Hello!

And, welcome to the first issue of the Afterschool STEM Quarterly Research Review on best practices in afterschool STEM research. This is a new publication from the Afterschool STEM Hub that aims to provide you with the latest and most relevant findings from the field of out-of-school time (OST) science, technology, engineering, and mathematics (STEM) education.

In this newsletter, we will review research covering a range of topics such as:

- How to design and implement effective afterschool STEM programs that foster youth engagement, learning, and interest;
- How to measure and evaluate the impact of afterschool STEM programs on youth outcomes, such as STEM identity, career aspirations, and academic achievement;
- How to support and develop the professional skills and competencies of afterschool STEM educators, such as content knowledge, pedagogical strategies, and facilitation techniques; and
- How to leverage the unique features and opportunities of afterschool settings, such as community partnerships, family involvement, and project-based learning.

For our inaugural issue, we have reviewed two articles:

1. The effects of an afterschool STEM program on students’ motivation and engagement, by Chittum, J., Jones, B., Akalin, S., & Schram, Á.

We hope that you will find these articles useful and informative for your own practice, research, or policy work in the field of afterschool STEM education. We also invite you to share your feedback, suggestions, and questions with us by emailing us at stemhub@afterschoolalliance.org. We would love to hear from you and learn more about how the Afterschool STEM Quarterly Research Review can support your interests and needs.

Thank you for reading and subscribing to the Afterschool STEM Quarterly Research Review. We look forward to bringing you more high-quality and timely research in the next issue. Until then, happy reading and learning!

Sincerely,
The ASQRR Editorial Team
THE VALUE OF RESEARCH AND DATA IN AFTERSCHOOL STEM

High-quality education research can help in better understanding factors that contribute to youth learning and development and, ultimately, what works to support youth success. Years of research on afterschool programs has demonstrated their potential to improve youth outcomes. Information about programs that have been shown to be effective in the past can guide the work of educators designing and implementing programs today.

Once a program is implemented, providers can use data about the program to help them teach and lead more strategically. The thoughtful collection and use of data about important youth outcomes can also help providers develop programs that are more effective. Both high-quality data and the use of data for program improvement are critical to build evidence about effective afterschool STEM programs, improve practice, and shift policy.

WHY NOW?

While a long history of research has shown the value of well-designed, well-executed afterschool programs for youth, COVID-19 created a new urgency to build evidence about the most recent efforts. In the wake of school closures, remote learning, and the trauma associated with a global pandemic, educators are being asked by various educational stakeholders to dramatically accelerate youth learning and development to address the stagnation and regression of outcomes during these turbulent years.

Research conducted during and after the pandemic can yield new insights into which afterschool models worked, for whom, and under what conditions. Credible data about the outcomes associated with individual programs is also critical. Significant federal, state, local, and philanthropic investments have created the need—and opportunity—to demonstrate who was served by afterschool STEM programs, what they experienced, and how they might have benefitted. Evidence from research is needed now more than ever for advocates to continue making the case for why the public should invest financially, socially, and politically in high-quality afterschool and summer STEM programs.

The Afterschool STEM Hub believes that all young people deserve access to high-quality afterschool STEM programs, that these programs are good investments for youth, families, communities, and our nation, and that high-quality afterschool STEM learning centers equity and the lived experiences of young people. In sharing research updates and discovering knowledge gaps, our hope is that awareness, investment in, and support of the afterschool STEM field can continue to grow, learn, and adapt to better serve our youth.

A NOTE ON TERMINOLOGY

Throughout this text, we reference afterschool, out-of-school time, and informal learning to be synonymous with each other. For the purposes of this review, all three terms are meant to be broadly encompassing varieties of programs that occur out of the normal school day setting, including in the summer, and provide structured science, technology, engineering, and math experiences for youth.
STUDY REVIEW

The effects of an afterschool STEM program on students’ motivation and engagement


STUDY SUMMARY:

This study investigates the effects of an afterschool STEM program, called Studio STEM, on youth motivation and engagement in science. The authors compare the beliefs about science of youth who participated in Studio STEM with those who did not. The study also examines the specific features of Studio STEM that motivated youth to engage in the program. The authors investigated youth motivation and engagement utilizing the MUSIC Model of Motivation, which states that youth are more motivated when they perceive that they are empowered, they perceive that the content or activities are useful, they believe that they can be successful, they are interested in the topic or activities, and they feel cared for by others in the learning environment.

RESULTS:

The main findings of the study are that Studio STEM was associated with more positive youth values for science and their sense of science competence, as well as their resilience in maintaining their motivation and interest in science over time. By the end of the program, the youth who participated in Studio STEM reported feeling more competent in their science abilities than their peers who did not participate in Studio STEM and found science more interesting and useful than their peers did.

The study also identifies several elements of Studio STEM that contributed to youth motivation and engagement, such as the design-based learning approach, the relevance and authenticity of the topics and activities, the autonomy and choice offered to youth, the collaboration and social interaction among peers and instructors, and the feedback and recognition provided by the program.

CONCLUSIONS:

This case study showed that the youths’ experience in the program was associated with more positive perceptions about science as a field, while maintaining youth motivational beliefs about science. Features of the program, such as the active inquiry approach to problem solving, motivated youth and can be replicated in other afterschool programs.

KEY TAKEAWAY:

Well-designed afterschool programs can help middle school youth maintain their motivation in science.

POPULATION:

Middle school youth participating in the Studio STEM program (one day a week for 6–12 weeks).

METHODS:

Case study with mixed-methods approach, combining quantitative surveys and qualitative interviews, to compare the beliefs and experiences of youth who participated in Studio STEM with those who did not.
STUDY IMPLICATIONS

IMPLICATIONS FOR PRACTICE:

- Provides evidence that once-a-week afterschool programs can be effective in fostering youth motivation and engagement in STEM, especially during the critical middle school years when youth interest in science often declines.

- Offers practical suggestions for designing and implementing afterschool STEM programs that are aligned with the motivational principles and best practices identified by the authors. For example:

  When asked about their recommendations for Studio STEM program improvement, most youth agreed that the program was boring when the educator belabored material, such as when youth felt that they already knew the information well enough and were ready to move forward.

  The design-based learning approach of the program allowed youth to use science to solve a societal problem, facilitating their ability to make direct and positive changes in society. Programs that foster youth feelings of empowerment and self-direction can help maintain their interest and motivation in science.

IMPLICATIONS FOR RESEARCH:

- Demonstrates the value of using a mixed-methods approach to make sense of the complex and dynamic nature of youth motivation and engagement in afterschool settings.

- Highlights the need for more longitudinal and comparative studies to examine the long-term effects and outcomes of afterschool STEM programs on youth academic and career trajectories that may be mediated by the motivation and engagement that is cultivated in afterschool settings.

IMPLICATIONS FOR POLICY:

- Strategic investments in afterschool programs for middle school youth can have ripple effects in motivating youth to maintain their interest in pursuing scientific endeavors throughout secondary and higher education, thus leading to more diverse perspectives and backgrounds in the field.

- Incentivizing STEM program models that empower youth to solve or prevent problems in their communities that they care about can have profound effects on youth mindsets related to science identity and continued science participation.

- Increased federal, state, and local funding for quality STEM-based afterschool programs will be necessary to ensure all youth have access to these programs, even if just for one day a week.
STUDY REVIEW

Promoting diverse youth’s career development through informal science learning: The role of inclusivity and belonging


STUDY SUMMARY:
This longitudinal study explored the role of inclusivity and belonging in informal STEM youth programs. The authors sought to understand whether feelings of inclusivity and belonging are associated with perceptions that these informal STEM programs help youth prepare for future careers. The authors surveyed 209 youth from the U.S. and the U.K., aged 10–20 years old, who participated in STEM youth programs in informal science learning settings. Surveys were conducted at the start of the afterschool STEM program, three months into the program, and 12 months after start of the program.

RESULTS:
The study demonstrates that if youth feel their social identity groups, such as gender, culture, and ethnicity, are welcome and included in STEM programming, then they feel a sense of belonging in the program. This sense of belonging is associated with youth perceiving the program preparing them for future STEM fields and careers. However, if youth did not perceive inclusivity at the program’s start, but did so later in the duration of the program, the same perception of career preparation did not hold true.

CONCLUSIONS:
At informal learning sites, youth feel a sense of program career preparation when they also feel a sense of belonging at the site and within the program. The authors demonstrate these results support Social Cognitive Career Theory, which emphasizes “the role of the social environment in career development via one’s motivation or expectations.” The authors conclude that this study extends the Social Cognitive Career Theory by including the role of belonging as a psychological factor in career development. An important part of the conclusion that shouldn’t be overlooked is the fact that perceptions of inclusivity for one’s own social identity groups must be felt at the start of the informal program to have the positive effects on youth perceiving the program prepared them for their future careers.

KEY TAKEAWAY:
When youth feel their social identities are represented and included in STEM programs, a sense of belonging is fostered. This sense of belonging in STEM is later associated with positive perceptions of STEM career preparation.

POPULATION:
Youth from the U.S. and U.K., aged 10–20 years old, participating in informal science learning programs.

METHODS:
Longitudinal study via surveys across different time points over one year.
IMPLICATIONS FOR PRACTICE:

- While quality programs need to focus efforts on STEM knowledge and career preparation, the findings from this study show that it is equally important for programs to commit resources in fostering youth participants’ sense of belonging. Programs can invest in inclusive practices that seek to ensure under-represented youth feel connected and heard. There are a growing number of educator resources and STEM justice and equity professional development offerings that programs can utilize to facilitate a welcoming environment. For example, the Science Museum of Minnesota has built a STEM Justice Toolkit and Techbridge Girls offers STEM Equity Professional Development. Additionally, the Afterschool Coaching for Reflective Educators (ACRES) program offers a module on elevating youth voice and choice and another on nurturing STEM identity and making career connections.

IMPLICATIONS FOR POLICY:

- Policies that incentivize diversifying the informal STEM educator and STEM workforce systems, particularly those that intersect with afterschool and summer programs, can foster youth feelings of inclusivity and belonging.

- Sustaining relationships between youth and program leaders also require policies that support informal STEM educator retention. These might include financial support (living wage, medical benefits, child care subsidies), professional development (quality and relevant STEM content, working effectively with youth, social–emotional understanding, and other examples that translate to career advancement), and other necessary work supports.

We hope you enjoyed exploring our first 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 as well as explore evaluation summaries of afterschool programs in Afterschool Alliance’s Impacts Database. You can also follow us on LinkedIn to learn more and stay up to date on what we are working on.
ADDITIONAL PUBLICATIONS TO NOTE


RESEARCH GRANT OPPORTUNITIES

National Science Foundation - Advancing Informal STEM Learning
Discovery Research PreK–12
EDU Core Research
Building Capacity in STEM Education Research
Innovative Technology Experiences for Students and Teachers

National Institutes of Health - Science Education Partnerships Award

U.S. Department of Education - Institute of Education Sciences