STEM READY AMERICA

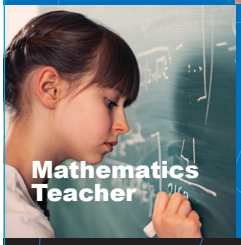
Inspiring and Preparing Students for Success With Afterschool and Summer Learning

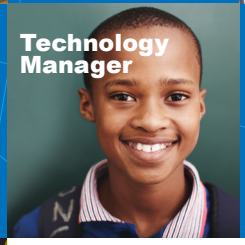
This collection of articles is excerpted from a new resource, *STEM Ready America: Inspiring and Preparing Students for Success with Afterschool and Summer Learning.* In this volume, Executive Editor Ron Ottinger and Contributing Editors Cary Sneider and Ian Hickox have collected expert perspectives on the state of the field of STEM learning—especially in afterschool and summer learning opportunities.

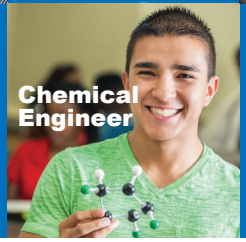
Collectively, these writings from more than 40 thought leaders highlight how young people are developing STEM knowledge and skills that will prepare them to be successful in school today and the workforce tomorrow.

The articles provide persuasive evidence and real-world examples to inform effective partnerships, policies, and actions to bring quality STEM learning to children and youth across the nation. This volume is focused in three key sections:

- **The Evidence for STEM**
- **Partnerships for STEM Learning**
- **Ensuring Access to Quality STEM Learning**







Developed by STEM Next with support from the Charles Stewart Mott Foundation, *STEM Ready America* builds on the award-winning 2013 publication *Expanding Minds and Opportunities: Leveraging the Power of Afterschool and Summer Learning for Student Success* edited by Terry K. Peterson, Ph.D., which made the definitive case for the power and effectiveness of afterschool programs and summer learning.

For more information about STEM Ready America and to download articles visit: www.stemreadyamerica.org.

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Evidence and examples on how young people are developing STEM knowledge and skills that will prepare them to be successful in school today and the workforce tomorrow.
www.STEMReadyAmerica.org

Prepare and Inspire: A Call to Action to Secure the American Dream

The Importance of STEM Outside the Classroom

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In September 2010, the U.S. President's Council of Advisors on Science and Technology (PCAST) released a report entitled *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) For America's Future* (also known as the "P&I report"). This was a direct tasking from President Obama, who instructed PCAST to report on the ways in which educational practices in the areas of science, technology, engineering, and mathematics (STEM) at the K–12 level could be better aligned in order to more effectively prepare U.S. citizens for the economic opportunities of the future.

The need for a more STEM-enabled workforce and citizenry was clear in 2010, and it is all the more pressing today. In an era driven by the dynamic forces of entrepreneurship and innovation, within the context of global competition, it is increasingly evident that the sorts of jobs that will enable young people to secure the "American Dream" will require a distinctively different set of cognitive abilities than have been the goal of American education for the last century. A recent survey showed that almost 30 percent of the "best U.S. jobs" were defined by occupational requirements aligned with those of STEM-enabled workers (Della Cava, 2017). Simply put, in view of the foreseeable needs of American employers, the skills and mindsets of students strongly trained in the STEM disciplines will have an economic premium for those possessing them.

As an example, take the changes in American manufacturing over the last 20 years. According to Federal Reserve data, the United States lost 30 percent of its manufacturing between 1998 and 2016. However, when it comes to a new era for American manufacturing there is reason for hope. The prevailing economic model—built on the basis of a large population engaged in traditional methods of human-labor intensive manufacturing—will likely face major disruption from the significant growth of the automation/artificial intelligence/information technology and robotics (A^2I^2TR sectors. Manufacturing jobs have been returning to the U.S. for some time (Lee, 2016; Clifford, 2013), but the qualifications for these new jobs are strongly aligned with future-forward A^2I^2TR industries rather than more traditional manufacturing. Another bright spot in the discussion of the evolution of U.S.-based manufacturing is the move toward "advanced

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manufacturing (PCAST, 2011)," which not only explores A^2I^2TR in pursuit of increasing efficiency in manufacturing traditional products but also looks at opportunities to advance science in order to create innovative products. Thus, there is a clear challenge to the American educational system to prepare a workforce that has the ability to adapt and even thrive in the era of A^2I^2TR disruption.

In view of these changing workforce needs, the P&I report was geared toward establishing policies to facilitate the uptake of these STEM skills in the workforce (PCAST, 2010). The P&I report was not aimed to address a possible need to create increased numbers of scientists, technologists, engineers, and mathematicians, per se, but rather to increase the STEM literacy of all of our citizens.

To this end, the P&I offered seven recommendations centered on STEM education. Most relevant to this compendium is "Recommendation Five," which calls for policymakers to "*create opportunities for inspiration through individual and group experiences outside the classroom:*"

STEM education is most successful when students develop personal connections with the ideas and excitement of STEM fields. This can occur not only in the classroom but also through individualized and group experiences outside the classroom and through advanced courses.

The Federal Government should develop a coordinated initiative, which we call INSPIRE, to support the development of a wide range of high-quality STEM-based after-school and extended day activities (such as STEM contests, fabrication laboratories, summer and afterschool programs, and similar activities). The program should span disparate efforts of science mission agencies and after-school programs supported through the Department of Education funding (PCAST, 2010, p. xi).

The Obama administration responded vigorously to this recommendation for 24/7 STEM learning, with efforts ranging from innovative uses of the president's time—at events like the White House Science Fair—to expanding the STEM focus of the administration's major afterschool learning program. Among of the most important, but least known, impacts of the P&I report is how much of the language in the bipartisan Every Student Succeeds Act (ESSA) pertaining to STEM education is closely aligned with the vision set forth in the report. In addition to its strong recommendations for the improvement of STEM in schools, the language of the bill calls for expanding STEM learning opportunities outside of school as well, including the following:

- **Increasing access for low-income students to programs outside of school, including nonprofit competitions related to STEM subjects (such as robotics, science research, invention, mathematics, computer science, and technology competitions);**
- **Additional opportunities for hands-on learning and exposure to science, technology, engineering, and mathematics;**
- **Field-based or service learning to enhance the students' understanding of the STEM subjects; and**
- **Collaboration among school, afterschool programs, and informal program personnel to improve the integration of programming and instruction in STEM (STEM Education Coalition, 2015).**

We must build on this momentum and opportunity. Looking toward the future, in 2017 and beyond, through the lens of the P&I report's out-of-school STEM recommendations, and the milestones already met, the clearest and most pressing need will likely relate to the final recommendation of the report, which calls for strengthening strategic national leadership in STEM.

Those leaders will certainly include the authors of the various articles in this compendium—*STEM Ready America: Inspiring and Preparing Students for Success with Afterschool and Summer Learning*. Collectively, these articles describe a major sea change in American's STEM education landscape beyond the school day. The articles highlight, for example, a national web of state networks dedicated to expanding and improving the quality of STEM afterschool and summer programs in all 50 states. Additionally, the articles provide summaries of extensive evaluation and research studies that clearly illustrate the value of informal STEM learning and in-depth discussions of recent efforts to bring together teachers and afterschool program providers to coordinate their efforts so as to optimize the complementary advantages of each setting.

This compendium is just the start—and all of the STEM education community needs to stand up and talk about why its work matters. Like the minuteman of the American Revolution, the STEM community will be required to be figurative "citizen-soldiers" in the continuing effort to ensure a robust educational system, in which STEM is integrally featured, that enables us to navigate the workforce challenges and changes ahead in the coming decades. The nation successfully met this challenge in the great migration from the farms to the cities at the birth of industrialization, and again in the post-WWII transition to the modern era. We will need all the resources that we can muster—including STEM education beyond school walls—to make the next transition to a future economy that is dynamic and inclusive.

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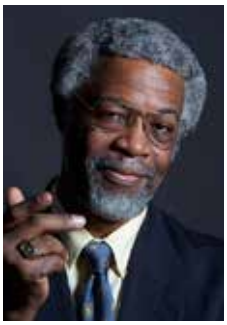
About the Author



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