Inside **Philanthropy**

The State of American Philanthropy

Giving for STEM Education

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ABOUT THE STATE OF AMERICAN PHILANTHROPY

The State of American Philanthropy is a series of background papers on important topics and trends in U.S. philanthropy. The papers draw on past research and reporting by IP writers, as well as new interviews, grantmaking data, and other sources. Learn more at insidephilanthropy.com/state-of-american-philanthropy.

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EXECUTIVE SUMMARY

The funding of STEM education—an acronym for science, technology, engineering and math—continues to be a favorite of corporations and major donors including Amazon's Jeff Bezos, Nike's Phil Knight, former Google CEO Eric Schmidt, as well as large foundations predisposed to making educational grants. The largest STEM funder, by far, continues to be the federal government, which views STEM as a way to boost the economy by encouraging innovation and also to help our national defense by training future scientists and engineers to design hypersonic warheads and develop new cyber warfare strategies.

Despite the federal government's STEM largesse and significant philanthropic contributions, America's students, on average, continue to trail other industrialized nations on standardized tests for math and science. The United States also lags behind our international competitors on the number of students who graduate with STEM degrees.

Given that there is a long history of U.S. leaders declaring educational crises, what are the areas of STEM that foundations and corporations are focused on—and which philanthropy is betting it can make the most difference?

Here are some of the key insights this State of American Philanthropy brief details:

Who's Giving

- STEM is one of the relatively few charitable giving areas where corporate donations play an outsized funding role. Boeing and ExxonMobil are two of the largest givers to STEM, and countless other corporations ranging across manufacturing, technology and media give large amounts to support or launch STEM programs.
- The number of large private foundations giving for STEM isn't nearly as large as the broader education giving category, but big-name funders like Carnegie, Gates, Hewlett, Howard Hughes Medical Institute, Schusterman and Simons give tens of millions every year for their STEM initiatives.
- Major individual donors play an especially important role in STEM funding, particularly at the collegiate level—with gifts most often going to an alma mater.
- Community foundations have relatively small discretionary funds to work with, but often are important funders for local STEM programs.

Who's Getting

- Math at the K-12 level receives a large portion of foundation and corporate support for STEM. While announcements by major donors of huge gifts to higher education institutions for STEM research centers and scholarship programs are increasingly common, they are just one portion of the growing private funds for STEM aimed more commonly at K-12, science museums, teacher training programs and other nonprofits.

- Another area that foundations are eager to fund is STEM curriculum reform. The Gates, Hewlett and Carnegie foundations have given a number of grants to develop digital-based open curriculums in math and science, which are then made available for free to school systems.
- America's "scientific illiteracy," as demonstrated by the rising tide of climate change deniers and vaccine skeptics, is a growing funder concern, with a number of leading foundations augmenting their STEM funding for public outreach efforts.
- Educational groups focused on STEM teacher development and recruitment are the big winners in receiving both corporate and foundation funding.
- Many nonprofits promote STEM activities outside the classroom, including after-school activities, summer camp, STEM dance teams, online STEM courses and even robotics competitions. These groups continue to receive robust funding from both foundations and corporations.

The Big Issues and Funding Trends

- The biggest issue in STEM is finding ways to move the academic needle so that American students, especially minorities and women, perform better on STEM standardized tests.
- The negative impact of COVID is a huge, ongoing issue. Because of the need for hands-on instruction, virtual learning has proven to be a poor substitute when teaching STEM. And standardized tests reveal that minority students were hurt the most by the COVID classroom shut-down.
- Foundations are increasingly partnering on shared STEM grant initiatives, not only with each other, but also with corporations.
- Several foundations have gone Hollywood, giving large grants for science-based documentaries to raise scientific literacy.
- STEM funding is increasingly focused on K-12, based on the supposition that if you lose a student's interest in STEM early on, you will never get them back.

Equity in the Sector

- The lack of diversity in STEM can clearly be attributed to America's failure to provide equal resources and to provide quality, engaging STEM education for all students no matter where they live or their economic status.
- Women also are underrepresented in STEM. A significant number of educational initiatives funded by foundations and corporations are now underway to encourage more women and girls to pursue STEM in high school and college.
- Changes are now afoot to address the inequity caused by math and science pedagogy — driven by foundation-backed progressive and open (free) math and science curricula.

Fundraising Now

- One of the biggest challenges confronting nonprofits raising funds for STEM is resourcing existing programs that bring STEM to all while also attracting additional funding for targeted programming for girls, people of color and other populations.
- Fundraisers are increasingly seeking funding for communications about STEM to a broader public.

- Many nonprofits struggle to prove to funders obsessed with assessment and quantifiable outcomes that their specific programs have long-term impacts on economic success for kids or higher numbers of young people entering STEM professions.

Inequity in America's public education system, especially in the ways STEM is taught (or not taught) to our nation's kids, is gaining increasing public and funder attention, similar to recognition and action taking place in the spheres of healthcare, justice, economics and other philanthropic concerns. Teaching STEM well requires levels of resources many urban and rural schools don't receive, so advocacy around education funding equity is relevant to STEM.

These subjects can also be quite challenging to teach, so better dissemination of good teaching techniques and better teacher professional development could lead to important advances for STEM learning. Relatedly, assessing progress in STEM teaching and learning that aren't wedded to the limitations of standardized testing could be a burgeoning area that draws increased philanthropic support.
For at least the last 70 years, STEM funding has been a pressing priority of the federal government, foundations, corporations and private donors. Yet, as a nation, we are far from declaring victory in the effort to make a quality STEM education available to all students in all schools.

Introduction

Calls to increase focus and resources on STEM education to ensure the ongoing success of the American economy and its defense are not new. As far back as 1862, the U.S. Congress, at President Lincoln's urging, passed the Morrill Land-Grants Act. The act led to the creation of numerous land-grant universities, whose charge was to promote the study of engineering, agricultural science and military tactics (something that was especially important during the Civil War). World War II gave an additional critical boost to the importance of science and technology with the Manhattan Project, which gathered top scientists and engineers at a remote desert location to design and build an atomic bomb. Their mandate? Develop the atom bomb before the Nazis did. Framed as an existential threat, the U.S. invested massive amounts in beefing up funding for what is now termed STEM.

In 1957, the Soviet Union's launch of a tiny satellite, Sputnik, produced great fear and concern in America, causing policymakers to wonder if we were being left in the technological dust. To meet the Soviet challenge, in 1958, Congress passed the National Defense Education Act, resulting in higher federal funding for education with a laser focus on graduating students with engineering and science degrees. That led to what became known as the "space race," and a concomitant massive defense build-up that laid the groundwork for Silicon Valley and the Defense Advanced Research Projects Agency (DARPA).

In the 21st century, recent calls for greater attention to STEM are highly associated with the rise of the internet and other advanced technologies that have helped fuel U.S. economic growth. In 2007, the National Academies of Sciences, Engineering, and Medicine, at the request of Congress, issued a report titled "Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future." One of the report's prime recommendations was to improve and expand K-12 STEM education.

In 2009, President Barack Obama established the Educate to Innovate Initiative—which among other things, called for 100,000 new K-12 STEM teachers by 2021 and further opened federal funding for STEM. In 2021, yet another STEM report—again, authored by the National Academies of Sciences, Engineering and Medicine, titled "Call to Action for Science Education: Building Opportunity for the Future," strongly urged Americans to back STEM education or risk having the U.S. lose out economically to competing nations. The report listed five key priorities: Provide time, materials, and resources for science instruction; develop and support a strong, diverse science teaching workforce; design supportive pathways for science students; employ well-designed assessments and accountability measurements for science education; use evidence to document progress and inform ongoing improvement efforts. Much of the philanthropic sector's STEM grantmaking reflects those priorities.

While splashy donations to major universities for STEM programs and capital campaigns for research centers receive considerable media coverage, the majority of giving for STEM continues to be targeted at K-12, based on the belief that if you lose kids' interest in STEM early on, they will not likely embrace STEM later, in college, or enter STEM fields as a career after college.

Sean Carroll, vice president for science education at the Howard Hughes Medical Institute (HHMI), says,

"Science is critical to solving the problems that confront us. In short, science matters."

The federal government is well aware that "science matters"—and remains by far, the single largest funder of STEM education initiatives. A 2018 congressional study estimated that "annual federal appropriations for STEM education are typically in the $2.8 billion to $3.4 billion range." Further, this report found, "These efforts have identified between 105 and 254 STEM education programs and activities at 13 to 15 federal agencies."

A growing number of foundations, corporations and private donors are dedicating significant philanthropic resources to STEM. The overall size of STEM grantmaking is a deceptively hard number to pin down, as grants are often part of larger education grants. But in IP's discussions with foundations and corporations, the amounts cited are surprisingly large. HHMI reported that it has spent $700 million on STEM in the last 10 years; the Simons Foundation reports it spent $140 million in the last five years; Gates reported that it spends around $100 million on math for grades K-12. Boeing told us it spends $50 million a year on STEM. And the National Science Foundation in 2021 had a total STEM budget of $1.44 billion. So total grants for these five alone is almost $2 billion a year.

STEM funding has become an ongoing commitment for a number of leading foundations, including Carnegie, Hewlett, Gates, Sloan, Howard Hughes Medical Institute, Simons and W.K. Kellogg.

The push by corporate America to support STEM comes out of what a policy expert at the Business Roundtable terms, "intentional philanthropic giving." America's CEOs believe that students who are well-versed in science, math, engineering and technology will lead to a more innovative and vibrant U.S. economy and also become effective workers for their companies. In other words, corporations are funding STEM out of their own "enlightened self-interest."

There is no denying that the world's economy—especially that of the U.S.—is becoming increasingly dependent on science and technology, with the ubiquity of cell phones, electric cars, artificial intelligence, space travel and RNA vaccines. A Pew Research Center study of U.S. data found that in 2019, 19.1 million workers aged 25 and over were employed in STEM jobs, defined as those in life sciences, physical and earth science, engineering, architecture, computer, math and healthcare. This represents an almost 10% increase in STEM jobs over two years. The PEW study estimated that STEM jobs will grow at an annual rate twice that of other occupations between 2019 and 2029.

According to a report by STEMconnector, there are currently more STEM jobs than trained workers, with an estimated 2.4 million jobs in the U.S. going unfilled. The report also finds that STEM jobs pay well. Workers with STEM jobs received 12 to 30% more in salary versus non-STEM jobs. The report by STEMconnector recommended several ways to address the growing Sworker shortage: Expose students to STEM in and out of school throughout their K-12 school years; increase experiential learning and STEM-based apprenticeships; equip educators so they can effectively develop STEM skills in students and employees.

Craig Newmark, who founded Craigslist and established a foundation that invests in STEM efforts, sums it all up pretty well: "America needs STEM both to prosper as a country and to defend ourselves."

The Lay of the Land

Who's Giving

Giving to advance STEM education comes from a wide range of private foundations, community foundations, corporations, major donors and intermediaries. As this brief details in the "Funders by Type" section, a vast number of corporations now give nationally and locally for STEM initiatives, which makes them increasingly important sources of funding. Fundraisers should also pay attention to many of the largest private foundations in the nation that have program areas dedicated to STEM. These foundations have an outsized influence on key initiatives like new curriculum development.

Another active area in STEM funding is at the collegiate level where college and university alums and individual donors are funding engineering, computer and medical schools—often with buildings named after their donors. Former Facebook executive Taner Halicioglu gave $75 million to his school, UC San Diego, for a new data science institute. And Paul Rady, CEO of Antero Resources, gave his alma mater Western State Colorado University $80 million to endow the Paul M. Rady School of Computer Science and Engineering. In Colorado, Philip and Nancy Anschutz gave $120 million to the University of Colorado for the Anschutz Medical Campus.

The No Child Left Behind (NCLB) legislation of 2002 made a large impact on STEM grants—at least with regard to funding priorities. NCLB mandated standardized testing to assess students on an annual basis in both math and reading in the third and eighth grades—and once more in high school. The testing served to determine which school districts would receive more or fewer federal dollars (over $54 billion in 2013) based on whether the math and reading scores for a school district were improving, declining or remaining the same. As a result of that legislation, STEM philanthropic dollars are most likely to support K-12 math initiatives since donors can ascertain whether their STEM grants are impacting math test scores in a positive way.

10 STEM Funders to Know[1]

Boeing
Carnegie Corporation of New York
ExxonMobil
Bill and Melinda Gates Foundation
William and Flora Hewlett Foundation
Howard Hughes Medical Institute
National Science Foundation
Silicon Valley Community Foundation
Simons Foundation
Alfred P. Sloan Foundation

Source: Candid

James Short, a program director at the Carnegie Corporation of New York, says, "Math education gets more funding because it has more accountability due to the ongoing testing component. Science does not have that benchmark."

One funder deeply invested in supporting math education is the Bill & Melinda Gates Foundation. Bob Hughes, the director of K-12 Education for Gates, says, "We spend roughly $300 million a year (on K-12—but not all of it STEM-related) ... with 35% of it going to math." The Gates Foundation is committed to developing new math curricula so that all students can enjoy it.

Simons Foundation is another major foundation supporting math. It is the principal funder of Math

For America, a $30-million-a-year nonprofit organization that provides professional development to math and science teachers in New York City. In 2018 alone, Simons made $21 million in grants to Math for America (see more details on the Simons Foundation in the "Private Foundations" section of this brief).

Science curricula are getting a similar upgrade to make it more student-friendly. Gates is co-partnering with the Carnegie Corporation of New York (see more on Carnegie in the "Private Foundations" section) on its current major STEM initiative, OpenSciEd, an open educational resource (OER) available for free to teachers on the OpenSciEd website. OpenSciEd is the offspring of an earlier Carnegie-funded effort in conjunction with the National Academy of Sciences to develop the Next Generation Science Standards. Those standards were released in 2011.

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"Girls in STEM - this is where the jobs are in the future, and we are leaving our girls out of the running for these growing, high paying, innovative jobs that will design the solutions of tomorrow."

—Fundraiser, Brooklyn, New York

With OpenSciEd's STEM curriculum, Carnegie sought to "implement the new Next Generation Science Standards," according to Carnegie's Jim Short. He adds, "In the last four years, we have given $11.5 million in grants for OpenSciEd."

Gates partnered on OpenSciEd because, according to Gates' Rachel Leifer, "Science has been a great way to explore math, especially in the upper grades." Other foundations joining with Carnegie and Gates on funding OpenSciEd were the William and Flora Hewlett Foundation and the Schusterman Family Philanthropies. According to the OpenSciEd website, "The OpenSciEd Instructional Model uses a storyline approach—a logical sequence of lessons that are motivated by students' questions that arise from students' interactions with phenomena."

Corporate America embraces STEM grantmaking, perhaps more than any other programmatic focus. The cosmetics company Olay is a recent corporate entry into funding STEM initiatives. Olay made a national media splash when it sponsored a STEM-themed float in the 2021 Macy's Day Parade, featuring a larger-than-life statue of a Black female astronaut.

Less whimsically and far more prominently, aerospace, technology and oil companies such as Boeing, ExxonMobil and Texas Instruments are major corporate backers of STEM—committing tens of millions of dollars in STEM grants. Case in point: ExxonMobil was the initial backer of the National Science and Math Initiative in 2007 with a massive $125 million grant to the organization, which is Texas-based.

Cheri Carter, Boeing's vice president for global engagement, explained her company's long-standing commitment to STEM: "Our STEM partnerships are focused on increasing access to inspiring educational opportunities for students who might otherwise not see themselves in STEM careers." She adds, "In 2020, Boeing helped inspire an estimated 3.7 million young women through a variety of STEM-focused programs."

Illustrating a public/private partnership effort, tech powerhouse Apple is joining forces with the state of California to fund Cal State, Northridge's new Global Hispanic Serving Institution Equity

Innovation Hub. In 2021, Apple made a $25 million grant that was matched by a $25 million grant from the state of California. The center's goal is to bring Latinos and other underserved students into college-level science, engineering and technology studies. The Hub is slated to open in 2024.

Community foundations play a notable role in STEM, focusing their efforts at the local level, supporting K-12 schools, community colleges and local science museums. Some of the most active community foundations are in the regions where STEM is already a major part of the local economy.

Individual donors are key players in STEM, especially at America's universities, where they are often supporters of scholarship programs and capital campaigns aimed at creating new STEM-focused centers for research and learning.

The number and prominence of intermediaries in the STEM world is increasing. Most states have established their own STEM intermediaries to amass and distribute funds to schools and nonprofits, principally funded by their state legislatures, but also receiving private donations. In addition, there are numerous intermediaries distributing grants, detailed in the "Intermediaries & Associations" section of this brief.

Who's Getting

Nonprofits receiving private funding for STEM initiatives are a wide-ranging group—school districts, higher education institutions, science museums, STEM policy-focused organizations, film productions, after-school programs and more. Even the Girl Scouts have entered the STEM programming field. One new element is that donors are increasingly committed to making their STEM grants to organizations or school systems committed to addressing the issues of both inequality and diversity in STEM.

One of the largest areas of interest for funders is targeting organizations involved in the recruitment and professional development of STEM teachers, especially in math and science. Math For America, founded by hedge fund billionaire Jim Simons, has been a magnet for STEM grants. It provides professional development to STEM teachers in New York City, the nation's largest school district. According to Candid, from 2014–2018, Math for America was the largest recipient of STEM grants, with $114 million in grants.

10 Leading Grantees in STEM[1]

American Public Television Stations
For Inspiration and Recognition of Science and Technology (FIRST)
Khan Academy
Iowa STEM
Math for America
National Science and Math Initiative
New York Hall of Science
OpenSciEd
STEM From Dance
University of Maryland, Baltimore County

Source: Candid

Another major recipient of STEM grants is the National Science and Math Initiative (NSMI); like MFA, it focuses on STEM teacher development. NSMI started up shortly after the release of the National Academies "Gathering Storm" report in 2007. Today, half of NSNI's $30 million in annual funding comes from federal and state government grants and 20% from foundations and corporations. Since 2007, NSMI has trained 65,000 teachers on

new and more effective ways to teach STEM. In addition, 1,300 partner schools nationwide are using the science and math curricula developed by NSMI.

MFA and NSMI focus on STEM teacher development because, according to a 2018 congressional report, too many current math and science teachers are not qualified to teach their subjects. The report found that "many U.S. mathematics and science teachers lack degrees in the subjects they teach. For example, nearly all high school teachers have at least a baccalaureate degree; however, mathematics teachers are less likely than teachers of other subject areas to have majored in the subject they teach."

An expanding portion of STEM grantees are organizations seeking to spread STEM education outside of the classroom. Grantmakers for Education executive director Celine Coggin says, "there is growing interest in grants to hybrid education, that is, STEM grants for out-of-school time, encouraging STEM activities outside of school."

One of the most successful and long-tenured non-classroom recipients of STEM grants is FIRST (For Inspiration and Recognition of Science and Technology). Founded in 1989 by entrepreneur and inventor Dean Kamen, who invented the Segway and a wheelchair incorporating Segway technology. Its major initiative is an annual robotics competition with student teams from around the world. According to vice president for development Mark Giordono, FIRST's focus "is on engineering and developing skills in teamwork and leadership." In a typical year (that is, pre-pandemic), FIRST reached over 600,000 K-12 students annually.

Giordono reports that two-thirds of FIRST's $28 million in annual funding comes from corporations such as Qualcomm, Boeing, Ford and Google. Over the last 10 years, FIRST has experienced hefty funding increases ranging from 5 to 20% a year. Giordono says funders are intrigued by FIRST's mission. "The idea is to have excitement about science, like in sports, based on the notion of our robotics competition." Over 1 million students have taken part worldwide since FIRST started its robotics competition in 1992.

Cheri Carter, Boeing's vice president for global engagement, says that by supporting FIRST, Boeing will help "graduate more students who are ready to enter aerospace and advanced manufacturing careers and STEM-focused post-secondary education." And FIRST research shows that 80% of FIRST alums go on to major in STEM in college—with 69% majoring in engineering or computer science. Fifty-one percent of female FIRST alums go on to major in engineering or computer science.

Khan Academy is another nonprofit getting major grants for its STEM work outside the classroom. Although it now offers online history and grammar courses, Khan Academy's initial and prime focus remains free online math and science courses. Today, it is a $50 million a year endeavor, with 40% of its funding coming from donors including Bank of America, Silicon Valley Community Foundation, and venture capitalist John Doerr and his wife, Ann.

Alumni want to diversify and increase the ranks of STEM graduates, but they also make huge gifts as a means to increase their alma mater's profile, fund world-class facilities, and boost regional economic development, especially in smaller college towns far from the coasts. STEM gifts are likely the No. 1 driver of the regional philanthropy boom.

As this brief touched upon in the Who's Giving section, major donors give major sums to institutions of higher education. In fact, there is a bit of a STEM "arms race" occurring among elite institutions, each of which is vying for a perceived finite pool of qualified STEM applicants and donors seeking to support major new scholarship programs and research institutes. This is also a contributing factor to regionally focused donors increasingly giving to local universities for STEM centers.

Giving & Getting Deeper Dive

The principal funding areas that private donations support in STEM include math and science curricula; engineering and tech courses, improving STEM in grades K-12; scholarships or enhanced STEM offerings for undergraduate and post-graduate programs; after-school programs, professional development of current and new STEM teachers; initiatives to increase the number of women/minorities in STEM; and informal STEM education programs and outreach.

The table below which is based on Candid data, should not be relied upon as a complete accounting, since it is hard to separate educational grants from STEM-only grants, but it does give an indication of the overall proportions of grant dollars being directed to subcategories of STEM funding.

Candid Top Funding Priorities: STEM 2014 - 2018[2]

Subject	Amount Funded
Mathematics	$120.48M
Higher Education	$45.11M
K-12 STEM Education	$30.35M
Science	$28.24M
STEM Teacher Training, CPE and Development	$16.35M
Diversity	$14.24M
Technology	$481.72K

Source: Candid

IP queried a number of foundations and corporations to determine their strategies and approaches to determining which organizations get grants, and why—as well as how they measure their grants' impacts and success.

For Boeing, one of the nation's largest corporate supporters of nonprofit STEM initiatives, the answer is simple: "Our goal is to graduate more students who are ready to enter aerospace and advanced manufacturing careers and STEM-focused post-secondary education," according to Boeing's Carter.

Unlike Boeing, most corporations are reluctant to tie their charitable giving explicitly to their ability to conduct business. Nonetheless, the popularity of STEM among businesses that couldn't thrive without intensive workforce development in this area speaks volumes.

Private foundations tend to frame their STEM interests in more procedural terms, relationships and definable outcomes. Simons Foundation is committed to working closely with grantees: "We do site visits," says director of outreach, education and engagement, Ivvet Modinou. "We are a hands-on funder, a thought partner. We stay connected with our grantees throughout their journey."

Jim Short at Carnegie measures grantees by their successful "implementation—that's our focus."

Angela DeBarger, a program officer in education with the Hewlett Foundation, says, "We have high-

level goals for our grantees and want to see real progress. We always set implementation markers and then work closely with our grantees."

Growth and scaling are often factors STEM funders consider important. Sandra Welch, who heads up the National Science Foundation's Informal Science Education division, says that in order to be greenlighted, grantees "need to have a rigorous evaluation plan. And we also look for projects that are reaching new audiences." HHMI's Carroll characterizes their grants as "venture capital investments which we then help scale into successful projects."

Major donors with fewer accountability structures have the luxury of being more laissez-faire in their approach. Newmark of Craigslist and Newmark Philanthropies tells IP that his foundation seeks "people who are good at their job, and then I get out of their way."

The Big Issues & Beyond

Despite the hundreds of millions of dollars going to STEM education, statistics show that America's schools are still not doing well with STEM, particularly with educating underserved populations (see the "Perspectives on Equity" section of this brief). According to the last National Assessment of Educational Progress (NAEP), the so-called "nation's report card," in 2020, math scores for 13-year-olds were down five points from 2012—and for the lowest percentile of students, math scores declined a startling 13 points.

"This was the first time in the almost 50-year history of the long-term trend assessments that we observed declines among 13-year-olds," says Peggy Carr with the National Center for Education Statistics. Carr adds, "These performance drops are especially notable among lower-performing students, who no longer demonstrate competency in skills that students were able to do almost a decade ago in both subjects (math and reading)."

Dane Linn, the senior vice president of corporate initiatives for the Business Roundtable, was equally troubled by the scores. He says, "We were discouraged by the fact that the lowest-scoring students were down by 13 points," It should be noted that some of this drop can be attributed to COVID and the fact that most math instruction was no longer classroom-based.

The NAEP science scores were also discouraging. For fourth-graders, in two of the three science categories, there were declines of two and four points, while the poorest-performing students declined by five points in all three areas.

"STEM students represent the future of aerospace innovation. We want to ensure that students of all ages—regardless of their background—have access to the tools and education they need to be successful and have access to job opportunities."

— Cheri Carter, vice president for global engagement, Boeing

Every three years, the Program for International Student Assessment (PISA) tests 600,000 15-year-olds worldwide in math and science. In 2018, the U.S. finished 37th in math out of 77 countries. In addition, the U.S. has shown little discernible progress on the PISA science tests—ending up, again, in the middle of the pack. The U.S. performance versus other nations has not improved over the years, despite the substantial investment in STEM by foundations, corporations, and federal and state governments.

Julia Phillips with the National Science Board says, "The performance of children in the U.S. has not kept pace with the performance of students from other countries in science and math for a decade or more. We have pretty much stayed steady, and other countries have improved dramatically... you see huge differences in performance based on race and ethnicity, so the (American) Asian and white students do much better on these standardized tests than students of color."

An uphill battle amidst changing demographics. According to the Center for National Education Statistics, K-12 student population demographics are undergoing radical realignment. In 1978, the U.S. student population was 6% Hispanic—today, it's 29%, almost five times that. And while the Black student population is stable—13% in 1978; 14% today—the percentage of white students in K-12 has dropped drastically—going from 80% in 1978 down to 46% today. Asian students in K-12 have gone from less than 3% in 1978 to 5% today. In short, white students have now become the minority.

Grantee Spotlight

STEM FROM DANCE

New York City's STEM From Dance was founded in 2011 by Yamilée Toussaint Beach. A self-described nerd and MIT graduate, Toussaint said, "There's got to be some way to take what you can gain from dance—the fun, the community, the form of expression—and translate it into the STEM world." And that's exactly what Toussaint did with STEM From Dance.

Meanwhile, the current K-12 public school student population is increasingly poor and academically challenged. More than 50% of public school students qualify for free lunch; 14% are in special education; 10% list English as a second language, and 3% are homeless.

No national curriculum standards or recommended curriculum. "The State of STEM" report by STEMconnector found that while some school systems have fully embraced newly developed open STEM curricula from companies or nonprofits including ZEARN, EiE and OpenSciEd, an emphasis on STEM is far from systemic in U.S. schools. In the United States, there are over 13,000 independent school districts, 127,000 public and private schools, almost 4 million teachers and 56.4 million K-12 students.

Unlike many of the other developed nations that America competes against economically, our school systems are run on a local level, with no federally developed curriculum. As a result, the organizations advocating for increased STEM instruction need to go district by district, school by school, sometimes even classroom by classroom. Some school systems embrace STEM, others don't—and there is no real ability to impose a rigorous STEM curriculum on America's local schools.

Difficulties adapting hands-on learning during the pandemic. Perhaps the biggest challenge for improving STEM education and outreach has been the COVID pandemic—which only recently appears to be ebbing. In terms of schools, COVID shut down most classrooms in spring 2020. COVID also prevented the hands-on teaching and experiential learning that are essential components of effective STEM instruction (and frankly, instruction in general). Erika Shugart with the National Science Teachers Association says that during COVID, "A lot was being done digitally, but virtual learning is not in any way a substitute for in-class instruction." Meanwhile, a National Bureau of

Economic Research study found that school systems that opened up earlier in the pandemic did significantly better on standardized math scores than those which remained closed and continued to teach virtually.

"Virtual learning is just hard. The classroom is the best environment," says Robert Ochsendorf, a program director at the National Science Foundation. He adds, "It wasn't for a lack of online modules that the scores went down; it is just hard to learn when you are staring at a screen all day." Randi Weingarten, president of the American Federation of Teachers, agrees. "Remote learning is a supplement, not a substitute for in-school instruction."

COVID also negatively impacted how the new STEM open curricula are used. DeBarger of the Hewlett Foundation says, "We have been seeing steady growth in both the awareness and interest in Open Education Resources (OER). But obviously, teachers found it hard to shift to OER during COVID. It requires more professional training for teachers, and they just did not have the bandwidth during COVID."

And some students, many from lower economic backgrounds, lacked the technical ability to access their virtual courses. One study cited by the Business Roundtable found 70% of minority students in Columbus, Ohio, didn't log on to their virtual classes—many because they simply did not have the digital tools or Wi-Fi to do so.

NSF's Ochsendorf says that even before COVID's onslaught, improving access to STEM education was tough. "The education system is going into strong headwinds, with systemic failures, coupled with increasing inequality."

Pandemic closures of science museums. Science museums took a painful financial hit during the pandemic. Christofer Nelson, who heads up the Association of Science and Technology Centers, says, "COVID changed everything." According to Nelson, science museums receive about 50% of their funding from visitors. "Our members lost over $1 billion in 2020 in admission fees," says Nelson. But the federal government, through two COVID relief programs, Paycheck Protection and Shuttered Venue Operators Grants, made up for about two-thirds of the lost revenue, giving out some $650 million in government grants to science museums.

Funder Spotlight
Craig Newmark Philanthropies

Craig Newmark is deeply committed to STEM through his giving, Craig Newmark Philanthropies. The founder of Craigslist, Newmark describes himself as the "Forrest Gump of philanthropy." His nonprofit has made grants to the Girls Scouts' Cyber Awareness Challenge, Women Who Tech and Girls Who Code, and he sits on the latter's board of directors. He also gave a $1 million gift to DonorsChoose.

Despite the challenges, Nelson compliments the science museums for finding ingenious and innovative ways to serve the public during COVID, like providing virtual online visits to their museums and sending staff to homeless shelters and working with students there. On the plus side, says Nelson, the funder response to the pandemic augmented an ongoing trend of foundations giving larger grants for general public outreach in science."The conversation around increasing general science literacy started with climate change, but COVID and the misinformation around it added rocket fuel to the need to educate the public about science and how it works," he

says. Nelson cites the Gordon and Betty Moore, Simons, Arnold and Schmidt Family foundations as funders that stepped up to the plate and increased their public science outreach grants during COVID. And the National Science Foundation is increasing its budget for scientific outreach from $164 million in 2021 to $221 million in 2022—a more than 33% jump.

Moving to open curricula hindered by textbook publishers. Another issue is a growing battle between some foundations and textbook publishers. On one side are foundations such as Carnegie, Hewlett and Gates who are funding open-source (free) educational curricula; on the other side are the mega-textbook publishing companies (Houghton Mifflin Harcourt/McGraw-Hill/Pearson, etc.) with their more traditional, for-profit approach to STEM instruction. Margaret Honey, New York Hall of Sciences executive director, says, "Science education is in the hands of the publishing industry. It's still a textbook economy. It pains me to see students laboring over science worksheets." In 2020, textbook publishers booked revenues of $16.67 billion, so they do swing a big bat—and have a lot to lose financially if curricula are increasingly offered to schools for free.

DeBarger with Hewlett says, "We have had back and forths with textbook companies, but tensions were greater three to four years ago. These are issues we are navigating around." She concludes, "Obviously, we need to bring the publishers of textbooks along in this process (of open and free curricula)."

Funder Strategies & Trends

Given that STEM-dependent industries claim to be all about breaking the mold and trying new things, the casual observer might expect that nonprofits and funders of STEM would be devising new and innovative methods to get more people into STEM. That said, the vast majority of grantmaking in this field looks fairly traditional. There are no major impact investing examples taking center stage; movement-building and cross-movement alliances are missing from the field, and advocacy for STEM is a relatively small piece of the funding pie. Still, there are some important strategies and trends fundraisers should note.

Science museums partnering with public schools. Science museums are among the major recipients of foundation funding for STEM, and increasingly, they are combining strengths built upon their private funding to work with public school systems in new ways. One of those is the New York Hall of Science. Its executive director, Margaret Honey, spoke to IP about how their current funding breaks down. The Hall of Science has around $21 million in annual revenue. Of that, some 25% ($5 million) comes from visitors' admissions fees and the gift shop; $10 million, or 50%, is from the National Science Foundation (NSF) and other foundations, including Simons, Carnegie, Gates, Ford and the New York Community Trust; and the other 25% comes from corporate donors. The city of New York also contributes just over $1 million a year to the Hall.

In part to expand its revenue stream and also to increase its impact, the New York Hall of Science is now following a growing trend of science museums increasing their partnerships with education systems and bringing their STEM expertise directly into classrooms. It is partnering with the New York City Department of Education on a new STEM-based pre-K school for over 300 young students to be built on the Hall of Science's site in Queens. The

city is paying for the building's construction. Honey says the new school will use "a science-themed pre-K program based on our Design-Make-Play methodology." She adds, "This unique collaboration leverages the strengths of both organizations to develop the next generation of STEM leaders among the youngest students." The school's student body will mostly comprise students of color from neighborhoods that have higher proportions of low-income families.

The Liberty Science Museum in Jersey City, New Jersey, has an even more ambitious construction effort underway, which broke ground in October 2021. Its project is scheduled to open in late 2023 or early 2024, and will include $300 million in new construction on 12.5 acres of land donated by Jersey City. The complex will have a business innovation hub, the new Liberty Science Center High School, and a scholars' village for STEM graduate students and entrepreneurs. The funding is coming from private donors, corporations (EY,Verizon, Bank of America and Horizon Blue Cross) as well as state and local grants and bonds.

Campaign Spotlight #FaceTheSTEMGap

In November 2021 the cosmetics company Olay sponsored a STEM themed float in the Macy's Thanksgiving Day Parade for the second year in a row. The float, called "Her Future is STEM-sational," highlighted Olay's #FaceTheSTEMGap campaign, which aims to help double the number of women in STEM and triple the number of women of color in STEM by 2030. Olay has already fulfilled a $1 million commitment to the campaign and in February 2022, it announced a second $1 million pledge.

To date, Liberty Science Museum has raised $42 million in grants and donations for the project.

Many other science museums are also now in the school business. For example, the Museum of Flight in Seattle runs an Aviation High School; Children's Museum of Pittsburgh has a K-8 charter school on campus; and Discovery Gateway — Utah's children's museum, planetarium and natural history museum —has a $10 million contract with the Utah Department of Education to provide in-classroom STEM instruction to all Utah public schools. According to Christofer Nelson, CEO of the Association of Science and Tech Centers, "This is a win-win for both the museums and the schools — the museums receive additional, much-needed revenue and the schools get top-tier STEM instruction."

With grants from foundations and the NSF, many science museums are developing new science or math apps that they make available, usually for free, to teachers and schools. The New York Hall of Science developed its Playground Physics app with support from an anonymous private donor and the National Science Foundation. It is now being used in middle school science classes in New York City. Liberty Science Center, the Exploratorium in San Francisco, and the Museum of Science in Boston also have their own science and math apps and curricula. In addition, foundation grants also fund science-museum-sponsored teacher training programs for local science and math teachers to improve their STEM teaching techniques.

The Museum of Science in Boston received a $50 million grant in 2016 from Bloomberg Philanthropies to fund its robust education program, which includes an online elementary school engineering curriculum, EiE, or Engineering

is Elementary. EiE reaches 1.1 million students a year. The Museum of Science also works closely with 1,900 New England educators each year on STEM teacher development.

Use of intermediaries. Foundations and corporations are increasingly pooling their funds and working together to bring more kids of all genders and racial backgrounds into STEM. The Million Girls Moonshot (MGM), which was launched in September 2020 by the STEM Next Opportunity Fund, exemplifies this trend. The program brought together more than three dozen corporate, foundation and education service organizations to encourage girls to participate in after-school and summer STEM learning opportunities. The principal funders include Gordon and Betty Moore Foundation and Intel Foundation, which each contributed $1 million; the Charles Stewart Mott Foundation allowed the initiative to leverage its 50-state Afterschool Network, which teaches more than 10 million students a year.

The goal of The Million Girls Moonshot is to reach 1 million school-age girls in the U.S. over a five-year period (2020–2025) and provide them access to STEM after-school learning opportunities. A particular focus of the initiative is Latinx and Black girls.

Dr. Penny Noyce is the board chair of the STEM Next Opportunity Fund and the daughter of Robert Noyce, a co-founder of Intel. She explains, "When my father... and Gordon Moore founded Intel, they built upon the experiences of their youth, where they had opportunities to build, invent, engineer and experiment. The Million Girls Moonshot will help girls from diverse backgrounds develop this same engineering mindset, and I'm thrilled at the way it continues the legacy of Intel's founders and their passion for advancing STEM."

MGM is well on its way to meeting its goals. In its first year, 2021, 160,000 girls took part in some 21,000 after-school STEM programs.

Integrating STEM into popular media. Several foundations have become significant media producers with a laser focus on telling compelling science-based stories. Most recently, the Simons Foundation launched Sandbox Films in September 2020. Its goal, according to Sandbox's executive director, Greg Boustead, is to "re-invent the science documentary so that they're less didactic and like going to school." Among the media heavyweights on Sandbox Film's high-powered advisory board are famed film director Werner Herzog and the Talking Heads' David Byrne. Documentaries produced under their banner include one by Herzog, "Fireball: Visitors from Darker Worlds," as well as "Oliver

Leadership Spotlight: Freeman Hrabowski

The University of Maryland, Baltimore County's president, Freeman Hrabowski, grew up in Birmingham, Alabama, during the turbulent civil rights protests of the 1960s. Even as a young boy, Hrabowski loved math and eventually earned his Ph.D. Today, UMBC leads the nation in the number of African American Ph.D. recipients in the sciences and engineering. "We are a magnet," says Hrabowski, "for black students interested in STEM." HHMI's Sean Carroll calls Hrabowski "a hero" who excels at finding creative and holistic ways to attract minorities and women into majoring in STEM.

Sachs: His Own Life" and "Fathom," which explores how whales communicate.

The Howard Hughes Medical Institute is now in its ninth year of running its own in-house science documentary studio, Tangled Bank Studios. Sean Carroll wears a number of hats for HHMI, among them, heading up Tangled Bank. Says Carroll, "Humans have always communicated through stories. It's how we share, how we laugh and how we learn. Our studio places storytelling at the heart of everything we do." In addition, HHMI also funds the IMAX films featured at many science museums. Carroll backs IMAX because "you get 45 minutes of a person's undivided attention."

The Alfred P. Sloan Foundation has the longest track record of funding science films, television, books and theater—an effort spearheaded over the years by its vice president, Doron Weber. Says Weber, "To paraphrase Willie Sutton, we go where the public is—that's why we've embraced TV, theater, films, books and social media."

In 2014, author Margot Lee Shetterly requested $50,000 from the Sloan Foundation to fund research for a nonfiction book about a group of Black female mathematicians who worked for NASA during the early 1960s. The grant led to the book "Hidden Figures," which became not only a bestselling book, but also a Hollywood box office break-out and an Oscar nominee. Weber is proud of the ongoing and wide-ranging impact of his initial micro-grant. "'Hidden Figures' has become a cultural milestone. I had a friend whose daughter dressed up as Katherine Johnson (one of the mathematicians) for Halloween."

Sloan and Weber are looking to reach all Americans with a positive message about science. "Our goal is to reach 95% of the public who won't be scientists. After all, we need science to better understand COVID or climate change." Weber reports that his public understanding budget has been stable over the last five years, but they are now funding more book projects since they are less expensive than TV or film, and serve as "low-cost R&D for us."

Principals at Sloan, HHMI and Simons are convinced that the need to educate the public about science has never been more urgent than in this age of growing science denial. Says Simons' Modinou, "We want people to feel connected to science; it is important for science to be seen as an important part of our society."

Public broadcasting engaging with STEM. For public television, COVID had a silver lining, marking a welcomed coming of age for the robust television education courses it offers younger students, much of it STEM-based. "COVID was a challenge and a great success for us," says Pat Butler, who heads up America's Public Television Stations (APTS). "PBS stations provided great educational programming to students—and enabled us to reach poor students who did not have access to the internet."

Grantee Spotlight

ChickTECH

Established in 2012 to improve diversity in STEM by engaging women and non-binary people in the technology industry, ChickTech currently serves youth and adults in 34 states and 15 countries. From 2020-2021 its 1,154 students participated in over 4,000 hours of learning through its hands-on workshops. ChickTech has received financial support from organizations such as the Adobe Foundation, CDK Global, and the Tides Foundation.

Stacey Karp, vice president for communications at APTS, cites a number of facts and figures on PBS's impact: "As schools closed, the use of PBS LearningMedia hit record-breaking numbers in the spring of 2020, with more than 8 million users. This was double the number of users in the prior three months and double the average monthly users compared with the previous 12 months. In addition to teacher use, student use is growing, with triple the number accessing and registering on the platform."

To broaden PBS outreach, Butler explains that in April 2020, the federal government provided $75 million in emergency COVID grants for PBS and NPR stations and their content providers. This emergency funding was in addition to funding from the traditional backers of PBS education programs such as the U.S. Department of Education, the National Science Foundation and the Corporation for Public Broadcasting, as well as dozens of corporate donors. Butler notes that over the years, Boeing has been a generous supporter. Says Boeing's Carter, "Boeing has a long history of partnership with PBS and its affiliates, including as an early sponsor of 'Sid the Science Kid,' produced by KCET and the Jim Henson Company. PBS LearningMedia was an important partner in developing STEM education content for 100 Days of Learning, the company's 2016 centennial celebration."

Supporting STEM Journalism. HHMI vice president for science education Sean Carroll maintains that "money (the size of grants) and change don't necessarily go together." Carroll points to a recent innovative partnership that HHMI formed with the Associated Press. "When daily newspapers shut down or reduce their reporting staff, science reporting is one of the first areas to go," says Carroll. To address this issue, HHMI gave AP a grant to hire 12 new science reporters. This grant proved especially useful during COVID. AP, with HHMI's donation, fielded its own reporting task force to track down and correct the rampant disinformation appearing on social media concerning COVID. "Some of the best things we've done didn't cost much," says Carroll. "AP, for instance, was a huge delta for us, and it was not that expensive."

Funder Spotlight

hhmi | Howard Hughes Medical Institute

In 2021, HHMI made a $2 billion commitment to "increase racial, ethnic, and gender diversity in science." The pledge includes goals ranging from increasing HHMI staff diversity to supporting underrepresented groups in science at U.S.-based universities and colleges. HHMI is also developing accountability systems throughout the institute through transparent reporting regarding the race/ethnicity and gender representation of its employees.

Using microgrants to get more types of organizations engaged. Simons Foundation believes in the transforming power of "microgrants." One microgrant recipient is STEM From Dance, a New York City-based dance troupe composed of young African American and Latina students. STEM from Dance's goal is to "use dance to empower, educate and encourage girls as our next generation of engineers, scientists and techies. Our students build their confidence through dance and create challenging, technology-infused performances—ultimately building the skills needed for a future in STEM."

Perspectives on Equity

In the wake of George Floyd's murder and the growth of the Movement for Black Lives, funders

are asking STEM grantees to make sure their requests address racial and gender diversity and seek to increase equity. Shugart of the National Science Teachers Association says, "Diversity is a real issue, and we are aware of the need for equity and how we can address this and make it better." Boeing's VP for global engagement, Cheri Carters, says that Boeing places "special emphasis on students of color and others from communities typically underrepresented in STEM fields."

Sean Carroll, HHMI's vice president for science education, told IP, "We realized early on that the scientific community does not look like America. And at HHMI, we have embraced a big increase in our discussions around those issues." In October 2021, HHMI announced a massive new 10-year, $2 billion commitment to advance diversity in the sciences—in the classroom, the lab and administrative settings. According to HHMI Board Chair Clayton Rose, the organization hopes that its financial commitment will "have sustained and lasting impact."

A recent article in Science Advances found that the lack of diversity in STEM goes beyond frequently discussed gaps by race and gender: "LGBTQ STEM professionals were more likely to experience career limitations, harassment and professional devaluation than their non-LGBTQ peers. They also reported more frequent health difficulties and were more likely to intend to leave STEM. These trends were similar across STEM disciplines and employment sectors."

The National Science Foundation's Welch admits that when it comes to diversity and equity, there is still much work to do. "NSF is committed to doing more with women and minorities. We are actually ramping up that effort as we speak. We issued a new program description about three months ago, Racial Equity and Diversity in STEM Education, and that initiative has brought in some very interesting new proposals."

Over the years, the Walton Family Foundation has been one of the largest backers of K-12 education, including STEM. In laying out its new five-year objectives this year, Walton identified diversity as one of its three core tenets, stating, "In the grants we make and the collective work we undertake, we will consistently act on our conviction that when people with different ideas and backgrounds are all at the table, this collective and inclusive effort yields more sustainable and innovative solutions."

The W. K. Kellogg Foundation is a legacy foundation most widely recognized for its long-term commitments to racial equity initiatives across all of its giving areas, including its STEM grantmaking. In 2021, it gave a $1.25 million grant to an HBCU, Prairie View A&M in Texas, to recruit and train Black male STEM teachers. WKKF gave another $1.25 million grant to the Center for Innovative Training in New Orleans, a new STEM hub for Black youth.

New York Hall of Sciences' Honey says that the new focus on STEM diversity and equity is a necessary trend. "The funding world tracks heavily what the current issues are, and we (NYSCI) responded by changing and pivoting to tailor our grant requests to those issues. The emphasis now is to include social justice into your grant requests, and I think that is a smart strategy."

Unfortunately, from one school district to another, there are vastly different STEM curricula, teaching resources and knowledge, and ultimately, student

performance. According to Julia Phillips with the National Science Board, "It ought to be extremely disturbing to everyone in the U.S. that science and math performance is not equally distributed across the country. You see huge differences in performance based on race and ethnicity so that Asian and white students do much better on these standardized tests than students of color."

The most recent federal data reveals that only 7% of STEM college graduates are African American, a number unchanged between 2008 and 2018, while Hispanic STEM college graduates did increase—from 7% in 2008 to 12% in 2018. The lack of diversity in STEM can be attributed to America's failure to provide equal, high-quality STEM education to all its students. The "Call to Action" report from the National Academies of Sciences, Engineering and Medicine found that among high-minority high schools, 42% did not offer chemistry. This is in stark contrast to 18% of low-minority high schools that didn't have chemistry classes. Similarly, 59% of high-minority high schools didn't offer physics, compared with only 31% of low-minority high schools.

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"I believe that the philanthropic center, like many, is bringing racial justice into the conversation. Unfortunately, I do not think there is a large shift in actual funding priorities or changing of missions that are necessary to constitute the institutional transformation necessary for racial justice."

—Fundraiser, Worcester, Massachusetts

The continuing lack of women pursuing STEM majors in college and going on to work in STEM jobs after college is another much-discussed challenge for the field. Strikingly, in one area of STEM, the health field, women are overrepresented, holding 74% of the jobs. However, in computer science, women fill only 25% of the jobs; in engineering and architecture, it's 15%. Overall, women receive only 32.4% of STEM college degrees, according to the National Center for Educational Statistics. While remaining a low portion of STEM graduates overall, the number of women earning STEM degrees increased 66% between 2009 and 2018.

The Million Girls Moonshot (discussed in the "Funder Strategies & Trends" section) is one of the larger initiatives now charged with getting girls more involved and engaged with STEM. Other K-12 initiatives encouraging girls to sample STEM include: STEM for Her, Techbridge Girls, code.org, Girls Who Code and ChickTech.

Among larger institutions, new initiatives are taking shape. For example, the University of Maryland, Baltimore County, has established its own Center for Women In Technology. The aerospace firm Northrop Grumman is a major funder of the center.

The University of Maryland, Baltimore County, is one of the leading universities effectively addressing STEM's inequities, and funders are looking to replicate its success. UMBC reports that 20% of its students who major in STEM are African American—and the university graduates more African American Ph.D.s in STEM than any other college or university. Part of the university's success is directly attributable to its Meyerhoff Scholars Program, which has received national attention and acclaim. It began back in 1989 and has since been replicated at a number of other universities. The program seeks to prepare minority students to major in college STEM programs.

UMBC's STEM efforts have been supported by numerous foundations, private donors and corporations. In 2019, the Chan Zuckerberg Initiative gave UMBC a $9 million grant to replicate MYS at the University of California, Berkeley, and the University of California, San Diego. A similar effort, funded by a grant from the Howard Hughes Medical Institute, launched MYS-based programs at the University of North Carolina and Penn State. Despite UMBC's ongoing success with its STEM-centric programs, the university's president, Freeman Hrabowski, says STEM fundraising "has not gotten any easier—and we are always in competition with the HBCUs." (UMBC is not an HBCU.) He adds, "Over the last few years, our funding has been fairly constant for our STEM programs."

Howard University, an HBCU, has its own program patterned after the Meyerhoff Scholars. Formerly called the Bison STEM Scholars Program, it was renamed the Karsh STEM Scholars in 2020 when it received a $10 million grant from the Karsh Family Foundation. The funding was used to endow the program and provide scholarships to 30 students a year who pursue a Ph.D. in a STEM field.

Despite a few stellar examples, private philanthropy does not devote adequate resources to institutions such as HBCUs, which could make the most difference in producing greater equity in STEM. A report commissioned by the Sloan Foundation found that the top 10 higher education institutions received over 44% of total STEM grants. Further, according to an Inside Philanthropy article co-authored by Sloan's Lorelle Espinosa, "a dismally small number of funders are prioritizing DEI. In private philanthropy, funding explicitly targeting groups underrepresented in STEM comprised just 5.8% of total STEM higher education investments." She added that "only 202 out of 2,330 funders invested in such initiatives." Espinosa says that as a result of their report, Sloan is committed to investing more in minority-serving institutions and other colleges with "a strong track record for enrolling and graduating Black, Latino and Indigenous students."

Another report by the Council on Foundations revealed that grant decision-makers in foundations are not as diverse as they should be. The 2020 report found that only 27.3% of full-time foundation staff members were people of color vs. 25.8% in 2016, but more concerning is that only 10.3% of foundation CEOs or executives in leadership were people of color (unchanged from 2016).

Program Spotlight

HOWARD UNIVERSITY

When Howard University established the Bison STEM Scholars program to increase the number of underrepresented minority students earning advanced degrees in STEM, university president Wayne A.I. Frederick said "We knew it wouldn't be sustainable without external resources." In 2020 the Karsh Family Foundation donated $10 million to Bison Scholars, now known as the Karsh STEM Scholars program (KSSP). Funding went to KSSP's endowment and to establish the Lomax KIPP Scholarships. The program awards two scholarships annually to KIPP graduates to help cover the gap between tuition and related costs to attend Howard and financial aid.

The "Call to Action" report makes a persuasive argument for much bolder moves to make STEM more equitable. "Beyond benefits to the scientific enterprise, expanding the pool of talent is important for ensuring that science takes up

education investments." She added that "only 202 out of 2,330 funders invested in such initiatives." questions and problems that are important for a wide range of communities. Building a diverse scientific workforce can help ensure that science better serves all people."

Christofer Nelson of the Association of Science and Technology Centers agrees: "The focus on diversity is with the intent to start the pipeline earlier, and at the end of it, getting more minorities into science and more into AI so we don't end up with facial recognition software that fails to recognize black people."

A Closer Look at Funder Types

Private Foundations

Private foundations, while not the largest source of funding for STEM (the federal government is the biggest source of funding, followed by state governments), have been leaders in funding both new STEM curricula as well as STEM teacher professional development.

As this brief touched upon in the "Who's Giving" section, the Gates Foundation is perhaps the biggest elephant in this room. In just one example, in spring 2021, the Gates Foundation announced a new Algebra Grant Challenge. The challenge will fund 15 recipients to develop innovative ways to "make algebra 1 more accessible, relevant and collaborative for students who are Black, Latino, English Learners, and/or experiencing poverty."

"One of the things we really resist is this idea that you are born a math person, right? And in fact, you aren't," said to Gates' Bob Hughes. "There are lots of examples of that. There's enormous work done by everybody from Uri Treisman in the post-secondary space to Jo Boaler in California, at Stanford, really talking about the multiple factors that determine whether you're good at math. And we want to focus on those to make sure more folks succeed."

The effort to develop new math curricula is driven, in part, by the research of Boaler, an education professor at Stanford University. She says, "There's a lot of research that shows when you teach math in a different way, kids do better, including on test scores." An article in Stanford magazine describes Boaler's approach: "As a researcher, teacher and evangelist, Boaler is a leading voice for a wholly different pedagogy where speed is out, depth is in, and the journey to an answer can be as important as the destination. It's an approach where sense-making matters more than memorization and retaining 'math facts' matters less than understanding how such facts interconnect."

The Gates Foundation is working with a number of software companies to meet Boaler's call for teaching math in a different way. Gates Deputy Director for K-12 Education Rachel Leifer says, "We're also really, really interested in the extent to which student engagement can improve that enjoyment of mathematics ... which we know is a leading indicator to ultimate success in critical courses like algebra I and beyond."

One of Gates's grantees is Zearn Math (zearn.org), a nonprofit educational curriculum developer that has developed an online math curriculum for grades 1–6. In 2020, Zearn received $1.6 million in grants from Gates.

The Carnegie Corporation of New York has been funding STEM education since the Sputnik era, and while the New York City-based foundation doesn't top lists of foundations with the largest endowments, it brings to the table "more caché than cash," according to one of its program executives, Jim Short. Carnegie's commitment to education goes back even further, more than a century, its earliest grantmaking in support of public education. Carnegie funded the recent "Call to Action for Science Education" report and also helped fund the Next Generation Science Standards in 2007.

Other recent Carnegie STEM grants include almost $1 million in grants between 2016–2018 to support

the New York Hall of Science; $450,000 to ZEARN to develop a new math curriculum; $300,000 to the American Association for the Advancement of Science (2021); $100,000 to the National Science Teachers Association (2021).

Simons Foundation is another influential STEM funder. Its founder, Jim Simons, has a Ph.D. in mathematics and founded Renaissance Technologies, an extremely successful hedge fund that revolutionized the use of mathematical formulas for trading. Before Renaissance, Simons was a code breaker at the National Security Agency and a professor of mathematics at MIT, Harvard and Stony Brook University.

Jim and his wife Marilyn started the foundation in 1994 and ran it until summer 2021. Its new director is an astrophysicist, David Spergel. The foundation's principal work is backing scientific and math research, but Simons also maintains a robust educational outreach initiative. "The Simons Foundation's Outreach and Education programs seek to stimulate a deeper interest and understanding of science and mathematics among students, professionals and the interested public," according to its website. Simons' Ivvet Modinou says, "We are a national funder, but 50% of our grants are New York City-based."

Howard Hughes Medical Institute has many aspects of an operating research lab — it uses its large endowment to fund its own work, but also gives a huge number of grants like a private foundation (HHMI largely functions as an operating foundation, but does engage in some significant grantmaking). HHMI also happens to be the sixth-largest foundation in the world, with $21.2 billion in assets. The only U.S. foundation larger than HHMI is Gates.

In 2020, HHMI gave out $822 million in grants with $66 million of that going to science education outreach. Its outreach division is headed by a leading evolutionary biologist, Sean Carroll. Carroll has written a number of bestselling science books, including "The Serengeti Rules" and "A Series of Fortunate Events." Carroll says its educational outreach budget has remained fairly constant over the last five years.

HHMI checks off a number of STEM funding boxes —including teacher development, IMAX and documentary film production, funding reporter slots for AP to cover science, and supporting the University of Maryland, Baltimore County's STEM efforts and programs.

Grantee Spotlight

ZEARN

The nonprofit education curriculum publisher and tech company, Zearn offers hands-on and digital learning materials for K-8 math lessons. The organization receives wide support from funders including the Gates Foundation and the Silicon Valley Community Foundation (SVCF). Gates granted Zearn $4.4 million in 2018 and $3 million in 2021 and the SVCF gave the organization $1.5 million in 2019 and 2020.

The Walton Family Foundation, established with the wealth of Walmart Inc., is deeply committed to STEM. Its grants have been mostly school-based—with $25.7 million between 2016–2020 going to the eSTEM Public Charter Schools. The charter system runs five schools in Little Rock and embraces the Next Generation Science Standards. Additional grants of $3 million went to High Tech High in San Diego, while the Denver School of Science and Technology received a $1.3 million grant from Walton.

The Charles and Lynn Schusterman Family Philanthropies is another supporter and donor to STEM efforts. The foundation was endowed by Tulsa-based Samson Energy founder Charles Schusterman, who died in 2000. His widow, Lynn, remains active in leadership along with his daughter, Stacy. Schusterman has given to the Tulsa STEM Hub, STEM Next Opportunity Fund and to online STEM curriculum companies Illustrative Math and Zearn. They have also worked closely with Carnegie on funding some of Carnegie's STEM initiatives.

Lyda Hill Philanthropies is run by Lyda Hill, a Dallas-based entrepreneur, and one of the heirs to the H. L. Hunt oil fortune. Her foundation is strongly committed to funding STEM with a particular focus on women in STEM. It supported the If/Then Exhibit at the Smithsonian, which placed 120 statues of women scientists on the National Mall during Women's History Month in March 2022. In 2011, her foundation gave a $20 million grant to start a STEAM center at Dallas' Hockaday School, an all-girls high school that she attended. Her gift represents one of the newer STEM trends, the move toward STEAM, with the "A" standing for arts. And this commitment will continue into the hereafter, according to the foundation's website: "Miss Hill has a fervent belief that 'science is the answer' to many of life's most challenging issues, and she has chosen to donate the entirety of her estate to philanthropy and scientific research."

Corporate Funders

For corporations, STEM has proven to be a continuing, seemingly irresistible draw. The list of STEM corporate funders reads like the Fortune 500: Apple, Boeing, Exxon Mobil, Lockheed Martin, IBM, Microsoft, 3M, Chevron, Procter & Gamble and Walmart. Boeing, for instance, made $234 million in grants and donations in 2020 and reports that $50 million, or 21%, was invested in STEM education and workforce development programs. Further, as a percentage of investments in charity organizations, 49% of Boeing's grants were in organizations involved with STEM. It reports that its STEM grantmaking has remained steady over the last five years. Pat Butler of American Public Television Stations is appreciative of Boeing's STEM commitment. "Boeing is big on STEM and they are a shining example of corporate philanthropy."

Other large corporate givers and corporate foundations (based on Candid data from 2014–2018) are: Toyota USA Foundation ($7.5 million), Comcast Foundation ($7.3 million), Verizon Foundation ($7.8 million) and Texas Instruments ($5.4 million).

Funder Spotlight

LYDA HILL PHILANTHROPIES

Lyda Hill Philanthropies focuses its charitable giving on advances in science, environmental stewardship and preservation, empowering nonprofits., and community-based organizations in Texas and Colorado. In recent years, Lyda Hill Philanthropies has awarded multi-million dollar grants to the University Texas Southwestern Medical Center to establish the Lyda Hill Department of Bioinformatics; MD Anderson Cancer Center's Moon Shots program; and the Center for Brain Health to help military service members and veterans recover from traumatic brain injuries.

The energy sector provides a great deal of STEM funding. Business Roundtable's Linn told IP that oil companies are particularly generous in funding STEM. For example, BP's OTC Energy Challenge allows students to directly experience how STEM works in the business world. The challenge is offered to high school students in the Houston, Texas area. Challenges include letting students solve technical and engineering issues found on oil platforms (OTC stands for Offshore Technology Conference).

Chemours, a global chemical company spun off from DuPont in 2015, announced in November 2021 a $4 million donation to build a 24,000-square-foot STEM facility at a middle school in Wilmington, Delaware, where the company is headquartered. The reason? Chemours CEO Mark Newman said, "We're nurturing a more capable, inclusive and diverse future STEM workforce that will be ready ... for jobs in STEM-related fields over the next 20 years."

Northrop Grumman has a major corporate and manufacturing presence in Colorado and is working to improve STEM offerings in the state. It supports a STEM summer camp program for Colorado students run in association with the University of Colorado. It also funds the Northrop Grumman Teachers Academy, which focuses on middle school science teachers—and is a principal funder of the Women in Technology Center at UMBC.

Tech companies like Dell and Texas Instruments are big players in the STEM funding game. Dell supports the Engineering is Elementary curriculum in partnership with the Boston Museum of Science. Texas Instruments has given some $150 million over the last few years to fund STEM education in K-16. Most recently, TI gave $4.6 million to the STEM for All program run by Educate Texas and the Richardson School District in Texas. This initiative involves 10,000 students, as well as professional development for the district's science and math teachers.

The bio-pharmaceutical company Amgen, through its foundation, operates the Amgen Scholars program, a summer program for college students to immerse themselves in STEM at leading U.S. colleges, including Harvard, Yale, Stanford and UCLA. The Amgen Foundation has invested $74 million in this 16-year effort. It also backs Khan Academy's science curriculum development with a three-year, $3 million grant.

Corporate Funder Spotlight

LOCKHEED MARTIN

Global security and aerospace company Lockheed Martin supports STEM efforts mainly through scholarships and outreach programs. With the overall goal of having a "higher availability of STEM qualified, digital-ready workforce from more diverse backgrounds and grounded ethics," Lockheed's giving in this field focuses on career readiness and career access for high school and post-secondary students.

Boeing and corporations such as Procter & Gamble, Chevron, Caterpillar and Microsoft are part of the STEM Careers Coalition, a website run by Discovery Education. It features video profiles of STEM career options, as well as links to STEM curricula and after-school STEM activities.

Another organization that has received robust corporate funding is code.org, which focuses on teaching computer programming skills to women and minority students. It is an almost $30 million a

year nonprofit that has received grants exceeding $10 million from Microsoft, Amazon and Facebook. In all, its online curricula have reached 60 million students.

The Business Roundtable remains committed to encouraging its over 200 corporate members, from Abbott to Xerox, to engage with and back STEM education. BRT's Linn says, "STEM corporate funding has increased exponentially."

Community Foundations

Community foundations, like the more well-endowed national foundations, have embraced STEM. However, they mostly focus their efforts on funding STEM programs at the local level – K-12 schools, community colleges and local science museums. The San Francisco Foundation is one of the more prolific STEM funders among community foundations, with over $8.2 million in grants (according to Candid data) between 2014-2018. Among the foundation's STEM grantees are Exploratorium, California Academy of Sciences, Khan Academy and Science Corps.

The Silicon Valley Community Foundation, also in the San Francisco Bay Area, is a major supporter of STEM education. In 2019 alone, it gave $4.5 million to the California Institute of Technology; $1.1 million to the American Institute of Math; $800,000 to the Association of Science and Technology Centers; and $2.5 million to the Virtual Science Center. Over the years, it has also given $5.4 million to code.org. In 2019, it made a $2.5 million grant to the Virtual Science Center in Sunnydale, California. It is also a supporter of the math curriculum developer Zearn, giving them $3 million over a two-year period (2019-2020).

The Community Foundation for Northern Texas has its own Educate Texas initiative, which makes STEM grants to North Texas school districts. The foundation has also formed a partnership with Texas Instruments to support STEM efforts in North Texas.

The New York Community Trust is a supporter of STEM from Dance, providing that organization almost $300,000 in grants in 2019 and 2020. It also has supported the New York Hall of Science, including a $170,000 grant in 2021 and a $217,000 grant in 2020.

But it isn't just the larger community foundations that direct resources to STEM initiatives. In Wisconsin, the Community Foundation for the Fox Valley Region helped a local children's museum in Appleton set up its Innovation Lab with a $35,000 grant in 2018. In 2020, the Community Foundation for the Fox Valley Region made a $250,000 grant to help the New London Library launch its STEM Lab.

Grantee Spotlight

SMASH

SMASH is dedicated to empowering all students of color with a STEM education. Launched in 2004 at UC Berkely by Dr. Freada Kapor Klein, SMASH is a funding favorite among both private and community foundations. Supporters include the Eli and Edyth Broad Foundation, Silicon Valley Community Foundation, New York Community Trust, and the San Francisco Foundation.

Major Donors

Individual donors often play a critical role in advancing the cause of STEM—especially at America's universities. (See also the State of American Philanthropy brief "Giving for Higher

Education" and the outsized role of major donors.) At the University of Maryland, Baltimore County, private donors endowed two of its more successful STEM efforts.

George Sherman, founder of Cypress Group LLC and a former corporate leader for numerous large corporations, and his wife Betsy donated funds to launch UMBC's Sherman STEM Teachers Scholars program. The program's goal is to encourage UMBC students to become STEM teachers. The college's much-replicated Meyerhoff Scholars Program was the result of a donation from a local real estate developer, Bob Meyerhoff. An MIT graduate, Meyerhoff cared deeply about math and science and came up with the funding to get more African Americans engaged in STEM at the college level.

The University of Oregon's Phil and Penny Knight Center for Accelerating Scientific Impact is the result of two $500 million gifts (in 2016 and 2021) from Nike founder Phil Knight. A recent 2020 study for the Nonprofit and Voluntary Sector Quarterly found that large university STEM donors are most likely to be alums—with an even higher percentage being entrepreneurs. Phil Knight represents both trends as an alum and successful entrepreneur. The study's author, Emily Nwakpuda of the University of Texas, Arlington, estimates that mega-donors ($1 million or more, by her classification) gave $61.2 billion to universities and colleges in support of STEM between 1995 and 2017.

A recent example of such philanthropy is a 2019 gift from Princeton alum and former Google CEO Eric Schmidt and his wife Wendy to Princeton University to create a new computer science center that will be named after the couple. Computer science is the largest major at Princeton, with 25% of students choosing it. And it was not Schmidt's first big STEM gift to Princeton. In 2009, Schmidt gave Princeton $25 million to set up its Transformative Technology Fund.

Harvard has enjoyed numerous STEM gifts from wealthy alums, including a 2014 gift of $77 million from former Microsoft CEO Steve Ballmer, which was used to increase Harvard's computer science faculty by 50%. And in 2015, hedge fund billionaire John Paulson gave Harvard $400 million to endow its School of Engineering and Applied Science, which was then named after him. At the time, it was the largest alumnus gift in Harvard's history.

Ronda Stryker, an heir to the Stryker Corporation, a medical technology company, gave a $30 million donation to Spelman College, an HBCU, to endow its Center for Innovation and the Arts. The center will integrate Spelman's art classrooms and studios with its STEM classrooms and labs—seeking to bring science and humanities students and faculty together in a collaborative setting. While not an alum, Stryker currently serves on the Spelman College Board of Trustees.

In June 2021, the University of Connecticut's School of Engineering received a $3 million donation from Mark Vergnano, an alum and CEO of the Chemours Company. The money will endow the Vergnano Institute for Inclusion, which will seek to bring more diversity and inclusion into engineering and other STEM fields. It will work with both college and K-12 students.

In 2018, Brown University received a $100 million gift from an alum, Robert Carney. It endowed the Carney Institute for Brain Science. Carney was the founder and chairman of Vacation Publications and founded Jet Capital, a financial advisory firm.

MacKenzie Scott is an individual donor giving massive sums across a wide range of subject areas, mostly concerning social justice. With a fortune derived from Amazon stock, Scott has donated billions of dollars over the last few years, and in a fairly expeditious fashion. In June 2021, she gave Florida International University $40 million, its largest grant ever. FIU intends to use some of her donation to enlarge and improve its STEM offerings, including its Mastery Math Lab and STEM Transformative Institute.

Other STEM college donations include $26 million from Jim and Thomas Duff, local Mississippi businessmen, to build a new $175 million Jim and Thomas Duff Center for Science and Technology Innovation at the University of Mississippi. A local Mississippi foundation, the Gertrude Ford Foundation gave $25 million to the construction effort, as well. When completed, the center will be the largest building on campus.

One of the go-to STEM grantees among major donors is code.org. This $30 million nonprofit provides free, online computer and science programs to schools and students. Bill Gates, Jeff Bezos, and Reid Hoffman have all written sizable checks to help fund code.org's educational efforts.

Intermediaries & Associations

The number of intermediaries and associations advocating for STEM and increasing the funding available for nonprofits working on STEM has increased concomitant with the rise of STEM as a funding category of growing importance and interest. Some of these associations are advocates for particular areas of STEM and providers of essential information for the field; others bring funders together for new initiatives; some coordinate and distribute funds that STEM organizations can seek out; a few function with some combination of these roles.

Grantee Spotlight

Spelman College®
A Choice to Change the World

"The rapid convergence of art, technology and entrepreneurship with the liberal arts and sciences are beginning to yield new solutions to old challenges," says Mary Schmidt Campbell, president of Spelman College. Soon, Spelman will begin construction of the Center for Innovation and the Arts, an $80 million facility. The building combines the sciences and arts in one building, exemplifying the STEAM movement. In 2018, it received a $30 million donation from Ronda Stryker and in 2021 it was awarded a $12 million grant from the Lettie Pate Evans Foundation.

There is no national funder affinity group dedicated to STEM interests, although many foundations that direct large portions of their grantmaking to this field belong to Grantmakers in Education, which does not manage collaborative funds, but is a center for learning and discussion on STEM issues, among other education topics.

Functioning essentially as intermediaries, but with the bulk of funds provided by government sources, STEM funding organizations have been established by many states, including Iowa STEM, Washington STEM, JerseySTEM, Texas STEM Coalition and North Dakota STEM Ecosystem. Most of these state-based organizations are principally funded by their state legislatures and disperse grants to local school districts to support STEM programs in their respective states.

Now in its 10th year, Iowa STEM is one of the older state-based STEM organizations. According to its director, Jeff Weld, 300 of Iowa's 310 public school districts have "taken part in one or more of our Iowa STEM programs." State funding for Iowa STEM has increased 20% since 2016 to $6.3 million in 2020. Weld adds, "Of course, everyone should be doing more. STEM has become a bridge between education systems and employer systems. It's positioned K-12 as a workforce mechanism. We can't scale it fast enough or big enough to meet the demand for a skilled technical and intellectual workforce and population across America, but it's the best hope we've got."

Washington STEM is an even more ambitious and well-funded effort than Iowa's program, receiving over $9.5 million in funding in 2020. Washington STEM oversees 10 regional STEM networks and reaches 1 million Washington students annually. In addition to state funding, Washington STEM receives corporate backing from many local and national corporations, including Amazon, Boeing, Google, Microsoft and Zillow.

Donor Spotlight

ripple

Shortly after cryptocurrency firm Ripple made its $29 million donation to DonorsChoose.org's #BestSchool Day campaign in 2018, it committed over $150 million to support various STEM related programs. $50 million went to universities around the world to support blockchain technology and research, new curriculum development in emerging financial technologies, and other technical projects. $105 million went to create Ripple for Good, a social impact program with funding focusing on STEM and financial technology.

A variety of STEM funds are popping up around the country (and around the world). The STEM Next Opportunity Fund was established by the Noyce Foundation with the Charles Stewart Mott Foundation and Arthur and Toni Tembe Rock. It operates the Million Girls Moonshot with funds from Intel, Gordon and Betty Moore Foundation, Qualcomm, Lockheed Martin, CISCO, Samueli Foundation, and others; as well as the Family Engagement Project with funding from Schusterman Family Foundation, Carnegie Corporation, CISCO and others.

DonorsChoose is an intermediary that allows private donors at all scales, corporations and foundations to make their own grants to individual classroom projects. It was founded in 2000 by a Bronx, New York, public school history teacher, Charles Best. The crowdfunding site gives STEM teachers and other teachers the ability to post specific funding requests for classroom materials and other educational needs.

Since its founding, DonorsChoose has funded 1.7 million classroom projects and given out $314 million in grants to over 16,000 schools. The site has some 5 million small and not-so-small donors. In 2019, Ripple, a cryptocurrency firm, gave DonorsChoose $29 million to fund every classroom project on the DonorsChoose website. Concerning that donation, Charles Best remarked, "I do not believe there has ever been a day when this many classroom dreams came true."

Besides individual donors, corporations and foundations are also using DonorsChoose, including Google, Chevron and GM. The Chan Zuckerberg Initiative made over $1 million in grants to DonorsChoose, while Gates has given some $500,000 in grants. The Craig Newmark

Foundation gave one of its bigger gifts, $1 million in 2017, to DonorsChoose. Typical STEM teachers' funding requests on DonorsChoose range from funding STEM Bins ($5.00) to paying for STEM Challenge Flip Charts ($38.00) or Weather Science kits ($23.00).

At the national level, there are many groups that provide essential information and coordination around STEM, and some also distribute funds. Some of these groups include: National Academy of Engineering, National Academy of Sciences, National Academy of Medicine, American Association for the Advancement of Science, American Institute of Mathematics, National Center for Science Education, American Association of Physics Teachers, and the STEM Education Coalition. As noted earlier, the National Academies of Sciences, Engineering and Medicine recently issued the "Call to Action" report calling for increased funding and support for STEM.

The STEM Education Coalition is a Washington-based lobbying organization whose members include a consortium of STEM-centric associations and corporations, including Society of Women Engineers, National Consortia of Secondary STEM Schools, National Society of Black Engineers, National Council of Teachers of Mathematics, and National Science Teachers Association, as well as corporations including ExxonMobil and Microsoft.

An important STEM advocacy group is STEMconnector. STEMconnector is actually a for-profit company that seeks to advise its mostly corporate clients about STEM initiatives and the best ways to support them. According to its website, STEMconnector's goal "is to inform, stimulate and connect leaders with a passion for, and vested interest in, growing a STEM-ready workforce."

Among STEMconnector's 80 members are Walmart, Procter & Gamble, 3M, Verizon, Lockheed Martin, Intel, Pepsico, Chevron, Comcast, Northrop-Grumman, and the Tiger Woods Foundation.

"STEMconnector's been invaluable in convening like-minded visionaries," says Jeff Weld, who heads up Iowa STEM and is a STEMconnector member. Weld adds, "They've filled a vacuum at the national level in terms of becoming a STEM 'North Star.'"

For the most part, intermediaries and associations are able to make their case for supporting STEM efforts with very little pushback. Shugart of the National Science Teachers Association, says, "In this era of acrimony and partisanship, science education remains bipartisan and supported by both sides of the aisle. Everyone is for it."

Association Spotlight

STEM connector

The professional services organization STEMconnector offers support to academic institutions, nonprofit organizations, corporations, and government members to "meaningfully develop, execute, and scale their STEM talent strategies." Members include NASA, National Geographic, the National Math and Science Initiative, and Northrop Grumman. It also operates independent programs like its Million Women Mentors network, which is dedicated to encouraging girls and women to pursue careers in STEM.

Fundraising Now

Fundraisers we spoke with assert the importance of both targeted and broad approaches to improving STEM learning outcomes across the country, especially for underrepresented groups. They observe that corporations are increasing support for out-of-school science learning, which may help STEM organizations reach more diverse audiences, and foundations are investing significant resources in science communication. A challenge has been the diversion of funding to support basic needs at the height of COVID-19, which made it more difficult to sustain support for areas such as the professional development of K-12 science educators.

Striking a balance between broad and targeted programs. Devon Nelson, assistant vice president of development at the Museum of Science and Industry in Chicago, Illinois, oversees all areas of philanthropy, including individual and institutional giving to the museum. Nelson said that fundraisers are seeking to balance attracting funding for STEM programming aimed at a wider audience, while also responding to funders' desire to direct special attention and resources to the most under-resourced communities. She pointed to a recent shift in focus, primarily at foundations, to achieving more impact on the neighborhood level —in particular, to reduce racial wealth disparities. "While STEM programs are a step in the direction of that," Nelson said, "to show direct impact between STEM education and reducing the gap can be challenging work in neighborhoods."

Rex Babiera, ITW director of professional learning at the Museum of Science and Industry, directs facilitated experiences for field trip groups, supports professional development for science teachers, and develops learning resources, such as science activity kits. Babiera said that striking a balance between broad-based and targeted programming is part of how STEM programs are evolving after deep inequalities became more apparent during COVID.

"Funders are coming around to saying explicitly that the investment in different communities historically has been unequal," Babiera said. "So we're looking for those places that are under-resourced systemically, and trying to align a more targeted focus on those areas within the umbrella of 'everybody gets something.' Because research shows that when you devote programs and resources to targeted areas that have been under-invested in in the past, everyone benefits."

Nelson said, "I hope that there can be some understanding that the world needs both. When we're talking about community investment, you need organizations that are really inside those communities, but you also need organizations that have a broader-based approach."

A related challenge is responding to funder insistence on demonstrating certain outcomes when that attribution can be difficult. "There's always a challenge in trying to meet the reporting outcomes, having a broad-based approach like we do," Nelson said. "Our programs still are really impactful, and have great need, even if the outcome isn't '10 students' science tests went up by XYZ amount, and therefore they got a job as a chemist.'"

IP also spoke to executive director Ron Ottinger and director of Philanthropic and Strategic Partnerships Kam Kyzer at the STEM Next Opportunity Fund. Based in San Diego, California, STEM Next works through a national network of large, youth-serving organizations to strengthen

STEM learning, focusing on middle school and out-of-school time. The organization focuses primarily on middle school because, Ottinger said, "The research tells us that if a young boy or girl hasn't said he or she is interested in being a scientist by then, it's much less likely to happen." Donors include the Charles Stewart Mott and Wallace foundations, and a large slate of corporate partners.

Funder Spotlight

stemnext OPPORTUNITY FUND

The STEM Next Opportunity Fund invests in organizations helping to ensure that young people have access to high-quality, after school STEM programs and those working to eliminate the gender gap in the field. Instead of investing directly in programs, STEM Next works with organizations "on the deeper systemic challenges that limit their growth and impact." Its portfolio includes Million Girls Moonshot, Imagine Science, and Girls Inc.

"The local is always important," Kyzer said, "especially from a corporate funding standpoint, because [corporations] have to show up in their local markets and communities as being a good local partner." Corporations play an outsized role in STEM philanthropy, investing in STEM education to strengthen their businesses and the overall economy. Ottinger reported that corporate funders are expanding beyond the programs they have traditionally funded in their backyards. He gave the example of Panasonic North America, which is in the process of moving from a "school district strategy" to funding informal STEM learning.

Kyzer's experience with STEM funders—corporations in particular—is that they tend to embrace risk-taking and experimentation. "They really come [along with you] in experimenting and pushing the envelope to figure out what works," Kyzer said. For instance, Kyzer reported that Takeda Pharmaceuticals approached STEM Next to propose designing a program together to help kids get caught up in math, saying "'Let's look at the research, test out a couple of things, and then figure out how to get it to scale.'"

Nelson added that as funders respond to current events and shift emphases over time, fundraisers need to "align the great work that our program staff do to the national trends." She added, "It is our job as fundraisers to make sure that we're listening to the funders and finding what resonates on both sides." This includes the need to reframe the way programs are described.

Another challenge that arose during COVID is raising and sustaining funds for training and other initiatives related to the implementation of the Next Generation Science Standards — a set of K-12 science content standards released in 2013 — as funders pivoted to immediate, basic needs. Nelson said, "A couple of years ago, there was a lot of funding interest in what we were doing as a museum about the Next Generation Science Standards. There may be specific people that still have interest in that, but the pivot has meant getting money and resources directly into the hands of young people, students and their families."

Moving toward a national systems approach. There is "no one entity that's going to eliminate all the barriers for underrepresented children in STEM education," Kyzer said. STEM Next thus concentrates on attracting funding to build infrastructure to reach that goal. Ottinger said, "Where there is a structure that allows us to help scale quality programming, that's where we have focused."

For instance, Kyzer noted that it's important for kids to have a network to tap into after an initial, animating experience. "You have to fund local programs in your backyard because somebody has to hold the weeklong 4-H camp in Bentonville, Arkansas. Walmart needs to keep funding that local camp. But it cannot be a 'one-and-done' experience. You might have a girl there who gets super-excited about one STEM experience, and then what?"

Part of STEM Next's work involves collaboration with the STEM Funders Network. "We work on issues that none of us could do alone," Ottinger said. "In the early stages, we came together to support the development of the Next Generation Science Standards, because without those standards, we wouldn't have the framework to move forward."

Resourcing communications with the public about STEM. The Alan Alda Center for Communicating Science at Stony Brook University in New York offers graduate and professional development programs that train scientists to be effective communicators, mainly through workshops that employ improvisational theater. The Alda Center's $2 million annual budget comes from workshop fees and philanthropic funding, including a $3 million gift from the Simons Foundation in 2019. The Kavli Foundation is also a supporter.

The Alda Center's executive director, Dr. Laura Lindenfeld, emphasized the importance of philanthropy for science communication programs. Science communication "could slip through the cracks if the philanthropic community were not focused on it, especially as the need for more engaged science communications increases," she said. "There's no effective science engagement without great science communication."

Lindenfeld credited the Kavli Foundation, as well as the other members of the Science Philanthropy Alliance, which includes the Alfred P. Sloan Foundation and the Gordon and Betty Moore Foundation, for providing excellent networking and learning opportunities. "We've benefited tremendously, not only from their direct financial support, but from the networking and learning opportunities they provided," Lindenfeld said.

A third of the Simons Foundation's grant to the Alda Center backs a study of how the workshops support science communication. Lindenfeld emphasized that the Alda Center "believes in empirical assessment of the work that we're doing as part of the scientific community." She added that the Alda Center employs "social science and educational understandings about how people learn, so that when we're training scientists to go out in the world, they have a better understanding of how audiences perceive them."

Intermediary Spotlight

SCIENCE PHILANTHROPY ALLIANCE

The Science Philanthropy Alliance advises and connects donors and foundation staff with its members to "identify best practices in basic science funding." Its supporters include the Chan Zuckerberg Initiative, Wellcome Trust, and the David and Lucile Packard Foundation. Alliance members are well known funders of science and STEM efforts including the Simons Foundation, Research Corporation for Science Advancement, and the Heising-Simons Foundation.

Documenting impact. The Alda Center's workshops can also help fundraisers secure National Science Foundation (NSF) grants through required statements of broader impacts. These impact statements describe a proposed activity's

potential to benefit society, and often include educational, community outreach and professional development activities. A good statement can make an application more competitive.

Lindenfeld said, "The National Science Foundation is fundamentally critical to the scientific undertaking in this country. And the ability to advance broader impacts is core to their work. I'm thrilled when we are able to be a partner that can bring our tried-and-tested methodology to the table so that the scientists trying to achieve broader impacts can connect and engage more effectively with their various stakeholders and communities."

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"There needs to be greater visibility of the smaller but influential programs that need to raise money through philanthropy. My public science program is very effective - but we can't attract sufficient funds to guarantee long-term operation and scaling to larger audiences."

—Fundraiser, United States

Furthermore, at the Museum of Science and Industry, several NSF research and evaluation grants help staff assess the impact of their STEM education programs and exhibitions. For example, a current NSF grant evaluates how viewing a juried art exhibition affected visitors' experiences of other science throughout the museum. Since demonstrating program effectiveness is an important aspect of securing and renewing grants, NSF funding may improve fundraisers' ability to attract more funding.

More funds for out-of-school time and diversity in STEM. A significant focus of STEM philanthropy is diversifying the scientific fields. STEM Next has been successful in raising funds for informal STEM learning experiences as grantmakers recognize their importance for girls and others traditionally underrepresented in STEM. Ottinger emphasized that out-of-school time is where kids who haven't been exposed to STEM in engaging ways often get their start.

"It's a low-stakes environment where they can really see the joy of engineering and design, and feel pride and accomplishment," Ottinger said. "They begin to develop confidence and competence, whereas in school, there is high anxiety around math and more traditional approaches to teaching science."

STEM Next's family engagement efforts, in particular, emphasize reaching kids from populations that often receive less exposure to STEM due to factors like their race, gender or economic status, as well as immigrants and kids with disabilities. The organization received a grant from the Carnegie Corporation of New York to bolster their family engagement work in 2020.

Out-of-school STEM experiences are also of particular importance for Babiera of the Museum of Science and Industry in Chicago. He said, "We want to make sure that kids who participate in afterschool programs have the opportunity to do science because we think out-of-school time is a really important place for us to promote kids becoming interested, motivated and excited about being science learners."

An Analysis of Opportunities & Challenges

The media's coverage of the COVID pandemic exposed the inequities of our health system, where people in low-income communities and neighborhoods of color found themselves much more likely to come in contact with COVID, less likely to have access to quality healthcare, and much more prone to become severely sick and to die. It is undeniable that our systems including health, justice and education—overwhelmingly favor the well-off. Inequity in America's public education system, especially in the way STEM is taught (or not taught), reveals a similar ongoing injustice that is impossible to deny.

Teaching STEM requires levels of resources many schools don't receive. Because public school funding in the U.S. is property-tax-based, public schools in suburban and wealthy areas continue to enjoy much more educational funding for multiple purposes, including raising teachers' salaries and offering Advanced Placement STEM courses, while their urban and rural counterparts are often starved for funds.

And although federal and state governments, along with foundations, corporations and individual donors, direct billions to STEM initiatives (and increasingly more of this STEM funding goes toward countering inequity), this funding pales in comparison to the total annual budget for K-12 education.

The total funding for K-12 education in the U.S. is $734.2 billion a year with the federal government underwriting 7.8% of that, or $58 billion. The American Enterprise Institute estimates that about $5 billion annually in education funding comes from foundations, with a fair amount of that going into STEM. Ochsendorf of the National Science Foundation says, "We are trying to move the needle on math, and we (NSF) spend about $163 million a year on K-12, but that's not that much money for the tens of millions of students in the U.S. It's a drop in the bucket."

In short, the diligent and well-meaning funding efforts by foundations, corporations and individual donors in their effort to move the STEM needle for underserved populations has barely scratched the educational inequity surface — which explains why, as important as it is, STEM funding has yet to make much of a broad impact.

Dissemination of teaching techniques and teacher training. One piece of good news on the STEM front is that, thanks to foundation grants, the field is learning more about the most effective ways to teach STEM. New York Hall of Science Executive Director Margaret Honey recalls a fact-finding trip she took a few years ago to Finland. When talking with local educators, she heard a common refrain: "We get our best educational ideas from you guys." Honey says, "Many of the best ideas about teaching STEM were developed right here, but they haven't taken root yet."

Shugart of the National Science Teachers Association agrees. She says, "We know what good teaching is, but we really need more professional development for teachers to embrace these new techniques."

Unfortunately, establishing how to teach STEM and resourcing the teaching of it are two different

matters. Finding and developing future STEM teachers continues to be a significant challenge generally, but in addition, there is the challenge of increasing the number of STEM teachers of color.

A recent survey by Frontline Education of 1,200 school districts found that 46% of the districts reported a critical shortage of high school math teachers; 26% reported a shortage of physical science teachers. This reality is not lost on the Gates Foundation's Bob Hughes, "I think there are giant shortages. For example, when you look at California, there's both a general math teacher shortage and then for students in schools with high concentrations of poverty or high concentrations of students of color, it's even more stark."

Shugart of the National Science Teachers Association agrees that not only is there "a science teacher shortage overall" but more concerningly, she says, "we are losing diversity in our teaching ranks" as older STEM teachers of color retire.

Meanwhile, fewer college students are majoring in education. With traditional low pay and high stress, teaching is not an attractive option for most millennials. Since 2010, enrollment at schools of education is down by 33%; 1 in 9 states has seen drops of 50% or more in students training to be teachers. The number of Black and Latino students pursuing degrees in education is down by 25%, which does not bode well for increasing diversity in the STEM teacher ranks.

Intensifying these staffing shortages, COVID has dramatically cut into the supply of teachers. A recent Rand study in the midst of the pandemic reported that 1 in 4 teachers were considering quitting because of the added stress of teaching during a pandemic (more than 400 teachers died due to COVID). For instance, the Fort Worth schools had 314 teacher openings in September 2021 versus only 71 vacancies in September 2019. And Florida reported that statewide, its teacher vacancy rate was up 67% in August 2021 versus teacher vacancies in August 2020.

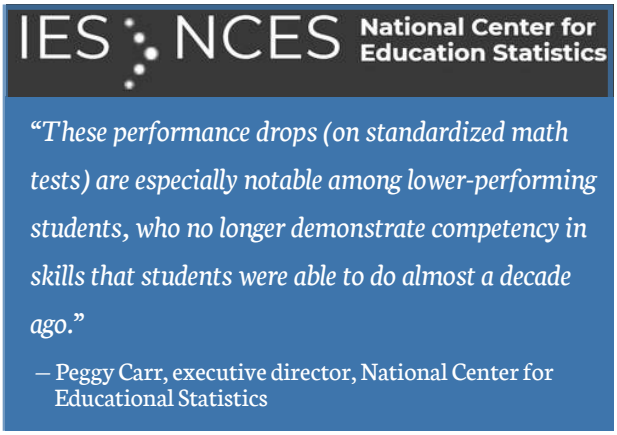
Assessing success beyond standardized tests. In terms of funders' ability to assess and measure the impact and success of their grants, one new educational trend might have a direct negative impact. The obsession with standardized testing is an offspring of the No Child Left Behind Act. The math and reading tests mandated by NCLB allowed STEM funders to at least gauge how well students are performing on the STEM curricula and initiatives that they fund. But now, the predilection for standardized testing is running up against a counter-trend in education — one that views standardized testing as both racist and an unreliable measure of academic progress.

Issue Spotlight: Teacher Shortages

Some of the biggest contributors to the lack of STEM learning in K-12 schools is the lack of available teachers and teaching resources. According to the Education Commission of the States, only 25% of high schools offer computer science classes and only 8% offer AP computer science. While the United States is experiencing a national teacher shortage, over 50% of school districts report that they are struggling to recruit and retain qualified STEM teachers. Additionally, a study conducted by the Morrison Institute, reported that 40% of school administrators have the most difficult time filling math teaching positions.

Numerous studies have found that the highest correlation of test scores is not based on the student's academic ability or intelligence, but their economic and racial status. With COVID, school systems were allowed by the federal government to drop their annual standardized testing in the spring of 2020—and many school systems quickly eschewed testing. Meanwhile, colleges, including a number of Ivy League schools, are opting out of requiring SAT or ACT test scores for admissions. Celine Coggin of Grantmakers for Education agrees that "it's time to re-think testing and minimize it."

Standardized tests have never been a favorite of teachers and educators, who see them as a Faustian bargain forced on them by Congress in return for additional federal funding of local schools. Increasingly, those tests are being viewed and condemned as a relic of a white-dominated educational establishment.



If standardized testing continues to decline, it will leave foundations, corporations and other STEM funders without a concrete metric of success or backsliding. The Business Roundtable's Linn is troubled by this trend: "I am concerned we are now in an anti-testing, anti-accountability period. How will we know how we are doing without testing?" The question then becomes whether foundations and corporations will continue to fund STEM at such high levels without having measurements and accountability.

Getting back on track amidst ongoing pandemic waves. In 2022, funders and educators are watching COVID and its variants carefully, forcing in January 2022 the closure of schools once again, and moving teachers and their students back to virtual learning. We know virtual learning negatively impacts all students' ability to learn, especially in STEM—and has an even greater and more deleterious effect on students of color.

A shutdown will also impact STEM funding, once again. During the first round of COVID, a number of STEM funders gave generous grants to aid virtual learning through the purchase of digital devices and enhancing broadband coverage, including: Walton Family Foundation ($20 million in education grants to help schools enhance virtual learning); Carnegie Corp.($9 million of its education grants set aside for COVID-related issues); Charles and Lynn Schusterman Family Philanthropies ($42 million in COVID-focused education grants); and the Chan Zuckerberg Initiative ($22 million).

As COVID infection rates decline, schools reopen and mask rules abate, we will have to wait and see if COVID remains in the rearview mirror and whether STEM teachers can return to the classroom for hands-on, experiential instruction.

Facing a potential STEM backlash. There is a brewing debate about whether the government, foundations and corporations should be donating so much money to STEM in the first place. In an intriguing Washington Post essay several years ago, the journalist Fareed Zakaria made the point that despite America's lagging test scores in STEM, we continue to lead the world in innovation from the iPhone to Tesla to RNA technology. And then there's the Nobel Prizes in science (physics, chemistry, medicine) won by American scientists.

The U.S. has won almost 50% of these awards over the years—as many as the rest of the world's scientists put together.

Further, Zakaria questions America's ongoing fervor for funding STEM over, say, the humanities, writing, "Americans should be careful before they try to mimic Asian educational systems, which are oriented around memorization and test-taking. I went through that kind of system (in India). It has its strengths but it's not conducive to thinking, problem-solving or creativity."

Columbia University professor and author Roosevelt Montas, in his new book, "Rescuing Socrates: How the Great Books Changed My Life and Why they Matter for a New Generation," writes, "The animating argument of this book is for liberal education for all—not instead of a more practical education, but as a prerequisite."

Similarly to the current move away from standardized testing, could the generous funding of STEM be on borrowed time? Could funders begin to change their priorities from STEM to the humanities and the arts or other educational areas? In short, will future foundation, corporate and major donor funding be more STEAM-focused than STEM? One must balance the call for increased funding for liberal education against the continuing economic priority to educate a STEM-ready workforce in a world where every nation's economy relies on technology. Given that, it seems a fairly good bet that STEM will remain a funding favorite for the foreseeable future.

Funder Spotlight

National Science Foundation
WHERE DISCOVERIES BEGIN

The National Science Foundation, or NSF, is the leading U.S. government agency devoted to advancing science. It was founded in 1950 and has an annual budget of $8.5 billion. It gives $80 million a year in grants to K-12 science programs and initiatives—and another $160 million for STEM public outreach. The program director for education, Robert Ochsendorf says, "We are looking to broaden participation in STEM with an emphasis on women and students of color." But he admits, "We are not doing a good enough job. We need to do better."

Resources for STEM Education

Websites & Individual Pages with Key Information:

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Dr. Freeman Hrabowski, III, MLK Celebration. (January 13, 2015). Used with permission under Creative Commons Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0).

Thank You

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[1] Based on available grantmaker data from Candid. Excludes federal funding and funding by higher education institutions, with the exception of University of Maryland, Baltimore County.

[2] Based on available grant recipient data from Candid. Excludes government organizations.

Feedback?

The State of American Philanthropy is an ongoing project. Each SAP brief will be updated periodically to integrate new information, additional data and evolving perspectives. This brief was originally posted to Inside Philanthropy in March 2022. It has not yet been updated. If you have comments or information you'd like to share with us, please email us at managingeditor@insidephilanthropy.com.