserved area of the field: **afterschool STEM programs in rural communities**. Rural students face a well-documented opportunity gap. A 2025 National Academies of Sciences, Engineering, and Medicine report, K-12 STEM Education and Workforce Development in Rural Areas, found that rural students have significantly fewer OST STEM learning opportunities than their urban peers. The same report highlights that middle and high school students who engage in STEM learning with near-peer or professional mentors report stronger STEM workforce readiness and greater interest in pursuing STEM degrees and careers. Closing this gap is urgent.

And the demand is there. According to the *America After 3PM* 2025 report, 75% of parents in rural areas agree that afterschool programs help children develop STEM skills and interests, yet access remains out of reach for too many families.

The two articles featured in this issue offer timely insights into the barriers and opportunities shaping afterschool STEM in rural communities, and what the research means for expanding equitable access:

- Ihrig, L., Assouline, S. G., Mahatmya, D., et al. (2022). Developing students' science, technology, engineering, and mathematics talent in rural after-school settings: Rural educators' affordances and barriers. Journal for the Education of the Gifted, 45(4) 381–403.
- Rivera, S., Kavanagh, K., DeWaters, J., et al. (2025). Secondary school-university partnerships foster STEMM interest and self-agency in rural students. Frontiers in Education, 10:1578370.

These articles demonstrate that when rural programs are equipped with meaningful partnerships and financial and curricular resources, they can effectively leverage their own assets to support students' interests and growth in STEM.

We hope you find the issue helpful and informative for your practice, research, or policy work in afterschool STEM education. We also invite you to share your feedback, suggestions, and questions with us at stemhub@afterschoolalliance.org. We would love to hear from you and learn more about how the ASQRR can support your interests and needs.

Thank you for reading and subscribing to the ASQRR. We look forward to bringing you more high-quality and timely research in the next issue. Until then, happy reading, learning, applying, and advocating!

Sincerely,
The ASQRR Editorial Team,
Anita Krishnamurthi, PhD
Leslie Brooks, DVM, MPH
Laura Lerman, M.S.Ed

STUDY REVIEW

Developing students' science, technology, engineering, and mathematics talent in rural after-school settings: Rural educators' affordances and barriers

Ihrig, L., Assouline, S. G., Mahatmya, D., et al. (2022). Developing students' science, technology, engineering, and mathematics talent in rural after-school settings: Rural educators' affordances and barriers. Journal for the Education of the Gifted, 45(4) 381–403. https://par.nsf.gov/servlets/purl/10412196

STUDY SUMMARY:

Researchers constructed case studies describing the experiences and perspectives of rural educators at three afterschool STEM program sites, which focused on identifying and fostering high STEM talent. The goal of the study was to help programs use their community-based advantages to close the achievement gap that exists at advanced levels of performance for underrepresented and low-income students.

This study focused on an accelerated afterschool STEM program for sixth- through eighth-grade students. All three sites received the same materials, training, and funding, but adapted the 96-hour curriculum for their unique learning community. Researchers collected data on program structure and implementation, then identified themes regarding educators' perceptions of the barriers and affordances (opportunities) rural contexts present for program delivery.

Barriers included limited opportunities for field trips and low internet bandwidth. Affordances included the ability to customize the curriculum, build community partnerships for advanced learning, and leverage relationships to connect youth with local resources and expertise. These insights can help educators approach program delivery with an asset-based mindset and make the most of local features to develop STEM talent.

RESULTS:

The educators reported feeling a sense of agency to shape their programs. For example, educators in one district modified the process for identifying high-talent students by considering classroom performance and hobbies, not just test grades. Another district designed its program to address an unused parcel of land next to the school building. Students were given agency to design what they wanted within the space, such as pathways, benches, or bridges.

The educators also pursued partnerships for their programming. One teamed up with local conservation groups and county officials to engage youth in native habitat restoration. Another asked the youth to survey teachers about the types of furniture they needed for their classrooms. The youth then designed and built classroom furniture to meet their needs.

Photo credit: IGraduate STEM Career Academy, Corvallis Afterschool Program

KEY TAKEAWAY:

Afterschool STEM educators in rural locations may face challenges related to their geographic setting. However, when they have ample resources and support, they can leverage positive features of rural contexts to foster high STEM talent. Those features may include close community relationships and the flexibility to create customized accelerated learning experiences.

POPULATION:

Fifteen educators and 127 high-talent students who attended sixth, seventh, and eighth grades in three school districts located in the southeast, central, and northwest regions of a Midwestern state. All districts were rural and subcharacterized as distant, fringe, or remote. Demographics ranged from 73% to 98% white and 48% to 61% eligible for free and reduced-price lunch.

All the educators combined grant funding with community resources and local expertise to develop engaging and effective learning experiences. The educators attributed these opportunities and program success to features of their rural setting, such as reduced pressure to create consistency across multiple school sites—a feature amplified by the nature of afterschool learning—and close relationships in the community.

CONCLUSIONS:

The study demonstrated that educators can use features of rural contexts to foster STEM talent through an afterschool program. Both classroom teachers and afterschool educators in rural settings experience similar obstacles and opportunities. But when rural educators are aware of those barriers and affordances and have support and resources from their school systems, they can leverage local expertise, relationships, and their own agency to create successful STEM programming.

METHODS:

Researchers selected three of the 10 school districts (one school per district) as representative case studies. They selected districts based on location, economic status, and rurality (remoteness). Researchers conducted site visits, interviews, observations, and reviews of student work to document differences and similarities in program structure and implementation. Then they analyzed the data to identify themes about the features of rural contexts that influence how rural educators identify and develop STEM talent in afterschool programs. At the time of the study, the afterschool program was in its fourth year of implementation. Youth participants had all been identified as high-talent when they were rising sixth graders, based on grade-level testing in math and science.

STUDY IMPLICATIONS

IMPLICATIONS FOR PRACTICE:

- **Identify Obstacles and Opportunities:**

Funders, curriculum designers, and resource partners should seek to understand the strengths and limitations of rural learning environments. Doing so can ensure that flexibility is built into the program design, allowing educators to adapt as needed. This can help educators structure and implement afterschool STEM programs with an asset-based mindset, and make the most of local features for talent development.

- **Turn Barriers into Advantages:**

Rural contexts may present challenges, but with support and resources, educators can use their local knowledge and relationships to create afterschool accelerated learning opportunities that narrow the achievement gap.

IMPLICATIONS FOR RESEARCH:

- **Investigate Contributing Factors:**

Additional studies should examine the specific types of support and resources needed to help educators leverage the advantages of rural contexts.

- **Document the Impact of Resourcing on Partnerships in Rural Settings:**

More research is needed to understand the factors that influence the types of partnerships rural educators forge and their specific impact on youth STEM learning experiences.

IMPLICATIONS FOR POLICY:

- **Provide Targeted Funding for Rural Educators:**

Policies that provide professional development, funding, and flexible curriculum support will mitigate obstacles that rural educators face and enable them to design and implement programs rooted in local culture and issues.

- **Enable Local Community STEM Partnerships:**

Through funding requirements, tax incentives, or other means, federal and state initiatives and legislation should support STEM organizations, educational institutions, businesses, industry, and professionals in partnering with rural afterschool programs to implement high-quality programming that meets students where they are.

STUDY REVIEW

Secondary school-university partnerships foster STEMM interest and self-agency in rural students

Rivera, S., Kavanagh, K., DeWaters, J., et al. (2025). Secondary school-university partnerships foster STEMM interest and self-agency in rural students. Frontiers in Education, 10:1578370. https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2025.1578370/full

STUDY SUMMARY:

This study explored the assets and obstacles of rural K12-university STEMM (science, technology, engineering, math, and medicine) partnerships. It focused on four programs developed jointly between a rural university and local school districts. The programs were designed to boost STEM engagement and inspire middle and high school students to matriculate at college. Each program included out-of-school learning components, such as campus visits, field trips, afterschool activities, or summer camps. Researchers administered open-ended surveys to participating educators, who shared their reflections on the opportunities and obstacles of rural settings for STEMM learning.

Educators identified common challenges of isolation, lack of family support, limited resources, and poverty. They noted strong relationships and tight-knit communities as assets. Educators reported that K12-university partnerships helped overcome rural barriers by exposing youth to new learning opportunities, role models, and mentors. Success required partners to invest in building trust and open communication, educators to drive curriculum design, faculty to provide content expertise, and the university to adapt to meet the needs of the K12 community.

Researchers found that educators played an essential role in fostering connection among partners and constituents by serving as cultural navigators who bridged relationships and facilitated understanding. Successful partnerships produced positive impacts, including increases in STEM skills, self-confidence, and exposure to opportunities. The partnerships cultivated lasting relationships and professional networks, opening doors and deepening connections for students and educators alike.

KEY TAKEAWAY:

Rural communities experience barriers to student engagement in STEMM and higher education. K12-university partnerships can overcome those barriers by leveraging rural assets to create effective out-of-school learning. Success requires trust, communication, flexibility, teacher-led program design, and subject-matter expertise. In this context, educators can serve as necessary cultural navigators, fostering understanding between students, families, faculty, and community members.

POPULATION:

Four STEMM programs, led by three white, female educators, operated as partnerships between a small private university and surrounding school districts in a rural region of the Northeastern United States. The programs engaged students in grades 5-12 from schools with populations more than 90% white. More than 50% of students qualified for free and reduced lunch. The county had a 19% poverty rate—second highest in the state—and more than 75% of residents did not hold a bachelor's degree.

METHODS:

The authors used a case study approach to examine one university and four of its school-partnership programs: a neuroscience program designed to boost student interest in healthcare careers, a national competition for students to design experiments that would be conducted on the International Space Station, a STEM and mentorship program for low-income youth, and an environmental outreach program focused on food and energy sustainability. Three representative educators from the programs completed surveys in response to open-ended guiding questions about their rural environment, what motivated their decision to partner with a university, and the impacts the partnerships had on them and their students. The researchers responded with follow-up questions to deepen understanding. Through data analysis, they produced a coding system from which key concepts and themes emerged.

RESULTS:

Four themes emerged from teacher reflections:

- advantages and disadvantages of rural settings for learning,
- critical factors for successful partnerships,
- positive impacts of STEMM programs on youth, and
- ways the programs fostered and strengthened relationships.

Educators identified several challenges common to rural communities, including:

- geographic and cultural isolation,
- lack of family support for academic pursuits, and
- limited access to resources.

Benefits of rural contexts included tight-knit communities and small class sizes, which helped educators tailor the curriculum to their students' needs. Educator narratives revealed key features of successful K12-university partnerships: mutual trust, effective communication, educator-led program design, content expertise, and flexibility. When any of these qualities were missing, disconnects between university staff/students and local residents widened. However, partnership programs with these features produced notable positive impacts: students became more engaged, inspired, confident, and motivated to learn; educators experienced more professional growth; and everyone developed stronger relationships that expanded networks and opened doors.

CONCLUSIONS:

Rural communities can face barriers that limit student engagement in STEM and interest in higher education. Effective K12-university partnerships can overcome those challenges by leveraging local assets. University faculty can provide content expertise and access to tools and resources, including lab equipment and mentorship. Educators bring critical insights regarding local culture and how their students learn, as well as close relationships with students and families. Educators are uniquely equipped to bridge common divides between universities and communities and foster understanding among partners and constituents. Success requires trust, communication, collaboration, agency, and flexibility. When those are present, partnership programs can engage youth in learning experiences that build skills and connections, offering valuable learning opportunities that might not otherwise be accessible.

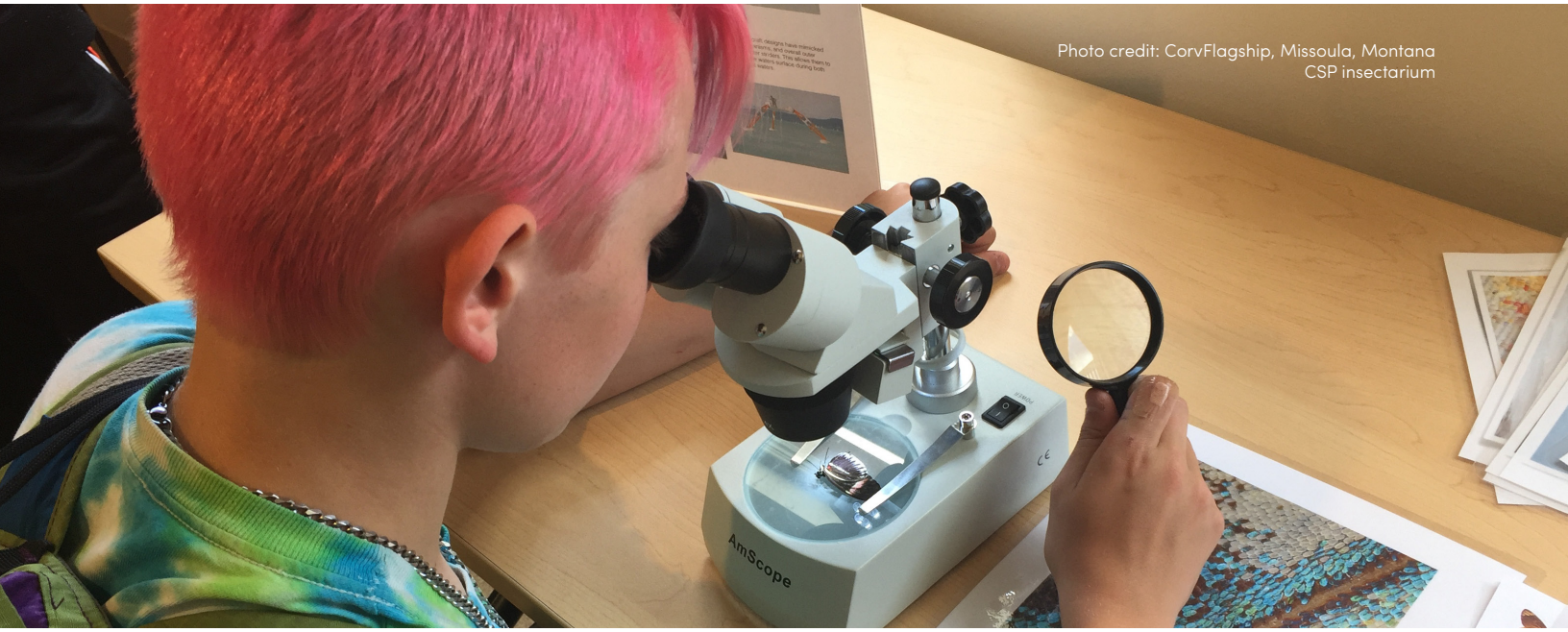

Photo credit: CorvFlagship, Missoula, Montana CSP insectarium

STUDY IMPLICATIONS

IMPLICATIONS FOR PRACTICE:

- **Seek Out Partners with Institutes of Higher Education:**

Universities and K12 schools in rural settings should proactively look for ways to collaborate on afterschool STEMM programming, recognizing the potential positive impacts.

- **Center Student Needs:**

Partnerships should be driven by and adaptable to the needs of students and schools. Universities are uniquely equipped to provide subject-matter expertise and access to research-level resources. Educators are uniquely equipped to design culturally relevant and meaningful curricula–they should be key partners in program design.

IMPLICATIONS FOR RESEARCH:

- **Expand the Study to Include More Educators and Communities:**

This study collected narratives from only three teachers, all of whom were the same gender and race and had a long history of partnership with the university. Future research should gather data from a larger group, which might produce a wider range of perspectives and insights.

- **Create Toolkits to Support Best Practices for Effective Partnerships:**

Document concrete strategies drawn from successful K12-university STEMM partnerships to help more rural communities foster similar collaborations.

IMPLICATIONS FOR POLICY:

- **Invest in Impactful Partnerships:**

When developing legislation that authorizes and appropriates funding for university STEM education outreach programs, ensure that afterschool educators are required to serve as project planning partners, and that project funding includes time to establish trust and relationships with local educators, students, and communities.

- **Incentivize STEM-Rich Institutions to Engage with Communities Authentically:**

Through federal grant requirements or tax-based incentives, encourage institutions of higher education to take STEM expertise and resources directly to where rural students live and learn. Encourage sustained, regular engagement rather than one-off STEM events.

We hope you enjoyed exploring this issue! Additional similar publications are listed below. Until our next issue, you can also read more about research highlighting the updated evidence of afterschool STEM in our research brief and explore evaluation summaries of afterschool programs in the Afterschool Alliance's Impacts Database. Follow us on LinkedIn to learn more and stay updated on our work.

You can register for our upcoming newsletters and receive a copy of any articles that are not open access by completing this Google form.

ADDITIONAL PUBLICATIONS TO NOTE

Jaumot-Pascual, N., Lara-Meloy, T., and Rafanan, K. (2025). Math and making in afterschool - A pedagogic innovation with Latinx middle school youth. Education and New Development. https://doi.org/10.36315/2025v2end123

Kim, S. H., Choi, G. W., Kang, J. H., et al. (2025). "I am an engineering person, I just don't call it that": Rural library professionals' engineering identities-in-practice. International Society of the Learning Sciences, 449-457. https://repository.isls.org/bitstream/1/11764/1/ICLS2025_449-457.pdf

Simpson, A., McCann, J., Miroff, L.E. et al. (2025). The complex STEM identity development of middle school girls in a culturally infused afterschool program. Journal for STEM Educ Res. https://doi.org/10.1007/s41979-025-00162-3

Tessman, D., Rhone, K., and Roberson, R. (2025). After-school STEM programs: Fostering academic growth and STEM engagement in rural communities. Chronicle of Rural Education, 3(1). https://ojs.library.okstate.edu/osu/index.php/chronicle-of-rural-education/article/view/10199/9044