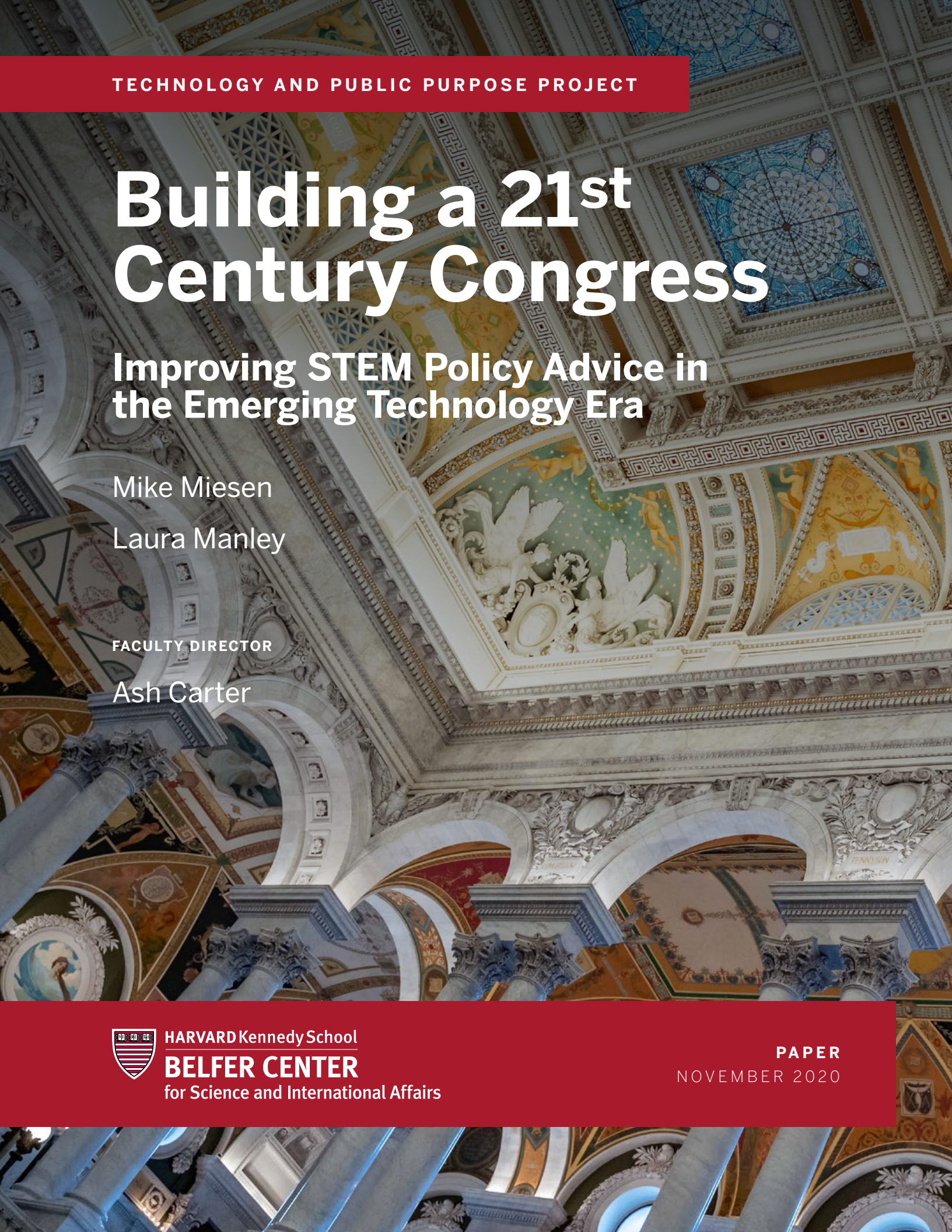

TECHNOLOGY AND PUBLIC PURPOSE PROJECT

Building a 21st Century Congress

Improving STEM Policy Advice in the Emerging Technology Era

Mike Miesen

Laura Manley

FACULTY DIRECTOR

Ash Carter

HARVARD Kennedy School
BELFER CENTER
for Science and International Affairs

PAPER

NOVEMBER 2020

Technology and Public Purpose Project
Belfer Center for Science and International Affairs
Harvard Kennedy School
79 JFK Street
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Acknowledgments

The Technology and Public Purpose (TAPP) Project, led by Belfer Center Director, MIT Innovation Fellow, and former Secretary of Defense Ash Carter, works to ensure that emerging technologies are developed and managed in ways that serve the overall public good.

Recognizing how vital legislation and regulation are to researching, developing, deploying, and managing emerging technologies, the TAPP Project endeavored to understand how Congress learns about and acts on emerging technologies. In 2019, with the assistance of over 140 current and former members of Congress, congressional staffers, academics, non-profit leaders, and others, the TAPP Project released its first report on congressional capacity, *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise*.

This report, *Building a 21st Century Congress: Improving STEM Policy Advice in the Emerging Technology Era*, seeks to better understand the pathways for STEM professionals to advise Congress on policy. We are grateful to the over 30 congressional staffers, non-profit leaders, university leaders, current and former fellows, and more who were interviewed for this report. Each took time out of their schedules to discuss how to make Congress work better for the American people. We are grateful for their time and attention to this important subject. Any errors in this report are not theirs.

Additional research support for this report came from Karyn Bruggeman, Jonathan Hudgins, and Chris Kuang. We are grateful for their assistance.

Finally, we are grateful to Joan Burton and Daniel Schuman for reviewing a draft of this report.

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Executive Summary

> *"Government needs technologists in policy development conversations to effectively serve people today and anticipate needs for tomorrow."*[1]

In September 2019, the Technology and Public Purpose (TAPP) Project released *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise,* a report that analyzed how Congress receives, absorbs, and uses scientific and technical information to craft legislation and conduct oversight of the executive branch. The report argued that,

> "Congress has simply not given itself the resources needed to efficiently and effectively absorb new information—particularly on complex [science and technology] topics. Legislative support agencies and committees have been allowed to atrophy, reducing policy expertise on S&T issues and institutional knowledge about policymaking and how to be effective in Congress. Congressional offices are not given the resources necessary to recruit and retain the number of experienced staff needed."[2]

To address Congress's science and technology capacity gaps to better prepare it for the present and the future, *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise* offered four recommendations:

1. Congress Should Address Its Institutional Gap by Creating a Legislative Support Body Focused on S&T Issues.[3]
2. Congress Should Hire Additional S&T Talent in Personal Offices and Committees.

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1 Jennifer Anastasoff, Jennifer Smith, and Max Stier, "Mobilizing Tech Talent: Hiring Technologists to Power Better Government" (Partnership for Public Service, September 2018), https://ourpublicservice.org/wp-content/uploads/2018/09/Mobilizing_Tech_Talent-2018.09.26.pdf.

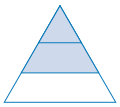
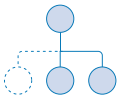
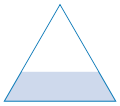
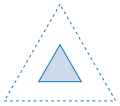
2 Mike Miesen and Laura Manley, "Building a 21st Century Congress: Improving Congress's Science and Technology Expertise" (Technology and Public Purpose Project: Belfer Center for Science and International Affairs, September 2019), 9, https://www.belfercenter.org/publication/building-21st-century-congress-improving-congresss-science-and-technology-expertise.

3 Because the Science, Technology Assessment, and Analytics team is a support body that sits within the broader Government Accountability Office, the report did not characterize the office as focused on S&T issues. It does, however, do important S&T work that aids Congress in its understanding of emerging technologies.

3. Congress Should Address Broad Structural Gaps by Increasing Its Funding.

4. External Resource Providers Should Seek to Produce Information in Formats that Congress Values.

Bridging the Divide: Actions to Increase Congress's S&T Capacity

GAPS	ACTIONS
 **INSTITUTIONAL SUPPORT GAP** Congress does not have a support body exclusively focused on S&T issues to provide objective, in-house consultation.	**CREATE A CONGRESSIONAL SUPPORT AGENCY THAT IS** **Embedded** within Congress to ensure 'shared staff' approach **Able to incorporate** all external perspectives **Structured** to be adaptable to the changing needs of Congress **Options-oriented** to give Congress multiple policy options
 **S&T TALENT GAP** Congress lacks robust recruiting pathway for diverse S&T talent.	**REEVALUATE PROCESS FOR FINDING S&T TALENT BY** **Creating Paths for Undergraduates Pursuing S&T Majors to Come to Capitol Hill.** Congress, universities, and foundations should work together to encourage S&T students to work on Capitol Hill. **Reimagining Talent Pathway to Encourage S&T Hires.** Create a mid-career pathway to enable S&T experts to work for Congress at level commensurate with their experience. **Expanding Policy Training.** Ensure that S&T experts can be effective congressional staff members
 **INTERNAL RESOURCING GAP** Congress does not give itself the resources to hire enough people with the right skillsets.	**ADDRESS STRUCTURAL GAPS BY** **Investing in Itself.** Increase the resources available to personal offices, committees, and support agencies.
 **EXTERNAL RESOURCES GAP** While many consider Congress the "most advised body in the world," many of the resources available are less useful than they could be.	**EXTERNAL RESOURCE PROVIDERS SHOULD** **Offer Customized, Concise, and Timely S&T Information.** Congressional staffers highlight these attributes as particularly important. **Build Relationships with Offices Over Time.** A consistent relationship will help ensure that a message is heard by the office.

This report seeks to provide a detailed look at the second recommendation: to outline how Congress can work with academic institutions, non-profit organizations, and other key stakeholders to build and scale career pathways to bring top STEM talent to work on Capitol Hill. After describing the value propositions for both STEM professionals and Congress, the report looks at existing pathways, analyzes how to maximize the impact of STEM professionals doing policy advising work, and offers opportunities for improving and increasing pathways.

BUT THERE ARE ALREADY STEM PROFESSIONALS WORKING ON CAPITOL HILL, RIGHT?

Yes!

Many congressional personal offices and committees are already staffed by smart, public-spirited STEM professionals; several of their perspectives are included in this report.

But none of the interviewees for this report, or for our previous report, *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise,* argued that the status quo worked as well as it should; no one thought that Congress had enough STEM expertise to best reckon with emerging technology issues.

Everyone—from members of Congress to their staffers, from non-profit leaders to private sector professionals, and from generalists to STEM professionals—thought that Congress can do better.

This report is not an exhaustive analysis of all existing pathways for STEM professionals to advise on policy; there are already too many programs to look at, and more are currently in development. Rather, the report investigates several of the most promising pathways and highlights opportunities to scale them to reach new STEM professionals.

Finally, creating and improving pathways for STEM professionals to serve in policy advising roles is just one piece of a larger puzzle; transformative changes are necessary for Congress to function as a truly 21st century institution. While creating and improving pathways for STEM professionals to work on policy will not address every part of Congress's science and technology capacity gap, it remains an important topic to address.

Value Proposition

Value to STEM Professionals

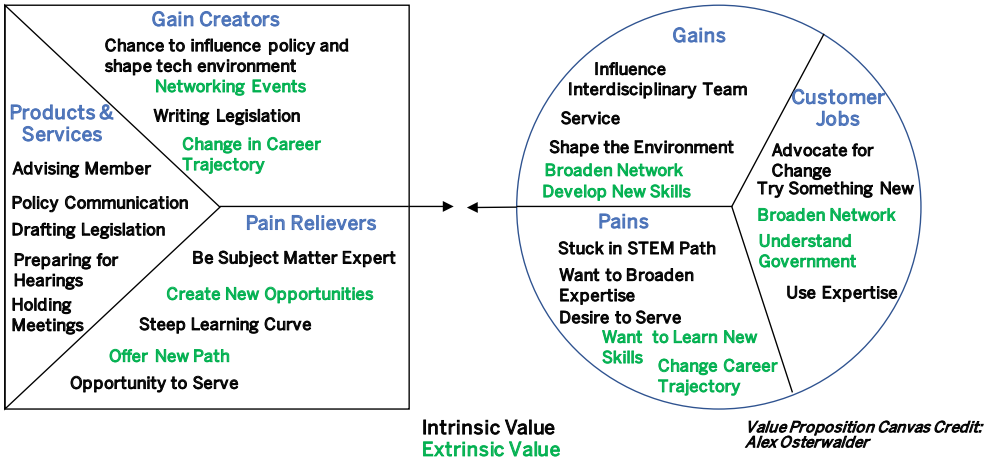
Like any role, working on policy issues on Capitol Hill has intrinsic value and extrinsic value; much of this value is common to professionals of all backgrounds, but some is unique to STEM professionals.

In addition to the intrinsic values of serving the public, influencing policy, and helping people that professionals of all backgrounds often gain from their roles on Capitol Hill, through interviews and a review of the literature, STEM professionals noted that "shaping the environment in which

they will eventually work," being a "trusted advisor," and being in a position to make significant change were uniquely valuable to them.

Extrinsic values motivate STEM professionals to work on Capitol Hill as well; several described altering their career trajectory, developing complementary skills, and broadening professional networks as important reasons to serve in policy advising roles. However, there is a perception among many STEM professionals that working on policy issues could be viewed as a waste of a degree that would not help make them attractive candidates in private sector roles.

Value Proposition Canvas: Why STEM Professionals Want to Work on Capitol Hill



Value Proposition Canvas Credit: Alex Osterwalder

Value to Congress

STEM professionals have much to offer Capitol Hill. The most consistent themes surfaced in interviews and the literature were that STEM professionals bring **unique technical skills**, like data analysis and an ability to quickly understand technical research; **subject matter expertise** in relevant areas, such as epidemiology and public health; and **metacognitive diversity**, or a different way of looking at problems and solutions than their peers with backgrounds in liberal arts or law.

Existing Pathways for STEM Professionals

There are several existing pathways for STEM professionals to serve in policy advising roles; due to their prominence and noted value, this report will focus on **university-driven pathways** and **not-for-profit-driven pathways**. Additionally, the **federal government has several existing pathways** for technical talent to work on technical issues; because these programs offer important insights into how to successfully construct a government-driven pathway, they are included as examples to draw from.

University Pathways

Universities are some of the most important nodes in the network that matches STEM talent to policy advising roles. Universities are natural places to create pathways to congressional policymaking roles for STEM students and alumni, as they are found in most congressional districts, already focus on helping students find a career path, and offer vital interdisciplinary learning opportunities.

Several prominent academic institutions, like the University of Maryland-College Park, University of Michigan, Harvard University, Carnegie-Mellon University, and Stanford University have dedicated programs for STEM students seeking to develop the skills they will need to be effective in the policy space. While existing programs typically do not focus on STEM-to-Congress pathways, all help to develop STEM professionals who are knowledgeable about and capable of serving in policy advising roles.

Additionally, the Public Interest Technology University Network (PIT-UN) is a New America Foundation-supported network of universities committed to developing the field of public interest technology at their institutions, creating a space for university leaders to share best practices and collaborate with one another.

Non-Profit-Driven Pathways

Several well-regarded organizations recruit and train technical talent to work on policy issues, whether in Congress or in state or local government.

Often, these organizations have experience bridging the for-profit, not-for-profit, and public sectors, allowing them to identify talent and bring positive attributes from one sector to another. Additionally, when a non-profit organization is adequately funded, it can help to scale successes internally—making existing projects larger—and externally, by bringing them to new institutions. However, non-profit-driven pathways often face funding challenges, and the structure of the programs often makes post-fellowship matchmaking a challenge.

Three notable non-profit-driven pathways are the American Association for the Advancement of Science's Science & Technology Policy Fellowship, which has recruited STEM professionals with a PhD to work on Capitol Hill and in executive branch agencies since 1973; TechCongress, which focuses on bringing technical talent to Congress for a one-year fellowship; and the Aspen Tech Policy Hub, a Bay Area organization that trains technologists in how the policy sphere works.

Government-Driven Pathways

Programs that sit within the government are valuable for their abilities to scale, bypass the arduous traditional hiring process, and to take root in the bureaucracy. Technology-oriented programs like the Presidential Innovation Fellows, the United States Digital Service, 18F, and the Defense Digital Service enable top technical talent to work on technical issues within the executive branch, while intergovernmental details allow individuals from the government and academia to temporarily work in a different agency or sector. Finally, the Presidential Management Fellowship is a program that offers two-year fellowships to individuals with advanced degrees; while not focused on technology talent, the program is well-regarded for its ability to bring top talent into the federal government at scale, and could be broadened to recruit and deploy technical talent in the legislative branch.

Maximizing Impact of STEM Professionals in Congress

Nearly all stakeholders interviewed believed that increasing the number of STEM professionals serving on Capitol Hill is desirable. Given limited

resources and the existing structure and strictures of Congress, it is worth considering how to make the most of additional STEM professionals.

What is the Appropriate Level of Experience for STEM Professionals Working on Capitol Hill?

One of the foundational questions for maximizing the impact that STEM professionals can have in Congress is what level of experience they should be coming in with.

While there was not consensus on the question, most stakeholders argued that junior STEM talent would not be as valuable as more experienced STEM talent on Capitol Hill, as more experienced and credentialed professionals would be seen as more capable and credible. As a leader of a nonprofit noted, the idea is "interesting in theory, in practice…" it is difficult to operationalize within the context of Congress.[4]

Attributes to be Successful in STEM Policy Advising

According to current and former congressional staffers and leaders of nonprofit organizations, STEM professionals need to have, or be trained in, several attributes to be successful on Capitol Hill. Among others, they must have:

- Policy communication skills, in order to "talk to people who aren't scientists";
- An understanding that science and evidence is one driver of many when crafting policy on Capitol Hill, so that they are prepared when a decision contrary to the science is made;
- Soft skills, like being flexible, having respect for the knowledge of others, empathy, and a "political muscle"; and
- Adaptability, as there is a steep learning curve on Capitol Hill and STEM professionals will need to be able to grow into the job quickly to thrive.

4 Interview with Nonprofit Leader, February 2020.

All the above attributes are important for policy advising staff in Congress, but some of them are more quickly trainable than others. Learning how the policymaking process works, for example, is easier to learn quickly than how to be flexible and adaptable at work.

Training to be Successful in STEM Policy Advising

Given the experience and attributes described above, it is critical that STEM professionals have training and mentorship opportunities available to them. Many of the existing pathways programs hold trainings, seminars, and networking events to introduce the policymaking process to STEM professionals, though some interviewees noted that the pace of Congress often makes attending events difficult.

Having the right attributes to be successful, coupled with valuable training, would somewhat inoculate STEM professionals against being viewed as politically naïve and incapable of navigating Congress by other congressional staffers.

Analyzing Opportunities to Improve STEM Pathways

There are several ways to create new STEM pathways or to supplement existing pathways. The opportunities below are not mutually exclusive; different stakeholders can, and should, simultaneously work on the problem from their different perspectives.

Analyzing Opportunities to Improve STEM Pathways

	BENEFITS	DRAWBACKS
Build on Existing Successes Scale successful programs to maximize impact	Leverages existing platforms for speed, simplicity, and cost savings	Could create overreliance on temporary expertise
Create New Institutions Congress and external stakeholders could build a new institution, or set of institutions, to recruit and house STEM talent working on policy issues	Creates a 'Home' for Technical Talent Builds Institutional Memory Creates Reputation for Excellence	Substantively and politically difficult to create
Create and Expand University Pathways Train the next generation of policy advising scientists and technologists by creating and expanding university pathways	Leverages existing pathways and resources Creates generational change	Is not immediate solution to problem Pulls resources away from more immediate solutions
Create New Short-Term 'Tour of Duty' Roles Create new time-limited opportunities for scientists and technologists to work on policy issues on Capitol Hill	Enables talent acquisition and assists with infusions of talent Builds relationships with expert networks Generates bidirectional learning opportunities	Introduces substantive or optical bias Could create overreliance on temporary expertise
Create New Fellowship Programs Develop a new model combining classroom learning, job placement, on-the-job training, and mentoring	Develops alumni network of cross-sector leaders Allows tailoring of program to local circumstances	Could reinvent the wheel unnecessarily Difficult to start new programs May not be resilient to leadership changes.
Create Vetted Talent Pools A trusted entity could offer a curated pool of qualified STEM candidates to congressional personal offices and committees	Relatively simple to create Offers potential for immediate impact	May not be resilient to changes in Congress

This report focuses on six opportunities that would help to increase STEM representation in Congress:

1. *Build on Existing Successes:*
   Stakeholders could build on existing pathways by augmenting available resources and enabling the growth of already-successful programs. This could be done by supporting existing congressional

pathways, such as AAAS and TechCongress fellowships; creating congressional pathways modeled on existing executive branch programs, like the USDS and PMF; or working with outside organizations, like Coding it Forward and College to Congress, which can help place STEM professionals in Congress.

2. *Create New Institutions to Bring Technical Talent to Congress:*
   Rather than seeking to add STEM professionals to personal offices, Congress and external stakeholders could build a new institution, or set of institutions, to recruit and house STEM talent working on policy issues.

3. *Create and Expand University Pathways:*
   Universities can be valuable staging grounds for more junior STEM talent in helping to seed interest in policymaking roles, developing skills for later use, creating personal and professional networks to draw from later, and connecting STEM undergraduates to congressional internships.

4. *Create New Short-Term 'Tour of Duty' Roles for Scientists and Technologists:*
   As noted in the Existing STEM Pathways section, the executive branch has established several tour of duty programs for technical talent to work on technical issues. Legislative branch support agencies, congressional personal offices, and congressional committees could establish new 'tour of duty' pathways for scientists and technologists to work on specific policy issues for a set amount of time.

5. *Create Custom-Built Fellowship Program(s):*
   Rather than building on existing fellowship programs, key stakeholders could develop a new model that combines classroom learning, job placement, on-the-job training, and mentoring.

6. *Create Vetted Talent Pools:*
   While congressional offices must independently do more to ensure that staff diversity is a priority for them, a trusted entity—a university or other non-profit organization, for example—could help by offering a curated pool of STEM candidates to congressional personal offices.

Conclusion

What is lost when science and technology policy is not informed and crafted by a diverse group of internal STEM professionals? What questions are not being asked during private meetings in personal offices or during public hearings about emerging technologies because there are not enough STEM professionals in congressional policy roles? How might Congress treat a pandemic differently if it had a more diverse group of internal experts in epidemiology and public health?

Many congressional personal offices and committees are already staffed by smart, public-spirited scientists and technologists, and Congress can draw on outside experts to inform its legislation and its hearings. **But none of the interviewees for this report or our previous report, argued that the status quo worked as well as it should; no one thought that Congress had enough STEM expertise to effectively reckon with emerging technology issues.** Everyone—from members of Congress to their staffers, from non-profit leaders to private sector professionals, from generalists to STEM professionals—thought that Congress can do better.

Increasing the number of STEM professionals working in Congress will not solve polarization or fully counter the influence of lobbyists on Capitol Hill. Adding more STEM professionals to personal offices will not convince members that climate change is a result of man-made greenhouse gas emissions if their political incentives dictate that they pretend otherwise. STEM professionals will not convince members to go against powerful members of their political party.

But while increasing the number of STEM professionals in personal offices and committees will not solve all of Congress's problem**, a Congress with more in-house STEM expertise is a better Congress**. Getting there will require a culture shift within Congress, as well. Members of Congress will need to recognize that STEM professionals bring special qualities to their offices and their committees; other congressional staff will need to value the divergent perspectives that STEM professionals will offer. None of this will happen immediately, but creating pathways is a generational investment that is worth the effort.

Ultimately, building a 21st century Congress is a job for all of us. Universities, foundations, non-profits, and the private sector all have major roles to play in inspiring the next generation of scientists and technologists to see that policy advising is a thing that STEM professionals do—and do well.


ONE GOD, ONE LAW,
ONE ELEMENT AND ONE FAR-OFF
DIVINE EVENT TO WHICH
THE WHOLE CREATION MOVES.

Introduction

In September 2019, the Technology and Public Purpose (TAPP) Project released Building a 21st Century Congress: Improving Congress's Science and Technology Expertise, a report that analyzed how Congress receives, absorbs, and uses scientific and technical information to craft legislation and conduct oversight of the executive branch. The report argued that,

> "Congress has simply not given itself the resources needed to efficiently and effectively absorb new information—particularly on complex S&T topics. Legislative support agencies and committees have been allowed to atrophy, reducing policy expertise on S&T issues and institutional knowledge about policymaking and how to be effective in Congress. Congressional offices are not given the resources necessary to recruit and retain the number of experienced staff needed."[5]

The need for science and technology expertise in Congress is clear—something the tumultuous year of 2020 has put in focus through the pandemic, the protests of police brutality and for racial justice, and the presidential election.

From the early days of 2020, the coronavirus pandemic demanded a thoughtful, knowledgeable legislative response commensurate with the threat and the associated economic fallout. Congress was responsible for passing legislation to fund COVID-19 testing, contact tracing, and more, and conducted oversight into how the executive branch responded. Would Congress's response to the pandemic have been any different if it had an Office of Technology Assessment to provide it with pandemic preparedness expertise?

In the summer of 2020, protests for racial justice showed how technology can be used to hold the powerful accountable, but surveillance technology wielded by law enforcement agencies threatened to restrict and infringe upon the constitutionally protected right to assemble and to a reasonable expectation of privacy. Would protesters have been safer if Congress had better understood, and passed legislation on, facial recognition technologies?

5 Miesen and Manley, "Building a 21st Century Congress," 9.

The presidential election was once again threatened by foreign and domestic actors using social media to spread disinformation and sow doubt about a free and fair election during a pandemic. Would a more cyber-literate Congress, briefed on the potential misuses of social media platforms, been more likely to enact legislation limiting the immunity granted by the Communications Decency Act?

Future threats will compel Congress's action as well. This pandemic will not be the last; a warming climate will lead to more and more catastrophic weather events. Advances in artificial intelligence, biotechnologies, and more will demand regulation to protect against the potential dangers they could pose.

As Jennifer Anastasoff, Jennifer Smith, and Max Stier argued in a 2018 report,

> "…in order for technologists to make the best possible recommendations for how policies can be shaped and executed, they must be immersed in government and working within agencies. Government needs technologists in policy development conversations to effectively serve people today and anticipate needs for tomorrow."[6]

To address Congress's S&T capacity gaps and better prepare it for the present and the future, *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise* offered four recommendations:

1. Congress Should Address Its Institutional Gap by Creating a Legislative Support Body Focused on S&T Issues.[7]
2. Congress Should Hire Additional S&T Talent in Personal Offices and Committees.
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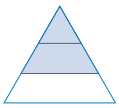
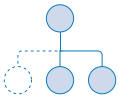
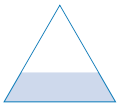
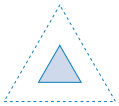
 **INSTITUTIONAL SUPPORT GAP** Congress does not have a support body exclusively focused on S&T issues to provide objective, in-house consultation.	**CREATE A CONGRESSIONAL SUPPORT AGENCY THAT IS** **Embedded** within Congress to ensure 'shared staff' approach **Able to incorporate** all external perspectives **Structured** to be adaptable to the changing needs of Congress **Options-oriented** to give Congress multiple policy options
 **S&T TALENT GAP** Congress lacks robust recruiting pathway for diverse S&T talent.	**REEVALUATE PROCESS FOR FINDING S&T TALENT BY** **Creating Paths for Undergraduates Pursuing S&T Majors to Come to Capitol Hill.** Congress, universities, and foundations should work together to encourage S&T students to work on Capitol Hill. **Reimagining Talent Pathway to Encourage S&T Hires.** Create a mid-career pathway to enable S&T experts to work for Congress at level commensurate with their experience. **Expanding Policy Training.** Ensure that S&T experts can be effective congressional staff members
 **INTERNAL RESOURCING GAP** Congress does not give itself the resources to hire enough people with the right skillsets.	**ADDRESS STRUCTURAL GAPS BY** **Investing in Itself.** Increase the resources available to personal offices, committees, and support agencies.
 **EXTERNAL RESOURCES GAP** While many consider Congress the "most advised body in the world," many of the resources available are less useful than they could be.	**EXTERNAL RESOURCE PROVIDERS SHOULD** **Offer Customized, Concise, and Timely S&T Information.** Congressional staffers highlight these attributes as particularly important. **Build Relationships with Offices Over Time.** A consistent relationship will help ensure that a message is heard by the office.

Figure 1. *Actions to Increase Congress's S&T Capacity, from Building a 21st Century Congress: Increasing Congress's Science and Technology Expertise*

This report seeks to provide a detailed look at the second recommendation: to outline how Congress can work with academic institutions, non-profit organizations, and other key stakeholders to build and scale career pathways to bring top STEM talent to work on Capitol Hill. After describing the value propositions for both STEM professionals and Congress, the report looks at existing pathways, analyzes how to maximize the impact of STEM professionals doing policy advising work, and offers opportunities for improving and increasing pathways.

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Everyone—from members of Congress to their staffers, from non-profit leaders to private sector professionals, and from generalists to STEM professionals—thought that Congress can do better.

The overarching goal of this report is to provide a better understanding of policy pathways for STEM professionals, in order to catalyze action from key stakeholders. Another goal, though, is to highlight to STEM students, graduates, and professionals that policy advising is a potential way for them to use their STEM degree for the public good—something that we heard was lacking in STEM studies from several interviewees.

This report is not an exhaustive analysis of all existing pathways for STEM professionals to advise on policy; there are already too many programs to look at, and more are currently in development. Rather, the report investigates several of the most promising pathways and highlights opportunities to scale them to reach new STEM professionals.

Finally, creating and improving pathways for STEM professionals to serve in policy advising roles is just one piece of a larger puzzle; transformative changes are necessary for it to function as a truly 21st century institution.

While creating and improving pathways for STEM professionals to work on policy will not address every part of Congress's science and technology capacity gap, it remains an important topic to address.


SCIENCE IS ORGANIZED KNOWLEDGE.

Value Proposition: STEM Professionals in Policy Roles

> *"Scientists and policymakers have a lot to learn from each other."*
> *—Angela DePace, Founder, Scientific Citizenship Initiative, Harvard Medical School* [8]

Before analyzing existing career pathways available to STEM professionals, it is important to understand the mutual value proposition between STEM professionals and Capitol Hill: why do STEM professionals want to do policy work on Capitol Hill, and why does Capitol Hill want STEM professionals to work on policy?

WHAT IS STEM?

Defining **STEM**—Science, Technology, Engineering, and Mathematics—is notoriously difficult, particularly in an age of technology development where *everything* could be considered STEM.

For the purposes of this report, a STEM professional is someone who has an undergraduate or graduate degree in a hard science, a technology topic, an engineering discipline, or mathematics.

That may not be your definition of STEM, which may be more expansive. Whatever your definition, the broad takeaways from this report likely apply, in whole or in part.

8 "Students Work to Narrow the Gap between Scientists and Society," *Harvard Gazette* (blog), September 16, 2020, https://news.harvard.edu/gazette/story/2020/09/students-work-to-narrow-the-gap-between-scientists-and-society/.

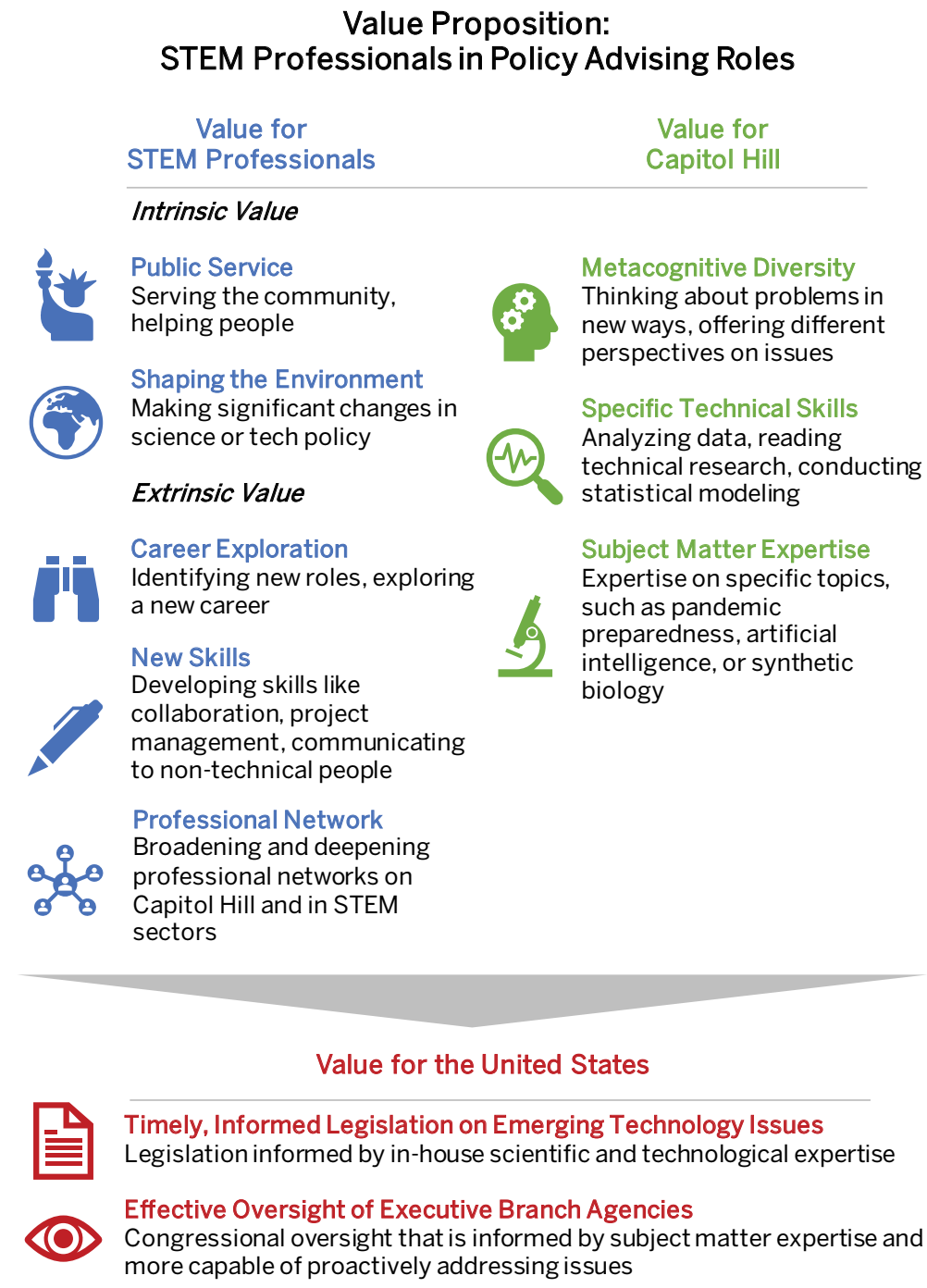

Figure 2. Value to STEM Professionals, Congress, and Society

Value for STEM Professionals

Like any role, working on policy issues on Capitol Hill has intrinsic value and extrinsic value; much of this value is common to professionals of all backgrounds, while some is unique to STEM professionals.[9]

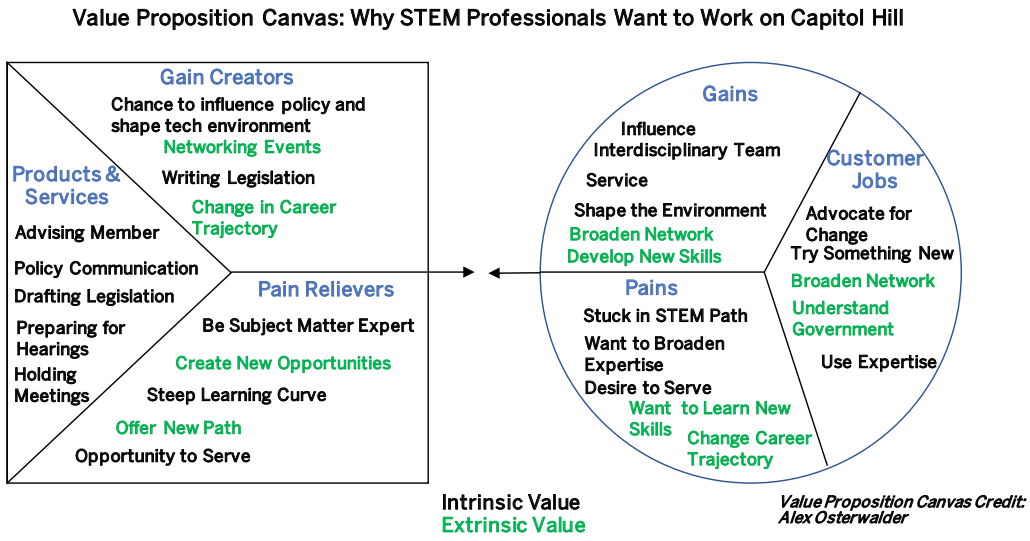

Figure 3. Value Proposition Canvas, adapted from Alex Osterwalder

Intrinsic Value

Intrinsic value includes, but is not limited to, being a public servant who can make meaningful policy change on a topic of interest and having the chance to serve as a subject matter expert on a topic.

In a somewhat dated article that nevertheless reflects timeless sentiments, Barbara Romzek and Jennifer Utter note that a vital intrinsic value for congressional staff is the ability to influence policy: "The fundamental motivation of congressional staffers is to be part of a process that affords opportunities to influence public policy."[10]

9 This report uses the terms 'intrinsic value' and 'extrinsic value' much in the same way as 'intrinsic motivations' and 'extrinsic motivations.'

10 Barbara S. Romzek and Jennifer A. Utter, "Career Dynamics of Congressional Legislative Staff: Preliminary Profile and Research Questions," *Journal of Public Administration Research and Theory: J-PART* 6, no. 3 (1996): 422.

According to congressional staff, this ability to influence public policy allows them to help and serve their neighbors and communities. In a 2013 survey of 1,400 congressional staffers conducted by the Congressional Management Foundation, "94% of congressional staff said they stay because they believe what they're doing is meaningful," "92% cited their desire to help people," and "90% said they stay out of dedication to public service." [11]

Of course, a desire to help people, influence policy, and dedication to public service are broad intrinsic values felt by professionals of all backgrounds. In interviews, STEM professionals noted several additional reasons why working on Capitol Hill is intrinsically attractive to them. A former senior leader in the federal public interest technology space, for example, argued that a source of value to STEM professionals is "shaping the environment in which they will eventually work," because "policy and regulation are essentially the constraints on science, technology, and innovation."[12] This person also noted that the ability to be both a "trusted advisor" and in a position to make significant change were factors for STEM professionals specifically.[13]

STEM professionals care about the topics they work on and seek to use their expertise to advance public policy in those areas. According to a large survey conducted on behalf of the American Association for the Advancement of Science (AAAS) of its Science & Technology Policy Fellowship (STPF), 79% of fellows believed that their time as a fellow was very successful or extremely successful at "[Offering] my skills & experience in public service."[14,15]

11 Congressional Management Foundation and Society for Human Resources Management, "Life in Congress: Job Satisfaction and Engagement of House and Senate Staff" (Society of Human Resources Management & Congressional Management Foundation, 2013), 4.

12 Former Leader in the United States Digital Service, January 2020.

13 Former Leader in the United States Digital Service, January 2020

14 Kat Song, "A Retrospective Evaluation of the STPF Program," *American Association for the Advancement of Science*, July 2020, 9.

15 The results above are for *all* STPF fellows, including those who served as fellows in the executive branch. For more about the AAAS's STPF, see the 'Existing Pathways' section.

Extrinsic Value

Extrinsic value includes, but is not limited to, financial compensation; diversifying a skillset to be more marketable on the job market; understanding the policymaking process and the legislative branch as a means of being more marketable at private and not-for-profit organizations; and being a more effective advocate for policy changes.

In surveys and interviews, STEM professionals discussed several major extrinsic motivators for working on Capitol Hill:

Altering Career Trajectory

According to the AAAS survey, 77% of former STPFs felt that the experience was extremely successful or very successful at allowing them to, "explore changing my career path."[16] Additionally, 65% of STPFs surveyed strongly agreed that being a fellow changed their career trajectory in particular, more worked in government after the fellowship than before it started, indicating that the fellowship was an entry point into additional public service roles.[17]

Developing Complementary Policy-Related Skills

According to the AAAS survey, "Fellows said they gained new skills including collaboration, project management, adjusting to faster deadlines, and communicating technical topics to non-scientists."[18] Gaining a new skillset may assist STEM professionals in doing their previous jobs better, getting promoted to a new role, or in switching roles to something requiring both STEM expertise and the new skillset, like government affairs at a technology company.

16 Song, "A Retrospective Evaluation of the STPF Program," 9.

17 Song, 11, 13.

18 "Bringing Scientists to the Federal Government: How Well Does It Work? An Evaluation of the AAAS Science & Technology Policy Fellowship Program" (American Association for the Advancement of Science, July 2020), https://www.aaas.org/sites/default/files/2020-06/Summary%20-%20STPF%20Retrospective%20Evaluation_0.pdf.

Broadening and Deepening Professional Networks

Time spent on Capitol Hill helps to broaden professional networks both within STEM fields and outside of them, given proximity to a diverse group of colleagues. This helps STEM professionals find new roles, particularly if they are looking to switch sectors.

However, interviews made it clear that there are several perceived extrinsic value gaps:

Perception That Policy Work is 'Waste of a Degree'

Some STEM professionals believe that their time on Capitol Hill could be viewed as a "waste of your science degree" by peers, advisors, and more.[19] This harmful perception can act as a deterrent to STEM professionals who may be interested in doing policy work but who are concerned that it could harm their prospects for achieving tenure.

According to a leader of a science and technology policy program, the view that policy is a waste of a STEM degree is passed down by some PhD advisors, who view policy work as detracting from research and other scholarly pursuits.[20] Additionally, a leader at a nonprofit organization focused on public interest technology noted that engaging in policy may hinder an academic's goal of obtaining tenure; this leader noted that, "[the] tenure question has been a real challenge" for the nonprofit.[21]

A dean of an engineering school noted that "certainly there are individuals" who feel that policy work is a waste of a degree, and that "in many cases, that reflects the perspectives and biases within a given institution."[22] This dean further argued that "the solution must involve broad engagement of the academic institutions and not pockets of partnership with a handful of universities."[23]

19 Leader at the American Association for the Advancement of Science, February 2020.

20 Director of a Public Policy Program Focused on Science and Technology, February 2020.

21 Leader at a Non-Profit Organization, September 2020.

22 Dean of an Engineering School, September 2020.

23 Dean of an Engineering School, September 2020

Compensation

Scientists and technologists can make more money outside of Congress than within it. While this is also true for non-STEM backgrounds, the gap between what a computer scientist could make at a technology company and at Congress is wide and growing.

Value to Private Sector Companies

According to the 2018 report, *Mobilizing Tech Talent: Hiring Technologists to Power Better Government,* "few [companies] have defined civic service leave policies."[24] This may contribute to the view that private sector companies do not see value in their employees working in government, which in turn may prevent ambitious scientists and technologists from working in the public sector.

This would be a mistake. As Bruce Schneier argues in his 2018 book, *Click Here to Kill Everybody*: "We need technology companies…to value [employee] experience in policy after they return to the business world."[25]

24 Anastasoff, Smith, and Stier, "Mobilizing Tech Talent: Hiring Technologists to Power Better Government," 27.

25 Bruce Schneier, *Click Here to Kill Everybody*, 2018, 224, https://www.schneier.com/blog/files/CH2KE-pp-220-225.pdf.

Value for Capitol Hill

As many serving on Capitol Hill are aware, STEM professionals have much to offer Congress, above and beyond what the traditional smart, hard-working, non-technical staffers can offer. In interviews with key stakeholders, three main areas stood out:

Metacognitive Diversity

According to interviewed stakeholders, one of the most important sources of value that STEM professionals bring to Congress is a tendency to think about problems differently than non-STEM staffers.

A current Senate staffer with a science background noted that STEM professionals bring metacognitive diversity to congressional offices, defining that as a diversity of thought and, more specifically, thinking about a problem from beginning to end, rather than end to beginning.[26]

Echoing this assessment, a former Senate staffer argued that scientists and technologists use different "modes of thinking" and that their value to an office is "more about how they think" than a specific subject matter expertise.[27] As examples, this person cited the ability to think critically, skeptically, and creatively about problems.[28]

As a former AAAS STPF in a Senate office noted, "STEM education purposefully teaches you how to objectively examine questions and look at the data both for and against" an answer, and that "most scientists undervalue that…they've been taught to unlearn [motivated reasoning]."[29]

Finally, a director of a science and technology policy program argued that STEM professionals understand "the system-level complexity" of policy

26 Policy Advisor at the United States Senate, February 2020.

27 Former Legislative Director at the United States Senate, February 2020.

28 Former Legislative Director at the United States Senate, February 2020.

29 Former AAAS Science and Technology Policy Fellow in the United States Senate, June 2020.

questions and decisions, which can help their offices understand and respond to policy issues in a more holistic fashion[30]

Specific Technical Skills

STEM professionals bring specific technical skills—for example, data analysis, statistical modeling, or an ability to quickly digest technical research—to congressional personal offices and committees.

Technical skills are valued in personal offices and committees. As a former Senate staffer put it, "nobody else understands data" but STEM staffers.[31] While that is an exaggeration—many non-STEM professionals can and do work with data, on Capitol Hill and elsewhere—it nonetheless shows how STEM professionals are positively viewed for the capabilities they bring to the office.

A former AAAS STPF noted that another specific skill STEM professionals bring is, "[comfort] with technical information…[and] not being intimidated by reading something that's technical."[32] This helps STEM professionals understand technical material more quickly and allows them to serv as internal sources of expertise that can push back against expert stakeholders with agendas, like lobbyists.

Specific Subject Matter Expertise

STEM professionals bring specific subject matter expertise that can be extremely helpful to personal offices and committees. For example, epidemiologists and public health experts can offer vital expertise to personal offices and committees working on COVID-19 legislation.

Due to the breadth of issues that a Legislative Assistant or Legislative Director is accountable for in a House of Representatives personal office, issue matching is more difficult to achieve in that body. However, when serving on committees and in Senate personal offices, specific subject matter expertise can be a major value driver for STEM professionals.

30 Director of a Public Policy Program Focused on Science and Technology.

31 Former Legislative Director at the United States Senate.

32 Former AAAS Science and Technology Policy Fellow in the United States Senate.


IN GOD WE TRUS
SOUTH THEATER
NORTH THEATER

Existing Pathways for STEM Professionals

> *"Science and technology are the roots, not only of our understanding of the natural world and its relationship to human welfare, but also of the constraints on what can be accomplished with the scarce resources comprising nature. Virtually all public policies are grounded in the realities of the natural world and proceed on the basis of constantly changing assumptions about or understandings of nature. An understanding of science and technology is thus essential to the formation of virtually any sound public policy."*[33]

There are several prominent career pathway programs for STEM professionals interested in advising on policy. In fact, there are too many programs to capture in depth in one report, so this section will look only at the programs that came up most often in conversations with key stakeholders and that represent potentially scalable models.[34]

The two most important broad categories of existing policy pathways for STEM professionals are those driven by **universities** and those driven by **non-profit organizations**, including fellowship programs. These categories are not mutually exclusive; some university programs are incubated and funded with help from non-governmental organizations, and many non-governmental organizations use partnerships with universities to recruit talent.

Additionally, the federal government uses several distinct programs to recruit technical talent for 'tours of duty' in executive branch agencies meant to address primarily technical problems; while not focused on policy, it is worth examining these programs to determine how they could be modified to address policy issues.[35]

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33 "Science and Technology Policy | Public Policy Program," accessed September 6, 2020, https://publicpolicy.stanford.edu/academics/graduate/concentrations/science-and-technology-policy.

34 The Engaging Scientists and Engineering in Policy (ESEP) Coalition has an excellent database of relevant resources, including policy pathways for STEM professionals. It can be accessed at http://www.science-engage.org/database.html.

35 Of course, there are also STEM professionals who are recruited to Capitol Hill through the traditional general hiring process; while valuable, this report will only examine pathways *intended* to recruit STEM professionals.

University-Driven Pathways

Universities are some of the most important nodes in the network that matches STEM talent to policy advising roles. Universities are natural places to create pathways to congressional policymaking roles for STEM students and alumni, due to their geographic distribution, ability to create professional networks, interdisciplinary learning models, and ability to create personal and professional networks spanning the public, private, and not-for-profit sectors.

Particularly in recent years, as the field of public interest technology has grown, many universities have created and expanded curriculum and training opportunities for STEM students to learn policy-relevant skills. Several examples include:

University of Maryland-College Park

The University of Maryland-College Park runs a highly regarded STEM pathways program for students interested in policy.

Started in 2008, the year-long Federal Fellows Program consists of inter-disciplinary coursework, workshops, simulations, networking events, and a semester-long internship. In 2013, a similar program for global policy, the Global Fellows, was launched.

For more on UMD's program, see the following case study.

CASE: UMD-COLLEGE PARK "GOING THE EXTRA MILE FOR STUDENTS"

The University of Maryland-College Park runs a highly regarded STEM pathways program for students interested in policy: The Federal Fellows program.

There are several components of the UMD-College Park Federal Fellows program that enable it to be successful—and that, crucially, are scalable to other institutions:

Uses Enthusiastic Leadership and University Champions

UMD's program is run by Dr. Joan Burton**,** an enthusiastic leader who has championed the program to internal and external stakeholders. Internally, Dr. Burton worked with UMD-College Park leaders to fund the program and to offer course credit to students in internships; externally, her team builds relationships with potential internship placements.

Creates Demand

The administrative team is proactive in marketing the Federal Fellows Program to students, rather than waiting for students to find out about it through word of mouth. By advertising the program broadly, the team creates demand, which allows it to pick a diverse group of students most likely to do well.[36]

Offers Interdisciplinary Approach to Learning

While the program is not restricted to STEM students, Dr. Burton and her team have placed a "very deliberate" focus on recruiting STEM students, saying that "STEM students need to be inspired early on to think about policy" and that in Congress in particular, there is "often a need for scientific knowledge." Dr. Burton noted that STEM students offer special value in policy roles because they are often "disciplined thinkers," "piercingly pragmatic," and that they "think precisely about a problem."[37]

Because it is a policy-focused program, it also attracts students who are traditionally more interested in working on Capitol Hill or in the White House.

As a result, the programs create an interdisciplinary learning environment where students can offer their unique perspectives and collaborate with one another in coursework and extracurricular activities.

Combines Theory, Practice, and Professional Development

The programs are book-ended by a fall classroom seminar and a spring internship. The fall seminars are taught by expert practitioners and based on topics like national security policy and public health policy. While the students must find their own spring internships, the program team offers support to ensure a proper placement is found.

Throughout the year, practitioners are invited to campus to teach students policy-relevant skills, like writing a policy memo or being an effective intern on Capitol Hill. Students also

36 Joan Burton, Director of the Federal and Global Fellows Programs at the University of Maryland-College Park, February 2020.

37 Burton.

conduct simulations, listen to information sessions on public service options, and receive assistance with resumes and cover letters.[38]

Offers Mentorship and Networking

Students are individually paired with a program alumnus who is tasked with helping students be successful.

Additionally, the program holds networking events for students, and uses workshop participants and course instructors to offer advice and counsel.[39]

University of Michigan

The University of Michigan's Gerald R. Ford School of Public Policy created a Science, Technology, and Public Policy (STPP) Program that "is devoted to interdisciplinary research and teaching on the politics and processes of science and technology policymaking"[40] through curriculum, events, and career support. According to a leader of the program, one of the goals is simply to "produce scientists who can succeed in policy."[41]

Established in 2006, the STPP Program offers a graduate certificate program to masters and PhD students that "provides students with tools to analyze complex science and technology policy issues."[42] Through two core courses and two electives, students "learn how science and technology are influenced by politics and policy, analyze the role of science and technology in the policymaking process, develop policy writing skills, gain methods and tools for science and technology policy analysis, and explore the political and policy landscape of specific science and technology areas."[43] A leader of the STPP program noted that the program is interdis-

38 "Federal Fellows Program at the University of Maryland-College Park," accessed August 23, 2020, https://federalfellows.umd.edu/.

39 "Federal Fellows Program at the University of Maryland-College Park."

40 "Science, Technology, and Public Policy Program | Gerald R. Ford School of Public Policy," accessed October 14, 2020, https://fordschool.umich.edu/research-centers-departments/science-technology-and-public-policy-program.

41 Interview with Leader at Public University, October 2020.

42 "Graduate Certificate | Science, Technology, and Public Policy Program | University of Michigan," accessed October 14, 2020, /graduate-certificate.

43 "Graduate Certificate | Science, Technology, and Public Policy Program | University of Michigan," accessed October 14, 2020, /graduate-certificate.

ciplinary by design, which helps students learn to "communicate across disciplines…[about] really technical subjects in clear language." [44]

Additionally, the STPP program holds events for its students to introduce them to different career paths and to build their professional networks. For example, alumni of the program will do webinars with current students to explain their current roles and what their various career paths looked like.[45]

Finally, the STPP program helps students learn about and access various internship and career opportunities. Through career events, an alumni database, a list of fellowships and other opportunities, and relationships with local and national representatives, the STPP program offers assistance with getting internships, fellowships, or full-time roles.[46]

Harvard University

There are several established and nascent pathways at Harvard University; this report will look at the Harvard Kennedy School's Belfer Center for Science and International Affairs and the Harvard Institute of Politics.[47,48]

The Belfer Center for Science and International Affairs

The Belfer Center for Science and International Affairs at the Harvard Kennedy School was founded in 1973 to analyze arms control and nuclear issues; soon thereafter, it expanded its focus by establishing the

44 Interview with Leader at Public University, October 2020.

45 Interview with Leader at Public University, October 2020.

46 Interview with Leader at Public University, October 2020.

47 One nascent pathway at Harvard is the Public Interest Technology Lab, which is to be launched Fall 2020. Run by Latanya Sweeney, a professor of Government at Harvard, the PIT Lab is an extension of the Harvard Data Privacy Lab, which Sweeney directs. Because the PIT lab is just being launched as this report is published, it is not analyzed in this report, but the TAPP Project is looking forward to its launch. For more on the PIT Lab, see https://wearecommons.us/2020/08/26/harvard-gets-a-pit-lab/.

48 This report does not analyze STEM pathways at the state level. However, as just one example, the Scientific Citizenship Initiative at Harvard Medical School, founded by Angela DePace and directed by Daniel Pomeroy, places STEM fellows at the Massachusetts State House to work on policy issues. For more, see https://news.harvard.edu/gazette/story/2020/09/students-work-to-narrow-the-gap-between-scientists-and-society/.

International Security Program and the Science, Technology, and Public Policy Program.[49,50]

The Belfer Center's mission is to "provide leadership in advancing policy-relevant knowledge about the most important challenges of international security and other critical issues where science, technology, environmental policy, and international affairs intersect; and to prepare future generations of leaders for these arenas."[51] To do so, the Belfer Center offers STEM-focused coursework to students and its faculty, staff, and fellows conduct research on STEM-focused policy issues.

Faculty members who are affiliated with the Belfer Center offer courses aimed at bridging the divide between STEM professionals and policy. For example, Belfer Center Director Ash Carter teaches "Solving Tech's Public Dilemma's," which enrolls students from Harvard's Kennedy School, Harvard's John A. Paulson School of Engineering and Applied Sciences, MIT, and more, analyzes solutions to issues arising from emerging technologies such as biotechnology tools, driverless cars, and artificial intelligence.[52] Sheila Jasanoff, the Pforzheimer Professor of Science and Technology Studies, teaches several STEM-focused courses, including "Science, Power, and Politics," which is meant to "[expand] students' understanding of the ways in which science and technology participate in the creation of social and political order."[53] Courses like these help STEM students develop a better understanding of the social and ethical implications of technology, along with the skills to effect change through policy.

The Belfer Center is also regarded for the research its faculty, fellows, students, and staff conduct on science and technology topics, and has been named the #1 university-affiliated think tank by the University of Pennsylvania's Think Tanks and Civil Societies Program for six consecutive

49 "History." Belfer Center for Science and International Affairs. Harvard Kennedy School. https://www.belfercenter.org/about/overview/history.

50 The Technology and Public Purpose Project, which is directed and staffed by the authors of this report, is a project at the Belfer Center.

51 "About." Belfer Center for Science and International Affairs. Harvard Kennedy School. https://www.belfercenter.org/about.

52 "IGA-505: Solving Tech's Public Dilemmas." Harvard Kennedy School. https://www.hks.harvard.edu/courses/solving-techs-public-dilemmas.

53 "IGA 513: Science, Power, and Politics." Harvard Kennedy School. https://www.hks.harvard.edu/courses/science-power-and-politics

years.[54] At the Belfer Center, research conducted by scientists and technologists on environmental policy, election security, global health, and myriad other topics furthers policy at the local, state, and national levels. Through research, mentorship, and ongoing professional development, the Belfer Center prepares its faculty, fellows, students, and staff for policy-making roles in national, state, and local legislative branches and executive agencies.

Institute of Politics

The Harvard Institute of Politics (IOP), an undergraduate-oriented program housed at the Harvard Kennedy School, is an example of an existing pathway that is broadening its focus to bring STEM students to its programming. The IOP exists to "inspire students into careers in public service and policy," as one staff member put it.[55] However, this staff member continued, "historically, the general view was that [this] meant to attract the [Government] concentrators," as opposed to other student populations.[56] In the past several years, the IOP's focus has changed: "We think to solve public problems we need students from all disciplines, more than ever."[57]

While the IOP's focus on STEM students is relatively new, its shift—away from solely interacting with liberal arts students and targeting a broader group of students with diverse aspirations—is indicative of how many pathways can be broadened to reach a larger audience.

As an IOP staff member put it, one of the barriers to creating stronger pathways is a disconnect between faculty and departments and the IOP: "in public service or civic engagement ecosystem…many times [it is] disconnected from faculty…[there is] not enough public service collaboration with the departments to create robust pipelines."[58]

54 "About." Belfer Center for Science and International Affairs. Harvard Kennedy School. https://www.belfercenter.org/about.

55 Staffer at the Harvard Institute of Politics, May 2020.

56 Staffer at the Harvard Institute of Politics, May 2020.

57 Staffer at the Harvard Institute of Politics, May 2020.

58 Staffer at the Harvard Institute of Politics, May 2020.

To address this, the IOP reaches out to faculty and departments that are interested in doing semester-long projects with teams of undergraduates. Known as the IOP STEAM Program, the aim is "to [promote] intelligent policy-making capable of tackling modern societal issues" driven by "a time of rapid technological change."[59] Student groups pair with Harvard faculty "to conduct research on politically relevant STEAM topics…[culminating] in a tangible deliverable, a product or policy solution."[60]

However, as the IOP staff member put it, "a lot of folks might not even know that the IOP has any STEM stuff going on, or that we have the desire to."[61] To remedy this, the IOP uses civic engagement entry points into diverse student populations, like the Harvard Votes Challenge, a university-wide voting initiative. For example, by discussing the Harvard Votes Challenge in the most prominent computer science course on campus, the IOP hopes not only to register new voters but to engage them in other IOP programs. This effort has been successful, according to the IOP staff member, and holds promise for future students: "through this, other civic engagement opportunities can emerge."[62]

The IOP also offers Director's Internships, which are paid summer internships in policy and politics.[63] While science majors are underrepresented in the Director's Internship applicant pool relative to their population on campus, the IOP is targeting outreach to attract more to apply.[64]

59 "STEAM: Science, Technology, Engineering, Arts, and Mathematics," The Institute of Politics at Harvard University, accessed August 22, 2020, https://iop.harvard.edu/get-involved/steam.

60 "STEAM."

61 Staffer at the Harvard Institute of Politics.

62 Staffer at the Harvard Institute of Politics.

63 "Director's Internship Program | The Institute of Politics at Harvard University," accessed August 23, 2020, https://iop.harvard.edu/get-involved/internships-careers/directors-internship-program.

64 Staffer at the Harvard Institute of Politics.

Stanford University

As a world-class university located in the heart of Silicon Valley, Stanford University offers STEM students several ways to learn about careers in public service.

Academically, Stanford's Public Policy Program offers a degree in public policy for undergraduates and a Science and Technology Policy concentration for both undergraduate and graduate students. In addition to courses that straddle technology and policy topics, such as Biosecurity and Bioterrorism Response and Foundations of Bioethics, students can complete a policy analysis exercise project with government clients.[65]

To prepare students for internships and full-time roles in policy, Stanford's Public Policy Program also offers skill-building sessions on policy-relevant skills, such as memo writing, policy brief writing, and oral communication.[66]

Stanford's Public Policy Program helps technical students to explain their expertise to non-technical employers, offering a brainstorming worksheet that assists students in thinking through and presenting their technical skills.[67]

Finally, Stanford's Haas Center for Public Service has several resources for STEM students to use to learn about public service roles, including in national, state, and local government. Some resources, such as the Cardinal Careers Guide to Getting Started in Public Service and the Public Interest Technology Edition of the Cardinal Careers Newsletter, focus on "hands-on opportunities to use [one's] technical skills for the public good"; these list specific fellowships, job boards, and examples of relevant organizations. Others, like a public service job application timeline and links to

65 "Practicum Program | Public Policy Program," accessed September 6, 2020, https://publicpolicy.stanford.edu/academics/practicum-program.

66 "Writing and Career Resources | Public Policy Program," accessed September 8, 2020, https://publicpolicy.stanford.edu/writing-and-career-resources.

67 Kathleen Cassidy and Mary Stroud, "Talking Public Policy: Marketing Your Degree" (Stanford University), accessed September 8, 2020, https://public-policy.sites.stanford.edu/sites/g/files/sbiybj9416/f/talking_public_policy_worksheet.pdf.

legislative roles, are for a general audience but would be helpful to STEM students.[68,69]

Carnegie Mellon University

Carnegie Mellon University (CMU) is renowned for its technical academic programs; it is "ranked #1 in Computer Science, Computer Engineering, Artificial Intelligence, and Information and Technology Management."[70] Since 1970, CMU has offered an Engineering and Public Policy (EPP) program at its College of Engineering, which "works to solve problems at the interface of technology and society" and is open to undergraduate and graduate students.[71] The EPP program selects for technical students who want to combine their backgrounds in engineering and the hard sciences with "the social and behavioral sciences, economics, political science, and law" to "address policy issues focused on science and technology."[72] In addition to offering interdisciplinary courses and opportunities to do research on science and technology policy, the school links students to resources on how to find jobs in the federal government.[73]

CMU offers several courses focused on public interest technology topics, including the Policy Innovation Lab, which "connects students with actual, current state-level policy challenges, and connects state-level policy makers with solutions to those challenges."[74] Students also complete capstone proj-

68 "Cardinal Careers Guide to Getting Started in Public Service" (Stanford Haas Center for Public Service), accessed September 6, 2020, https://haas.sites.stanford.edu/sites/g/files/sbiybj10391/f/cardinal_careers_guide_to_getting_started_in_public_service.pdf.

69 "Service and Impact Job Search Timeline" (Stanford Haas Center for Public Service), accessed September 6, 2020, https://haas.stanford.edu/sites/g/files/sbiybj10391/f/service_and_impact_job_search_timeline.pdf.

70 "Public Interest Technology at Heinz College," Carnegie Mellon University's Heinz College, accessed September 6, 2020, /about/public-interest-technology/.

71 Carnegie Mellon University, "Department of Engineering and Public Policy - Engineering and Public Policy - College of Engineering - Carnegie Mellon University," accessed September 6, 2020, http://www.cmu.edu/epp/index.html.

72 University.

73 "Specialty Area Guide: Federal Government Tip Sheet" (Carnegie Mellon University), accessed September 6, 2020, https://www.cmu.edu/career/documents/spec_area_guide_federal_govt_2020.pdf.

74 "Policy Innovation Lab," Carnegie Mellon University's Heinz College, accessed September 6, 2020, /about/public-interest-technology/policy-innovation-lab.

ects with public entities, like the Pennsylvania Department of Labor, the City of Pittsburgh, and more.

In July 2020, CMU focused its annual Public Service Weekend, an event put on by the Public Policy & International Affairs Program, "to introduce more students to the broad range of opportunities available in the field of public service"[75] on public interest technology. The conference "[brought] together a diverse group of practitioners from across the field—including policymakers, technologists, designers, and leaders—to develop innovative solutions to pressing issues in public policy and equity."[76] CMU will also host a Public Interest Technology Week on campus in late September.

Public Interest Technology University Network

Individual efforts are beginning to be coordinated by networks like the Public Interest Technology University Network (PIT-UN), which was launched in March 2019 by the New America Foundation and 21 charter members, with financial support from the Ford Foundation and the Hewlett Foundation.[77]

The goal of the PIT-UN is to "cultivate an area of inquiry, education, and practice—what we call public interest technology—that positions the next generation of students to more effectively design, build, and govern new technologies in ways that directly advance the public good."[78] In doing so, "The [PIT-UN] seeks to equip tomorrow's computer scientists, information architects, engineers, data scientists, designers, lawyers, policy experts, and

75 "PPIA Public Service Weekends," accessed September 6, 2020, https://ppiaprogram.org/our-work/public-service-weekends/.

76 "Heinz College Public Service Weekend 2020: A Next Generation Leaders Conference" (Carnegie Mellon University), accessed September 6, 2020, https://sites.psu.edu/sciadvising/files/2020/04/PUBLIC-SERVICE-WEEKEND-2020-Carnegie-Mellon-University.pdf.

77 The Public Interest Technology University Network is both a university-driven pathway and a non-profit-driven pathway, as it is supported by the New America Foundation. Because the individual efforts are at the university level, it is included in the university-driven pathway section

78 "What We Learned In PIT-UN's First Year," New America, accessed August 20, 2020, http://newamerica.org/public-interest-technology/blog/what-we-learned-pit-uns-first-year/.

social scientists with the skills to create public policy that centers the needs of people and their communities."[79]

Currently, the PIT-UN has 36 members, including Harvard University, the Massachusetts Institute of Technology, the University of Michigan, and Stanford University. PIT-UN members commit to "field building" in the public interest technology space, including three elements relevant to creating and supporting pathways:

1. "Support curriculum and faculty development to enable interdisciplinary and cross-disciplinary education of students, so they can critically assess the ethical, political, and societal implications of new technologies, and design technologies in service of the public good.
2. Develop experiential learning opportunities such as clinics, fellowships, apprenticeships, and internship, with public and private sector partners in the public interest technology space.
3. Find ways to support graduates who pursue careers working in public interest technology, recognizing that financial considerations may make careers in this area unaffordable to many."[80]

   According to a New America Foundation report about PIT-UN, the network "enables leaders…to share best practices and spur collaboration" through a newsletter, public grant awards to catalyze innovative ideas, and to directly collaborate with other members of the network.[81] A leader at the New America Foundation noted that "sharing resources" between network universities is one of the most important benefits of the PIT-UN.[82] For example, the PIT-UN

79 "Fifteen New Universities and Colleges Join New America's Public Interest Technology University Network," New America, accessed August 20, 2020, http://newamerica.org/public-interest-technology/press-releases/fifteen-new-universities-and-colleges-join-new-americas-public-interest-technology-university-network/.

80 "Public Interest Technology University Network," New America, accessed August 20, 2020, http://newamerica.org/public-interest-technology/university-network/.

81 "Building the Future 2020," New America, accessed August 20, 2020, http://newamerica.org/public-interest-technology/reports/pit-building-future-2020/.

82 Leader at a Non-Profit Organization.

report noted that "Howard, Georgetown, and Stanford to develop a repository of PIT case studies" collaboratively.[83]

PIT-UN's hybrid approach—individual university initiatives supported by a non-profit organization—creates an environment where successful programs can be more easily scaled and where pathway administrators can work with one another to troubleshoot.

None of the examples above is perfect; each is a work in progress. However, understanding how programs are built, improved, and sustained is useful for universities seeking to create programs of their own.

83 "Building the Future 2020."

Non-Profit-Driven Pathways

There are several not-for-profit organizations that recruit and train technical talent to work on policy issues in government, with some of the most prominent focusing on Congress.

Non-profit-driven pathways are notable for their:

- **Experience with Bridging Sectors.** Many of the not-for-profit organizations discussed below focus on bringing talent from the private sector and academia into Congress. By bridging for-profit, not-for-profit, and public sectors, these organizations help to bring the best of each sector to the others.
- **Ability to Help Scale Successes.** Not-for-profit organizations can put funding towards several promising ideas, track progress, and identify clear successes that they can scale both internally—by making the successful projects larger—and externally, by bringing the idea to new venues.

Many non-profit-driven pathways face similar challenges, including:

- **Funding.** While non-profit organizations can receive funding from myriad sources, it takes time and effort to raise the money necessary to create and expand pathways. One nonprofit leader put it simply: "insufficient funding and capacity to do all the things that need to happen" is an issue.[84]
- **Post-Fellowship Matchmaking.** For congressional fellowships, it can be difficult to sync opportunities to stay on as a full-time staff member with the rhythms of the fellowship. After a fellowship is complete, many fellows seek to find a full-time role in their personal office or committee. However, because the fellowships are externally funded, there often is not space in the office budget for the fellow to come on as a full-time, Congress-paid staffer. Even if both the fellow and the office/committee want to continue to work together, poor timing may prevent it.

84 Leader at a Non-Profit Organization.

This report does not identify every not-for-profit STEM pathway; however, a few exemplars are:

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS) SCIENCE & TECHNOLOGY POLICY FELLOWSHIP (STPF)

The AAAS STPF program is one of the oldest and most respected pathways sending technical talent to Capitol Hill. Started in 1973, the STPF sends paid fellows, most of whom have a PhD, to work in the federal government for one year. Fellows are funded through AAAS, so agencies, congressional personal offices, and congressional committees do not have to pay fellow salaries.

Traditionally, the AAAS has relied on professional societies like the American Meteorological Society and the American Public Health Association to fund the STPF. However, there is a limit to the amount of funding AAAS can get through this channel, and demand for fellows outstrips the funding. For example, according to a staff member at the AAAS, in 2019, 100 congressional personal offices and committees wanted STPF fellows, but AAAS only had the funding to support 33.[85] While funding is likely to continue to be a limiting factor, AAAS is looking into using private foundation money to support the program.[86]

TECHCONGRESS

Launched in 2016 and incubated by the Open Technology Institute at the New America Foundation, TechCongress "places computer scientists, engineers, and other technologists to serve as technology policy advisors to Members of Congress."[87]

TechCongress has two main programs: the Congressional Innovation Fellowship, which recruits mid-career fellows, and the Congressional Innovation Scholars, which recruits recent technical degree program graduates.[88] Of the six Congressional Innovation Fellows in 2020, half are placed directly in a House or Senate Office, and half are placed on a relevant committee or subcommittee.[89]

85 Leader at the American Association for the Advancement of Science.

86 Leader at the American Association for the Advancement of Science.

87 "About Us," TechCongress, accessed August 22, 2020, https://www.techcongress.io/about-us.

88 "About Us."

89 "Meet the Fellows," TechCongress, accessed August 22, 2020, https://www.techcongress.io/fellows.

ASPEN TECH POLICY HUB

Launched in 2019, the Aspen Tech Policy Hub recruits technologists for its 10-week Incubator Fellowship, which trains fellows in the policy process through an orientation, classes, exercises, and networking events. A leader at the Aspen Tech Policy Hub noted that it begins with a "four-week intensive bootcamp" that offers trainings on the policy process works, specific emerging technology policy briefs, and hands-on exercises like policy memo writing.[90] At the end of the program, fellows create a practical policy output and present it to a key stakeholder.[91]

Based in the Bay Area, the Aspen Tech Policy Hub calls itself a "Silicon Valley-Style Think Tank" and "models [itself] after tech incubators like Y Combinator, but train new policy thinkers and focus [on] the impact of their ideas."[92]

90 Leader of Tech Policy-Focused Organization, February 2020.

91 "Fellowship," *Aspen Tech Policy Hub* (blog), accessed August 22, 2020, https://www.aspentechpolicyhub.org/fellowship/.

92 "Fellowship."

Government-Driven Pathways

The most prominent government-driven pathways focus on bringing technical talent into executive branch agencies to work on technical problems, rather than focus on policy. However, because they offer important insight into how to successfully construct a government-driven pathway, they are worth including in this report.

Government-driven pathways are valuable due to their:

- **Ability to Scale.** A program in one federal agency can, if successful, be scaled to other agencies, particularly with the assistance of the General Services Administration, White House, or other cross-agency entity.
- **Staying Power.** Established programs within government agencies tend to become rooted, particularly when they are apolitical, relatively inexpensive, and can build a broad base of support. This potentially allows them to have greater staying power than university or non-profit pathways, which are potentially more contingent upon leadership, internal champions, and funding support.

For the purposes of this report, there are three categories of government-established pathways that are worth understanding:

Technology-Oriented Programs

Between 2012 and 2015, several programs were created to increase the federal government's technology competency.[93] While each program has different missions and processes, all recruit technologists and entrepreneurs to work on technical problems faced by executive branch agencies. These programs include, but are not limited to:

93 Anastasoff, Smith, and Stier, "Mobilizing Tech Talent: Hiring Technologists to Power Better Government."

PRESIDENTIAL INNOVATION FELLOWS

The Presidential Innovation Fellows (PIF) program was established in 2012 to "equip our country with a powerful, scalable framework to innovate and address the greatest challenges facing our leaders and people" and "provides a path for bringing private-sector talent with cutting-edge skills, customer obsession, and emerging-tech leadership into the Federal government."[94] The program offers a one-year fellowship in a federal agency, with the possibility of a one-year extension.[95]

UNITED STATES DIGITAL SERVICE

The botched rollout of the Healthcare.gov website in 2013 made clear that the federal government could use a new infusion of technical talent. To meet this need, the United States Digital Service (USDS) was founded in 2014. The USDS hires technologists to do "tours of civic service" and "deploys small, responsive groups of designers, engineers, product managers, and bureaucracy specialists to work with and empower civil servants."[96] USDS employees work on administration priorities throughout the executive branch.

18F

18F is an office within the General Services Administration that "collaborates with other agencies to fix technical problems, build products, and improve how government serves the public through technology."[97] Founded in 2014 by PIF alumni, 18F acts as an in-house consultancy for federal agencies. Unlike the PIF and USDS, 18F is not built on a short-term/tour of duty model; rather, it seeks to hire employees for the long term.

DEFENSE DIGITAL SERVICE

In 2015, former Secretary of Defense Ash Carter launched the Defense Digital Service (DDS) to bring top technology talent to help solve technology-related defense issues at the Department of Defense.[98] Among other programs, the DDS hosts a bug-bounty program called Hack the Pentagon, incentivizing computer scientists to find and point out vulnerabilities that could lead to security issues in DoD systems.

94 "Who We Are | Presidential Innovation Fellows," accessed August 21, 2020.

95 "Frequently Asked Questions | Presidential Innovation Fellows," accessed August 21, 2020.

96 "Our Mission," United States Digital Service, accessed August 21, 2020, https://usds.gov/mission.

97 "18F: Digital Service Delivery | About," accessed August 21, 2020, https://18f.gsa.gov/about/.

98 "'Building the First Link to the Force of the Future' Remarks by Secretary of Defense Ash C," U.S. DEPARTMENT OF DEFENSE, accessed August 21, 2020, https://www.defense.gov/Newsroom/Transcripts/Transcript/Article/630419/building-the-first-link-to-the-force-of-the-future-remarks-by-secretary-of-defe/.

Temporary Details

The Intergovernmental Personnel Act of 1970 allows "the temporary assignment of employees between the Federal Government and State, local, and Indian tribal governments, institutions of higher education," federally funded research and development centers (FFDRC), and more.[99] For example, Congress or a federal agency could bring on university or FFRDC talent on a specific technology topic for a temporary assignment. Similarly, federal employees can be detailed to universities to teach or to conduct research, which allows them to learn about a specific topic and to grow a professional network at the university.

As noted in *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise*, detailees "are highly regarded in congressional offices and committees…staffers noted that fellows and detailees often add significant value as translators, reality checks, and educators for other, less technical staff."[100]

Additionally, federal agencies have several hiring authorities available to them to create tours of duty for private sector talent. One such authority is the Fellowships and Industry Exchange Program Hiring Authority (Schedule A(r)), which allows agencies to hire fellows and to create positions for private sector talent.[101] The AAAS STPF program, for example, uses Schedule A hiring authority to bring fellows to the federal government.[102]

Presidential Management Fellowship

Entities like the Presidential Management Fellows (PMF) program offer two-year fellowships in participating federal agencies for those with an advanced degree. The PMF program was started in 1977 and is meant to

99 "5 CFR § 334.101 - Purpose.," Legal Information Institute: Cornell Law School, accessed August 21, 2020, https://www.law.cornell.edu/cfr/text/5/334.101.

100 Miesen and Manley, "Building a 21st Century Congress," 54.

101 Vanessa Pena and Chelsea Stokes, "Tour of Duty Hiring in the Federal Government" (Institute for Defense Analyses Science and Technology Policy Institute, June 2019), https://www.ida.org/-/media/feature/publications/t/to/tour-of-duty-hiring-in-the-federal-government/d10700final.ashx.

102 "Interns and Fellows Appointed through Schedule A," National Institutes of Health Policy Manual, September 2017, https://policymanual.nih.gov/2300-213-1.

"[develop] a cadre of potential government leaders."[103] Fellows, who come in with diverse academic and professional backgrounds, are based in executive branch agencies and have the opportunity to do several rotations, including on a congressional committee.

103 "PMF.Gov - Presidential Management Fellows Program - U.S. Office of Personnel Management," PMF.gov - U.S. Office of Personnel Management, accessed August 21, 2020, http://www.pmf.gov/the-opportunity/pmf-as-a-pathway/.

Maximizing Impact of STEM Professionals in Congress

> *"STEM training rarely, if ever, provides students with an understanding of how to engage with public policymakers. Yet, science is an essential input to the development of policies that address some of our most difficult societal challenges."* [104]
>
> *—Daniel Pomeroy, Executive Director of the Scientific Citizenship Initiative, Harvard Medical School*

Nearly all stakeholders interviewed believed that increasing the number of STEM professionals serving on Capitol Hill is desirable. Given limited resources and the existing structure and strictures of Congress, it is worth considering how to make the most of additional STEM professionals.

This section will answer two questions vital to understanding how to maximize the value of STEM talent in Congress:

1. What is the Appropriate Level of Experience for STEM Professionals Working on Capitol Hill?
2. How Can STEM Professionals be Prepared to Work on Capitol Hill?

104 "Students Work to Narrow the Gap between Scientists and Society."

What is the Appropriate Level of Experience for STEM Professionals Working on Capitol Hill?

One of the foundational questions for maximizing the impact that STEM professionals can have in Congress is what level of experience they should be coming into the role with.

As discussed in *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise,* the traditional recruiting and promoting pathways in Congress are not built for experienced STEM talent:

> "Career progression in Congress also puts those with an S&T background—often with a PhD—at a disadvantage. As a current staffer noted, congressional offices often hire from within Congress; staffers typically start as interns who work their way up over time. In other words, the hiring process is not designed for subject matter experts with years of experience."[105]

This leads to the question of whether junior STEM talent—defined for this report as recent undergraduates and those without a PhD—can fit within the traditional career pathways in Congress.

In interviews, stakeholders noted several benefits and drawbacks of actively recruiting junior STEM talent to personal offices and committees.

Benefits

Interviewees argued that creating pathways for junior STEM talent to work on Capitol Hill would offer three main benefits.

First, as one leader of a nonprofit put it, junior STEM talent is a "larger, cheaper pool" of talent, with more life flexibility.[106] Professionals may be more likely to move to Washington, DC and take a lower-paying job on Capitol Hill when they're younger and relatively less experienced.

105 Miesen and Manley, "Building a 21st Century Congress," 66.

106 Leader at the American Association for the Advancement of Science.

Second, there is value in "growing up in the system," as this same nonprofit leader argued. Junior STEM talent could start in an entry-level role and use that time to learn how Congress functions.[107] After advancing to a position where they could use their STEM expertise, they would know the institution well enough to understand how to be effective.

Finally, as a current Senate staffer noted, from a skills-building perspective, junior STEM talent could use their time on Capitol Hill to develop hard and soft skills that they may not be able to acquire at an entry-level role in a laboratory or at a technology company.[108] This would be valuable for them in more senior roles in Congress, in academia, or in the private sector.

Drawbacks

Interviewees noted several drawbacks and hurdles.

First, it is not clear that junior STEM talent would want to take entry-level roles that do not pay well and that do not require junior STEM talent to use the skills they built at school. A former TechCongress fellow was "doubtful that [there are junior] STEM graduates interested enough that they work their way up" and that "starting at the bottom doesn't feel viable to me."[109]

Similarly, it is not clear that personal offices would want to hire junior STEM talent for low-level roles, either. As a former staffer put it, offices "aren't going to go out of their way to hire STEM talent," preferring instead to often hire young professionals connected to the member either by personal or professional networks or simply by the congressional district or state.[110]

Finally, there is a concern that junior STEM talent would lack the credibility and gravitas that comes with experience. A former AAAS STPF noted that, while STEM professionals "don't need a PhD to be useful to the office…having it gives you a significant advantage in terms of credibility"

107 Leader at the American Association for the Advancement of Science.

108 Policy Advisor at the United States Senate.

109 Former TechCongress Fellow, February 2020.

110 Former Legislative Director at the United States Senate.

and that it could be "tricky to be successful without a PhD unless you also have some policy education experience."[111]

While there was not consensus on the question, most stakeholders argued that junior STEM talent would not be as valuable as more experienced STEM talent on Capitol Hill. As a leader of a nonprofit noted, the idea is "interesting in theory" but in practice it is difficult to operationalize within the context of Congress.[112]

In short: **many stakeholders said that STEM professionals with PhDs or years of experience would offer personal offices and committees more of the attributes they desire from their staffers.**

However, if a stakeholder *were* to prioritize recruiting junior STEM talent to work on Capitol Hill, some interviewees argued that they could add value at legislative support agencies like the Congressional Research Service or the Government Accountability Office's Science, Technology Assessment, and Analytics (STAA) team.[113] Additionally, one former congressional staffer with a STEM background noted that a value-add for junior talent could be doing data analysis, as that is a discrete skillset that is both lacking in congressional personal offices and can be done by a relatively junior staffer.[114]

Finally, one former TechCongress fellow noted that a fellowship combining policy work and technical product work could help onboard junior STEM talent, giving them experience in Congress without having to start at an entry-level role that would not use their technical talents.[115] This fellow argued that a one-year fellowship would potentially allow junior STEM talent to be viable for Legislative Assistant roles.[116]

111 Former AAAS Science and Technology Policy Fellow in the United States Senate.

112 Interview with Nonprofit Leader.

113 Former TechCongress Fellow.

114 Former Legislative Director at the United States Senate.

115 Former TechCongress Fellow.

116 Former TechCongress Fellow.

How Can STEM Professionals be Prepared to Work on Capitol Hill?

To understand how STEM professionals can be trained or prepared to work on Capitol Hill, it is useful to consider what attributes they need to be successful and what training is offered within existing pathways.

Attributes to be Successful in STEM Policy Advising

Stakeholders argued that there several skills or traits that STEM professionals need to be successful on Capitol Hill:

Policy Communication Skills

It is vital for STEM professionals to be able to, as a leader of a nonprofit organization put it, "talk to people who aren't scientists," because most of the people they work and interact with will not have a technical background.[117] STEM professionals need to be able to translate tech into policy, while also being able to translate policy into technical language.

When writing, STEM professionals must be able to condense complex technical information into one-page policy memos with the most salient points at the top—writing "backwards," as the nonprofit leader put it.[118] This is not how most scientists and technologists are trained to write, but it is vital to getting information across to the busy, non-technical generalists who will be using it to advise on policy.

Soft Skills

Various soft skills came up in interviews as vital attributes of a successful congressional staffer. A former TechCongress fellow argued that being an effective Legislative Assistant requires good judgment, the ability to trust and be trusted, being willing to do what is needed—even if it seems

117 Leader at the American Association for the Advancement of Science.

118 Leader at the American Association for the Advancement of Science.

mundane or beneath one's expertise.[119] A former senior leader of the United States Digital Service agreed, noting that being flexible, having respect for the knowledge of others, and being empathetic are vital traits for STEM professionals working on policy projects with non-technical people.[120]

One important soft skill is what a nonprofit leader described as a "political muscle."[121] As a staffer quoted in an evaluation of TechCongress noted,

> "Often what a [TechCongress] fellow lacks is the ability to apply a political filter. You have to understand that's a consideration too. Not just is there a policy improvement to be made, but is there going to be any attention for this? Is it actually going to make a difference for people back home reading in their local paper about the things we're doing? Can we make people understand that? Part of it is putting things in relatable terms. It's not just coming with your sharpest policy blade.'"[122]

Adaptability

Being a successful policy advisor in Congress requires quickly learning how to be effective in a personal office or committee—particularly for short-term fellows who have limited time to make an impact. STEM professionals entering the roles need to be able to thrive in this environment.

A former STPF noted that, while there are supports in place, the congressional fellowship is "kind of a sink-or-swim program" given the fast-paced nature of Congress.[123] Similarly, an evaluation of the TechCongress fellowship program quoted a fellow supervisor on the steep learning curve: "After a few weeks, you're ready to dive into policy."[124]

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119 Former TechCongress Fellow.

120 Former Leader in the United States Digital Service.

121 Leader at the American Association for the Advancement of Science.

122 David Shorr, "TechCongress and Public Interest Technology: An Evaluation," August 2018, https://static1.squarespace.com/static/552c519fe4b0906b45bb9b8d/t/5b622e7a575d1fcd22f8b95f/1533161085901/TechCongress+Evaluation+Findings+PUBLIC+version+August+2018.pdf.

123 Former AAAS Science and Technology Policy Fellow in the United States Senate.

124 Shorr, "TechCongress and Public Interest Technology: An Evaluation," 7.

To approach the learning curve, STEM professionals can ask for help from their colleagues. As a former TechCongress fellow noted, mentorship is key to help fellows understand the policy process.[125] Both being willing to be mentored and being able to ask for help, then, are vital skills to have as a congressional staffer.

Understanding that Science/Evidence is One Driver of Many

Many STEM professionals are trained to think of problems as having a right, or most right, solution as dictated by the data. Policymaking is not so neat; as a nonprofit leader put it, "science is not the only driver."[126] The technically correct answer may be politically wrong, or at least wrong for the moment; other equities—which issues are prioritized given a fixed amount of political capital or how constituents feel about an issue, for example—weigh heavily on the policymaking process. As a current STEM professional staffer in the Senate noted, "understanding what is important" is a critical skill for congressional staffers.[127] This can be frustrating for some STEM professionals working on Capitol Hill.

All the above attributes are important for policy advising staff in Congress, but some of them are more quickly trainable than others. Learning how the policymaking process works, for example, is easier to learn quickly than how to be flexible and adaptable at work.

Training to be Successful in STEM Policy Advising

Given the skills that STEM professionals bring in and the attributes that make them effective on Capitol Hill, preparatory training can be a valuable resource to help them understand how Congress and the policymaking process really work—and importantly, how to navigate Capitol Hill to get things done.

125 Former TechCongress Fellow.

126 Leader at the American Association for the Advancement of Science.

127 Policy Advisor at the United States Senate.

Many of the prominent fellowships and university pathways described in the Existing Pathways section conduct such trainings in one form or another. For example, AAAS holds a two-week orientation session before the STPF program begins, and according to one former fellow, "most of orientation is devoted to an exploration of science policy, the workings of the federal government, and other topics that will enable fellows to make the most of their fellowship."[128] The orientation helps to inform fellows how the executive and legislative branches work and what to expect in their roles, combining lectures with interactive sessions, during which fellows practice skills such as "writing talking points and drafting an appropriations bill."[129]

The survey of AAAS STPF alumni indicated that their training and orientation is useful; 84% said it was very or extremely successful.[130] However, one former STPF noted that "[a lot] of presentations are very academic in style" and that there is "a lot of lecture [and] not enough doing."[131] This former fellow also noted that, while AAAS hosts career development events throughout the fellowship term, the pace of Congress makes it difficult for congressional fellows to attend.[132]

TechCongress holds a two-week orientation as well, during which incoming fellows meet with members and their staff, listen to workshops on the legislative process, do interactive exercises, and meet with "tech policy thought leaders at academic institutions, civil society groups and technology companies to explore the range of perspectives on common tech policy challenges."[133]

Having the right attributes to be successful, coupled with valuable training, would somewhat inoculate STEM professionals against being viewed as politically naïve and incapable of navigating Congress by other congressional staffers.

128 "Orientation Info Sheet | S&T Policy FellowsCentral," accessed August 20, 2020, https://www.aaaspolicyfellowships.org/events/orientation/orientation-info-sheet.

129 "Science & Technology Policy Fellows Prepare for a Challenge in Washington | American Association for the Advancement of Science," accessed August 20, 2020, https://www.aaas.org/news/science-technology-policy-fellows-prepare-challenge-washington.

130 "Summary - STPF Retrospective Evaluation" (American Association for the Advancement of Science, July 2020), 9, https://www.aaas.org/sites/default/files/2020-06/Summary%20-%20STPF%20Retrospective%20Evaluation_0.pdf.

131 Former AAAS Science and Technology Policy Fellow in the United States Senate.

132 Former AAAS Science and Technology Policy Fellow in the United States Senate.

133 "Join the Congressional Innovation Fellowship," TechCongress, accessed August 20, 2020, https://www.techcongress.io/congressional-innovation-fellows.

Analyzing Opportunities to Improve STEM Pathways

> *"The United States government must fundamentally re-imagine the way it recruits and builds a digital workforce."*[134]

There are several ways to create new STEM pathways or to supplement existing pathways. The opportunities below are not mutually exclusive; different stakeholders can, and should, simultaneously work on the problem from their different perspectives.

Analyzing Opportunities to Improve STEM Pathways

	BENEFITS	DRAWBACKS
Build on Existing Successes Scale successful programs to maximize impact	Leverages existing platforms for speed, simplicity, and cost savings	Could create overreliance on temporary expertise
Create New Institutions Congress and external stakeholders could build a new institution, or set of institutions, to recruit and house STEM talent working on policy issues	Creates a 'Home' for Technical Talent Builds Institutional Memory Creates Reputation for Excellence	Substantively and politically difficult to create
Create and Expand University Pathways Train the next generation of policy advising scientists and technologists by creating and expanding university pathways	Leverages existing pathways and resources Creates generational change	Is not immediate solution to problem Pulls resources away from more immediate solutions
Create New Short-Term 'Tour of Duty' Roles Create new time-limited opportunities for scientists and technologists to work on policy issues on Capitol Hill	Enables talent acquisition and assists with infusions of talent Builds relationships with expert networks Generates bidirectional learning opportunities	Introduces substantive or optical bias Could create overreliance on temporary expertise
Create New Fellowship Programs Develop a new model combining classroom learning, job placement, on-the-job training, and mentoring	Develops alumni network of cross-sector leaders Allows tailoring of program to local circumstances	Could reinvent the wheel unnecessarily Difficult to start new programs May not be resilient to leadership changes.
Create Vetted Talent Pools A trusted entity could offer a curated pool of qualified STEM candidates to congressional personal offices and committees	Relatively simple to create Offers potential for immediate impact	May not be resilient to changes in Congress

Figure 4. Opportunities to Improve STEM Pathways

134 "Second Quarter Recommendations," Quarterly (National Security Commission on Artificial Intelligence, July 2020), vi, https://drive.google.com/file/d/1hgiA38FcyFcVQOJhsycz0Ami4Q6VLVEU/view?usp=embed_facebook.

Build on Existing Successes

Rather than create new pathways, stakeholders could build on existing pathways, augmenting available resources and enabling the growth of already-successful programs. This could be done in three broad ways:

1. Augment Existing Congressional Pathways

Organizations like AAAS and TechCongress already funnel STEM talent into Congress to serve in policy roles. With infusions of money and manpower, these existing pathways could scale to serve additional congressional personal offices and committees.

Rather than create something new, stakeholders could put efforts towards funding existing programs.

2. Create Congressional Pathways Modeled On Existing Executive Branch-Oriented Organizations

As detailed earlier in this report, several programs within the government focus on recruiting and deploying talent throughout the executive branch. These programs could be broadened to identify STEM talent that could be successful in the legislative branch. Stakeholders could work with these programs to develop congressional extensions of their existing work, likely by placing STEM talent in congressional committee or support agency ranks. Any of these programs could be expanded to include legislative branch 'bases' on committees, in the CRS, and at the STAA.

3. Work with Not-for-Profit Organizations to Develop Legislative Branch STEM Fellowships

Some not-for-profit organizations, like Coding it Forward, bring junior technology talent to executive branch agencies to work on product issues. Others, like College to Congress, bring junior talent to the legislative branch.[135] Still others, like the Aspen Tech Policy Hub, train technologists to think about and affect policy. Organizations like these could work

135 For more on College to Congress, see https://www.collegetocongress.org/.

together to create classes of scientists and technologists capable of serving in the legislative branch.

Benefits

- **Leverages Existing Platforms for Speed and Simplicity.** Building a new program from scratch would likely take longer than creating a new opportunity within existing programs. Leaders at existing programs understand the bureaucracy, have established relationships with key stakeholders, and have developed best practices for recruiting and retaining talent.
- **Leverages Existing Programs for Cost Savings.** Similarly, building on existing platforms would reduce costs by allowing for the use of existing infrastructure—everything from office space to human resource talent.
- **Uses Expertise of Leaders.** Leaders of these organizations, inside and outside the government, understand the challenges of implementing programming with the federal government. As a result, they are well positioned to assist in implementing another program operating within the federal government.

Drawbacks/Risks to Mitigate

- **Most Programs are Not Custom-Built for Finding and Using Policy Expertise.** Programs like the USDS hire technical talent interested in using their technical skills to solve government problems; they do not seek out talent to work on policy issues. While there is likely some overlap between the two groups, work would have to be done to orient existing channels to intentionally identify policy-interested technical talent. Connections to the legislative branch would also need to be created, cultivated, and maintained.
- **Could Cause Overreliance on Short-Term Resources.** One drawback of relying on fellows and details is that they are, by their nature, temporary. As noted in *Building a 21st Century Congress:*

Improving Congress's Science and Technology Expertise, "Fellows and detailees gain tacit knowledge about how Congress works and how to be effective within it, then leave; new talent then comes in and starts the process anew."[136] While there is value to seeding other institutions with legislative branch expertise and understanding, relying too heavily on temporary talent can accelerate congressional 'brain drain' as well.

Create New Institutions to Bring Technical Talent to Congress

Rather than seeking to add STEM professionals to personal offices, Congress and external stakeholders could build a new institution, or set of institutions, to recruit and house STEM talent working on policy issues.

This is not a new idea; as noted above, executive branch agencies have created several institutions in recent years to bring technical talent into government. Additionally, institutions like the Office of Technology Assessment once did this within the legislative branch, and the GAO's STAA could similarly be considered an institution in this space. However, several interviewees were not sure that STAA would be the proper place to house STEM talent in the legislative branch.[137]

Building a 21st Century Congress: Improving Congress's Science and Technology Expertise noted that Congress should create a congressional support agency focused on science and technology issues. In our view, such an agency would exist within Congress, convene groups of diverse stakeholders, serve multiple congressional needs, and be options-oriented in its outlook and outputs.[138]

136 Miesen and Manley, "Building a 21st Century Congress," 56.

137 For more on this discussion, see *Building a 21st Century Congress: Improving Congress's Science and Technology Expertise*.

138 Miesen and Manley, "Building a 21st Century Congress," 62.

In September 2019, a bipartisan and bicameral group of elected leaders introduced a bill to refund and reform the OTA, calling the new organization the Congressional Office of Technology.[139]

As introduced, the bill would create an organization much like the one recommended in our previous report. Crucially, it would allow the organization to appoint "scientists, engineers, and other technical and professional personnel on leave of absence from academic, industrial, or research institutions to work for the Office"—creating an institution that could offer a natural home for short-term technical talent in the legislative branch.[140] While no action has been taken on this bill in the House or Senate to date, it can be used as is, or as a foundation for future legislation.

While the FY2021 Legislative Branch Appropriations Bill has not passed both the House and Senate, Congress is likely to increase funding to the STAA, rather than to a revitalized OTA.[141]

Benefits

- **Creates a 'Home' for Technical Talent.** Creating a 'home' for STEM talent within the legislative branch would allow scientists and technologists to work with one another to address emerging technologies and their potential policy impacts. Having colleagues to bounce ideas off one another would help catalyze new thinking about problems and would create a collegial working environment.

  Additionally, this home for technical talent would somewhat insulate it from everyday political pressures. While certainly not a panacea—the OTA faced, and was harmed by, political

139 "Reps. Takano and Foster, Sens. Hirono and Tillis Introduce the Office of Technology Assessment Improvement and Enhancement Act | U.S. Congressman Mark Takano of California's 41st District," accessed August 23, 2020, https://takano.house.gov/newsroom/press-releases/reps-takano-and-foster-sens-hirono-and-tillis-introduce-the-office-of-technology-assessment-improvement-and-enhancement-act.

140 Mark Takano, "Text - H.R.4426 - 116th Congress (2019-2020): Office of Technology Assessment Improvement and Enhancement Act," webpage, September 19, 2019, 2019/2020, https://www.congress.gov/bill/116th-congress/house-bill/4426/text.

141 "Appropriations Committee Releases Fiscal Year 2021 Legislative Branch Funding Bill," House Committee on Appropriations, July 6, 2020, https://appropriations.house.gov/news/press-releases/appropriations-committee-releases-fiscal-year-2021-legislative-branch-funding.

pressure—some insulation would help STEM talent focus on STEM policy issues.

Of course, technical talent will still reside in personal offices and on committees, as STEM professionals provide valuable advice in those roles. They, too, would benefit from a new institution focused on science and technology.

- **Builds Institutional Memory.** Formalizing an institutional structure for STEM advice within Congress would ensure that institutional memory could be sustained through a small permanent staff plus larger successive waves of temporary appointments. In this way, new appointees could quickly get up to speed on how to be an effective policy advisor to Congress.
- **Creates Reputation for Excellence.** The Congressional Budget Office, the Congressional Research Service, and other legislative support agencies are known for their cogent, rigorous, and branded work products. Their reputation attracts top talent, creating a virtuous cycle that redounds to the benefit of Congress.

  Building a new institution within Congress for STEM advice, and allowing it to produce rigorous work, would similarly help to develop a reputation for excellence that it could use to attract top STEM talent to Congress.

Drawbacks/Risks to Mitigate

- **Difficult to Create and Sustain.** Creating new institutions in the federal government is difficult, especially in the legislative branch—it takes internal champions to fight for the creation of the institution, ensure it has enough funding to be successful from the start, and to give it time to develop into its own. A new institution, in other words, may be a long-term goal and not an immediate solution to the problem.
- **Politically Difficult to Create**. In an age of increasing political polarization, building new institutions that are both nonpartisan and perceived to be nonpartisan is a difficult endeavor. Funding those institutions is difficult, too.

To overcome this challenge, the institution must give clear input to both parties, including from multiple committees and multiple members. The institution must offer a venue for diverse perspectives to be heard and discussed respectfully, and for multiple constituencies—executive branch agencies, private sector companies, lobbyists, think tanks, advocacy groups and more—to be and feel heard. The new institution must be protected by a bipartisan, bicameral group of senior legislators capable of fending off threats to its survival.

Create and Expand University Pathways

As noted in the Maximizing Impact of STEM Professionals in Congress section, PhD students and recent graduates are the optimal population to create pathways around; building pathways to place recent STEM graduates into congressional offices is a relatively low-value effort. However, universities can be valuable staging grounds for more junior STEM talent in four ways:

1. **Seeding Interest.** Many STEM professionals are simply not aware that policymaking roles are available to them. Through networking events, workshops, and invitations to speak, university pathways offer specific examples of individuals who use their STEM skills to serve the public. Crucially, this can happen at any career stage—from undergraduate to PhD student.

2. **Developing Skills.** The skillset to be an effective legislative assistant or policy adviser on Capitol Hill is different than the skillset to be an effective computer scientist at a large technology company or a researcher at a laboratory. Through interdisciplinary courses and workshops, university pathways can teach STEM students some of the skills they need to be successful on Capitol Hill.

3. **Creating Networks.** Personal and professional networks are vital to the hiring process in congressional personal offices. Through internships, networking events, and alumni engagement, universities can link STEM students and graduates to policy-focused networks that could help them get experience on Capitol Hill. Networks can be resilient beyond graduation, as well, allowing for a 'network now, use later' model.

4. **Connecting STEM Undergraduates with Congressional Internships.** As one career services professional at a private university argued, doing a congressional internship the summer after freshman year is optimal for STEM students, as they do not yet have the technical skills necessary to do technical internships.[142] This gives an opportunity for STEM undergraduates to get a feel for what the

142 Career Services Official at Private University, January 2020.

policymaking process is like, and could spark interest in policy advising later in their careers.

In the opinion of a dean at an engineering school, "a substantial internship program would be the most effective tool to spur new interactions…particularly if the internships can be combined somehow with both a policy dimension and a technology dimension."[143] This dean noted that a benefit of this model would be "not [forcing] a choice with the pressure of a job commitment and corresponding career path, but rather you educate the student via the internship about the career possibilities."[144]

The simplest way to create new pathways at universities is to use existing universities. However, the National Security Commission on Artificial Intelligence recommended that Congress should authorize and fund a new institution, the United States Digital Service Academy (USDSA), with "the mission to help meet the government's needs for digital expertise."[145] The USDA would recruit students who would earn a degree, paid for by the government, with the expectation of having a post-graduation service requirement.[146] Modeled off of the existing service academies, like West Point, the USDSA would produce graduates who "would enter the institution to become civil servants" and "would serve across the Federal government," after receiving "a highly technical education."[147]

Benefits

- **Leverages Existing Pathways, Draw on Existing Resources.** Colleges and universities are pathways in and of themselves, and many have dedicated networks for their non-STEM students to get involved in the policymaking process. Simply by making a concerted effort to connect STEM students to existing networks, academic institutions could help STEM students become interested

143 Dean of an Engineering School.

144 Dean of an Engineering School.

145 "Second Quarter Recommendations," 43.

146 "Second Quarter Recommendations," 43.

147 "Second Quarter Recommendations," 44.

in—and able to—offer policy advice, while linking them with opportunities to do so, both during and after their time at school.

This means that universities can offer this service to STEM students at a low marginal cost, reducing the need for start-up capital and giving universities the freedom to experiment and take risks with little downside risk.

- **Creates Generational Change**. Others narrower models are responsive to the specific problem but do not endeavor to create broad, lasting change in how scientists and technologists are trained. Centering colleges and universities in this process would allow for generational change, with potential cascading effects on research, development, and deployment of emerging technologies.

Drawbacks/Risks to Mitigate

- **Does Not Serve as an Immediate Solution to Problem.** Putting energy towards university-led pathways will create some near-term benefit by engaging PhD students and enthusiastic junior STEM talent. However, the most significant benefits of this model would likely be felt over a longer timeline, as many interventions would only truly bear fruit several years after a student graduates from the college or university.

  However, on balance it is still valuable to create pathways for future talent; this is a generational problem, not one with a short-term fix. Engaging PhD students now will also create a near-term benefit that would redound to Congress.

- **May Reduce Funding to Existing, Narrower Solutions.** Rather than seeking broad change, perhaps allocating resources towards narrower solutions, like existing fellowship programs, would yield better results and are more worth focusing on in the short term.

  While existing fellowship programs could use additional funding, they also need a steady stream of interested and capable STEM professionals. Investing in university pathways, then, also creates value for these fellowship programs over time.

Create New Short-Term 'Tour of Duty' Roles for Scientists and Technologists

As noted in the Existing STEM Pathways section, the executive branch has established several tour of duty programs for technical talent to work on technical issues. Legislative branch support agencies, congressional personal offices, and congressional committees could establish new 'tour of duty' pathways for scientists and technologists to work on specific policy issues for a set amount of time.

Benefits

There are several benefits to using 'tour of duty' talent. Current and former congressional staffers noted other benefits of the model:

- **Enables Talent Acquisition.** For personal or professional reasons, many STEM professionals may not want to make a career of government service; giving the opportunity to work on a specific problem for a limited amount of time enables this group to offer their expertise on their terms.
- **Assists with Infusions of Talent.** Individuals cycling in and out of the private sector, academia, national laboratories, and more bring with them up-to-date expertise that Congress would benefit from having within its ranks.
- **Builds Relationships and Expert Networks.** Through tour of duty roles, congressional staff would gain useful relationships with subject matter experts. Everyone who completes a tour of duty role becomes a potential expert who can be consulted, formally or informally, when hearings or legislation are considered on an issue.
- **Generates Bidirectional Learning Opportunities.** Just as Congress must learn about emerging technologies, so too must technologists learn about how Congress—and the result of the federal government—functions. Tours of duty allow for cross-fertilization of ideas

and knowledge, foster bidirectional learning, and create a cadre of informed cross-sectoral leaders.

Drawbacks/ Risks to Mitigate

- **Introduces Bias.** Substantively and optically, it may be difficult for an employee of a private sector company to do a tour of duty on Capitol Hill, where they could be able to influence policy that affects their company. Care must be taken to ensure that Congress would benefit from STEM expertise while not being harmed by bias. Three ways to mitigate risk would be to:

    a. **Have talent work on adjacent policy topics.** An employee of a social media company should not work on social media policy; rather, she could work on an adjacent issue that does not directly affect her employee.

    b. **Host talent in non-policymaking position, such as the Congressional Research Service, GAO's STAA, or revitalized OTA**. In roles at the CRS, STAA, or a revitalized OTA, STEM professionals could add significant technical expertise to Congress without being able to directly bias policy.

    c. **Recruit talent primarily from universities and the non-profit sector.** Congress could primarily seek talent from academic and non-profit settings. This mitigates some of the benefits of tour of duty talent and is likely too restrictive; in certain cases, though, it may be necessary in order to avoid substantive or perceived conflicts of interest.

- **Could Cause Overreliance on Temporary Tours of Duty.** One of the major strengths of tour of duty roles—how they cycle fresh talent into government organizations—is also a weakness of relying on the model. If overused, tours of duty prevent Congress of the staff with both technical expertise and institutional know-how necessary to get things done. Additionally, relying on temporary talent may

disincentivize the hiring of permanent staff, which could cost more to retain. Care must be taken for Congress to not rely too heavily on temporary talent.

Create Custom-Built Fellowship Program(s)

Rather than building on existing fellowship programs, key stakeholders could develop a new model that combines classroom learning, job placement, on-the-job training, and mentoring.

There are myriad models for how this could be accomplished. Four particularly promising options are:

1. **Small, University-Driven Fellowship with District and State Representatives**

   A university could work with its representatives in Congress to develop a small fellowship program with those offices. Masters graduates, PhD students, and post docs in STEM fields at that university could take preparatory courses at the university before being placed in an office for a year-long fellowship.

   Alternatively, the same format could be used to offer an internship program for STEM undergraduates, with the goal of introducing the policymaking process to STEM students.

   In either case, this model could scale to any university interested in establishing a program with its representatives.

2. **University-Centered Fellowship with Broader Cohort of Placement Offices**

   Rather than hoping for each university to set up its own program, one university could set up a fellowship that is open to anyone and that connects fellows with a broader cohort of placement offices, rather than just its own representatives.

3. **Leverage PIT-UN to Create Scaled Fellowship Strategy**

   Combining the positive attributes of university-driven and centralized fellowship options, key stakeholders could work with the PIT-UN to build out, fund, and deploy a fellowship model that is supported centrally and operated in a federated manner.

4. **Create Non-Profit, Partner with Universities for Training**

   AAAS and TechCongress have developed highly regarded fellowship programs; new non-profit organizations could use their experiences as foundations for a new fellowship program. For example, when supplemented with a modest training program in partnership with a university, this model could train talented STEM professionals to be effective policy advisers, then deploy them into offices. Through a concurrent mentoring program, fellows would be able to learn both from one another and from others who could offer real-time counsel from alumni and other stakeholders.

Benefits

- **Develops Alumni Network of Cross-Sectoral Leaders.** A fellowship model will create a cadre of STEM professionals with a strong understanding of the policymaking process. After the fellowship, this group would be able to take that knowledge into academia, not-for-profit organizations, and the private sector, bridging the divide between policy and practice.
- **Offers Ability to Tailor Programs to Local Circumstances.** Localized fellowship programs could recruit STEM talent to work on district- or state-wide issues unique to that locality, pairing specific expertise with the policy issues most confronted by their member of Congress. For example, colleges or universities in rural districts dominated by agricultural concerns could create fellowships targeting agronomy experts.

Drawbacks/Risks to Mitigate

- **Could Unnecessarily Reinvent the Wheel.** In short: why develop a new fellowship when non-profit models like AAAS and TechCongress are successful and scalable with additional funding? Creating duplicative programming is an inefficient way to use time and financial resources.
- **Difficult to Start New Programs.** Creating new programs is difficult and often expensive and requires internal champions—both in Congress and at a partner institution—to shepherd the program.
- **Potentially Not Resilient to Changes in Elected Leaders.** Models that aim to create relationships between a university and their members of Congress may not continue when new representatives are elected.

Create Vetted Talent Pools

Because congressional personal offices are resource-constrained organizations, they often fill vacant positions as efficiently as possible. This has several consequences; as one staff member in a Senate office noted, time constraints often lead offices to hire those they know—who often have a similar background and come from similar demographics.[148] This staffer argued that, as a result, congressional offices can become homogenous without a specific and determined focus on diverse talent pools.

While congressional offices must independently do more to ensure that staff diversity is a priority for them, a trusted entity—a university or other non-profit organization, for example—could help by offering a curated pool of STEM candidates to congressional personal offices. This could be done in several ways, from a less formal network to a more formal credentialing process, with the overall goal of reducing searching costs for offices.

Congressional staffers noted that they use informal vetted talent pools to find talent from think tanks and other organizations already, so a new

148 Policy Advisor at the United States Senate, December 2019.

talent pool from which to draw potential applicants would likely be readily accepted and used.[149]

Benefits

- **Relatively Simple to Create.** In the simplest form of a vetted talent pool, a trusted stakeholder—an academic institution or a think tank—could develop a list of STEM professionals that both had interest and the capacity to do policy advising work and build it over time.
- **Potential for Immediate Impact.** Due to its simplicity, a vetted talent pool for STEM talent could be operationalized quickly, allowing for immediate impact for interested personal offices and committees.

Drawbacks/Risks to Mitigate

- **Not Necessarily Resilient to Changes in Representatives.** New members of Congress may not use the tools that their predecessors used to seek out talent, or they may care less about bringing technical talent into their personal offices.

149 Policy Advisor at the United States Senate, December 2019.


r in Action

Conclusion

What is lost when science and technology policy is not informed and crafted by a diverse group of internal scientists and technologists? What questions are not being asked during private meetings or public hearings because there are not enough STEM professionals in congressional policy roles? How might Congress treat a pandemic differently if it had a more diverse group of internal experts well-versed in epidemiology and public health?

Many congressional personal offices and committees are already staffed by smart, public-spirited scientists and technologists, and Congress can draw on outside experts to inform its legislation and its hearings. **But none of the interviewees for this report or our previous report, argued that the status quo worked as well as it should; no one thought that Congress had enough STEM expertise to effectively reckon with emerging technology issues.** Everyone—from members of Congress to their staffers, from non-profit leaders to private sector professionals, from generalists to STEM professionals—thought that Congress can do better.

The United States desperately needs Congress to do better.

The current generation of emerging technologies is transformative. As just one example among many, the racial justice protests of 2020 have led to questions about the free speech-stifling impacts of facial recognition technologies directed at crowds of people. Piecemeal bans of facial recognition technology use by law enforcement at the city or state level, or voluntary moratoriums put in place by the private sector, cannot offer the same privacy and free speech protection as a federal moratorium, like the one put forward by Representative Ayanna Pressley and Senator Ed Markey.[150] Congress could have acted sooner, before Americans were harmed by facial recognition tools.

150 "Ed Markey and Ayanna Pressley Propose Federal Facial Recognition Ban | Boston.Com," accessed September 8, 2020, https://www.boston.com/news/politics/2020/06/25/markey-pressley-federal-ban-facial-recognition-technology.

Congress should not wait for the next generation of technologies to deploy and mature before reacting. Congress should proactively consider the public purpose implications of enzymatic DNA synthesis, gene drives, life extension technologies, and countless other early-stage innovations that are likely to have profound effects on society, and put in place safeguards before they are in widespread use.

The United States needs a legislative branch that understands not only the next generation of emerging technologies but also the scale of the problems that emerging technologies will help to solve. The tumultuous year of 2020 helps to clarify the stakes: a long-feared global pandemic ravaged the world, infecting tens of millions of people and devastating economies; wildfires choked the western United States with smoke as multiple hurricanes battered the eastern part of the country.

Pandemics will be more common in the future. Climate change is not coming—it is already here. Congress has a vital role to play; it can direct federal research dollars to technologies that could help limit, or even decrease, carbon dioxide levels in the atmosphere; it can hold oversight hearings to ensure that American tax dollars are put to good use by the executive branch.

Of course, Congress failing to act, reactively or proactively, on emerging technology issues is not solely due to a lack of expertise. Historic levels of political polarization create disincentives for the majority and minority parties to work together, impeding progress on many fronts. Different philosophies on the role of government and the proper use of science in decision making prevent action on a host of issues. Lobbyists for technology companies get paid handsomely to stymie efforts to regulate Big Tech, while wealthy donors exert influence on incumbents and aspiring representatives alike.

Increasing the number of STEM professionals working in Congress will not solve polarization or fully counter the influence of lobbyists on Capitol Hill. Adding more STEM professionals to personal offices will not convince members that climate change is a result of man-made greenhouse gas emissions if their political incentives dictate that they pretend otherwise.

STEM professionals will not convince members to go against powerful members of their political party.

But while increasing the number of STEM professionals in personal offices and committees will not solve all of Congress's problem**, a Congress with more in-house STEM expertise is a better Congress**. Getting there will require a culture shift within Congress, as well. Members of Congress will need to recognize that STEM professionals bring special qualities to their offices and their committees; other congressional staff will need to value the divergent perspectives that STEM professionals will offer. None of this will happen immediately, but creating pathways is a generational investment that is worth the effort.

Ultimately, building a 21st century Congress is a job for all of us. Universities, foundations, non-profits, and the private sector all have major roles to play in inspiring the next generation of scientists and technologists to see that policy advising is a thing that STEM professionals do—and do well.

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