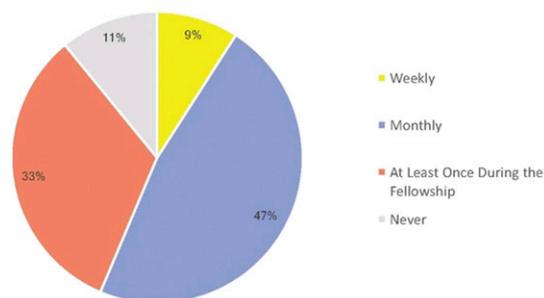


Percent of Fellows Who Identified Incorrect Technical Interpretations Resulting in Host Office Course Correction



Employment of Fellows After Their Fellowship Year

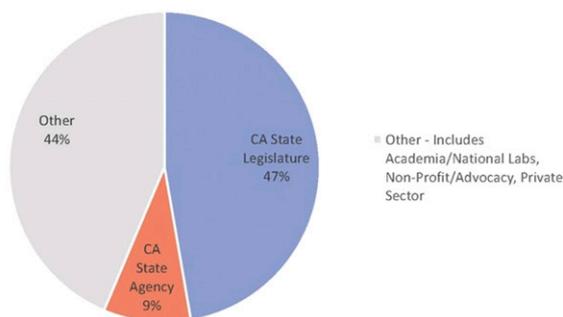


Fig. 1. Selected results from a survey of former California S&T Policy Fellows. Legislative offices regularly corrected course based on fellows' input, and a majority of fellows were employed by the State of California after completion of their 1-year fellowships. See [Supporting Information](#) for the full survey results.

permanent policy roles (1–3). Inspired by the AAAS example, a program for placing S&T fellows in state legislatures was conceived and seed-funded by the Gordon and Betty Moore Foundation (<https://www.moore.org>). This program was further supported by a 2007 convocation held at the National Academies to survey the status of state S&T policy advising, which concluded that “almost all legislators and their staffs need help in dealing with science and technology policy issues” (4), and that “A mechanism for sharing best practices and innovative approaches could strengthen policy advice in all states” (5).

In 2009, the Gordon and Betty Moore Foundation provided a 5-year matching grant of \$3.5 million to the California Council on Science & Technology (CCST) to launch an S&T policy fellows program for the California State Legislature. CCST is a nonpartisan, nonprofit organization, established in 1988 at the request of the California State Legislature to provide objective advice from California’s scientists, engineers, and research institutions on policy issues involving science (6).

Evaluating the California Program

The Gordon and Betty Moore Foundation’s primary metric for gauging the effectiveness of the fellows was evidence that their technical input affected the approval, improvement, or rejection of legislation. The program has scored well in all those respects, and both fellows and legislators generally report positive experiences.

Interviews with former legislators revealed how fellows add value, including by proposing ideas for bills that stimulate job creation and by helping policy makers better understand the importance of S&T throughout society. Former Republican California Senator Sam Blakeslee emphasized in an interview we conducted that a fellow “brings an evidence-based professional to the team in a Legislator’s office, with a new perspective that improves the discussion when developing and evaluating legislation.” This becomes particularly valuable, he added, “in this era of ‘fake news,’ where the use of science has become political and is being used as a weapon.” Blakeslee noted that the fellows read peer-reviewed journals, know the bona fide institutions, and can identify poor science that can be misused by

lobbyists in advocating for policy positions. “With this expertise, a legislator can avoid embarrassment and increase his or her impact,” he said.

We surveyed former fellows in March 2017 about their perceived effectiveness and related information, with 82% of the 67 individuals surveyed responding. (The full results are presented in the [Supporting Information](#).) When the fellows were asked how often their host offices corrected course after they had identified incorrect technical interpretations, 56% responded that this happened weekly or monthly during the fellowship (Fig. 1), directly addressing the key metric for success that had been identified by the Gordon and Betty Moore Foundation. Strikingly, 47% of fellows were hired into the Legislature at some point after they completed their fellowships, with an additional 9% hired into Executive Branch offices (Fig. 1). These postfellowship hires demonstrate that the California State government seeks a more permanent professional involvement of these fellows and that the fellowship experience helped shift the careers of many fellows from research to policy.

According to the former legislators interviewed, the offices that hosted these fellows find that they not only add technical expertise to the legislative team, but that they also bring broad analytical skills that can help inform many types of legislation, including bills without a science component. These embedded fellows bring an increased understanding of the scientific variables in policy decisions and, in some cases, reframe the issues and questions being asked. This helps policy makers sort through and understand what scientific messages or arguments are valid and reliable and which are not as they work to govern. At a time when science is often used as a marketing or obfuscating tool, the legislator who has this expertise available is at an advantage. Former California Democratic Senator Joe Simitian stressed in an interview that “the kind of science input that the S&T fellows bring is more important than ever, and, I think, especially important in states without full-time legislatures where legislators are more reliant on their executive branches and lobbyists.”

Fundamental Lessons Learned

Several components that have proven critical for the success of the California effort will be valuable for other states to consider as they plan or contemplate their own S&T policy fellowship programs.

Foremost, the fellows must be free from influence. Of the highest priority is developing a trusted, unbiased, and nonpartisan program. In California, the prospect of having “outsiders” in the legislative environment initially raised concerns (both from legislators and their staffs) about a possible undue influence of those funding and selecting the fellows. Early in the establishment of the California program, enabling legislation was unanimously passed (AB573), and a guiding memorandum of understanding was developed to set forth clear guidelines to minimize potential risks and allay concerns. This core need—to ensure that the fellows are trusted, free from influence, and not guided by partisanship—should be addressed throughout all aspects of the program, from membership of the selection committee to how and where fellows are placed in their fellowship assignments.

Any fellowship program needs a clearly identified, credible managing organization (or consortium of organizations) with expert-level knowledge of the state and its legislature. In California, the program was launched and managed by CCST, whose board includes representation from many of the state’s higher education and research institutions (6). To lead the new program, CCST hired staff with a deep knowledge of California and the California State Legislature. The core team was composed of a science policy expert with a long career working at the interface of higher education research and federal/state policy, Lora Lee Martin, and a former long-term state legislative staff member, Douglas Brown, enabling an effective bridging of the academic research and state policy-making cultures. For experienced advice, staff engaged consultants, Claudia Sturges Scott, former Director of the AAAS Science and Technology Policy Fellowship program, and Karen McClure, former Fellowship Coordinator at the US Environmental Protection Agency. In different states, other types of organizations, such as external policy groups or perhaps internal government offices could effectively serve in this capacity.

The involvement of legislative leaders of both parties early in the implementation of the fellowship program was critical to the success of the California effort. These champions ensured that the program was developed in a way that reflected the structure and needs of the state’s governing body. As additional states explore similar programs, they will need to consider many structural and cultural issues. These include the constraints faced by a full-time versus a part-time legislature, the role of staff and relationships to lobbyists, the priorities of the state, and the makeup of the legislature and the executive branch, as well as the specific processes, timelines, and procedures for legislative cycles. All these factors can significantly shape fellowship programs. In California, the continuous involvement of experienced legislative staff has been critical to both generating and maintaining buy-in for the fellowship program, being instrumental in providing

insights, “opening doors” for fellows, and implementing the program.

California recruits its fellows from a nationwide pool of PhD and professional degree applicants, instead of focusing only on California candidates. The selection process is designed to be independent of political and special-interest influence, and it is driven by a selection committee composed of science policy experts from across the United States. In addition to technical excellence in their fields, potential fellows are scored for demonstrating equally important professional skills. These include an ability to work under pressure, to work on topics outside their areas of expertise, to be self-motivated, to work on more than one issue at a time, to communicate concisely and clearly, to take direction from non-science-trained staff and legislators, and to respect and hear political opinions that conflict with their own.

Once recruited, training of the fellows is essential. In California, a month-long “boot camp” introduces them to the Legislature’s structure and processes, as well as to the intricacies of policy development. The training period engages former California fellows, legislators, and legislative staff as lecturers and presenters to provide current, relevant information. This involvement also serves to recruit key legislative personnel for the support network required by the fellows. Emphasized are the state context, the legislative process, and the professional expectations of working in the legislature. Specific sessions range from how a bill becomes law to political history, and include appropriate business attire and relational subtleties in the policy and political arena. The program offers numerous exercises in bill development and analysis, plus field trips to state programs, including prisons, to provide context so that fellows can better appreciate the wide portfolio of issues that legislators address. Boot camp also imparts the critical tenant that scientific input, although very important and useful, competes with a variety of social and economic interests for the legislators’ attention. Fellows learn first-hand the difficult lesson that a variety of elements, not just the relevant science with conclusive evidence, influence the decisions of policy makers.

Placements are jointly negotiated by the fellowship program staff and the legislative body leadership, with input from both legislators and fellows to minimize any sense of partisanship. After placement in either a committee or an individual legislator’s office, the fellows work there as full-time staff. The program administrators continue to engage with the fellows through weekly seminars and roundtables. The weekly gatherings provide time for fellows to ask questions and seek advice of their peers and the program administrators. Outside speakers, experts on relevant topics, are brought in. The strict confidentiality of legislative work is respected [for details, see the CCST report (7)].

Replicating the Model

Nine other red, blue, and purple states across the country are now exploring the establishment of their own state S&T policy fellowship programs. This cadre of

efforts was catalyzed by the Gordon and Betty Moore Foundation and its partner the Simons Foundation (8) through a competition that has awarded planning grants to program developers in Alaska, Colorado, Connecticut, Idaho, Massachusetts, Michigan, New Jersey, North Carolina, and Washington (9).

The California model can provide valuable guidance, yet each state should develop a program that is unique to its state culture and the specific challenges of its policy environment. Most of the programs being planned are focused on PhD-level researchers, but several are considering master's level or even undergraduate internships as part of a wider spectrum of engagement. One state, Idaho, is considering using this program as a way to keep PhD-level researchers in their state by providing incentives to stay, including professional development and network building activities, while another, Alaska, is considering recruiting senior scientists with a deep understanding of Alaska's unique social, economic, and geopolitical challenges. The newly developing program in Colorado has decided that its fellowship training program will be implemented as a 3-week summer course that can qualify for graduate credit at the university involved in its launch. This course will be piloted in spring 2018 as an intensive introduction to science policy and policy making at the state level, and it will include a wide variety of guest lecturers.

All the newly developing programs have articulated a sensitivity to the importance of being inclusive, to getting appropriate buy-in early on, and to identifying strong and committed champions. Different states plan to place fellows in legislative committee offices, in legislator's offices, in nonpartisan legislative analysis bureaus, and/or in their executive branches.

Those who are developing new state fellowship programs have identified the securing of sustainable funding as a major challenge. In California, the Gordon and Betty Moore Foundation provided a grant that required CCST to raise matching funds for a program that would span 5 years. The requirement to secure matching funds diversified and broadened the funding base, and it demonstrated that the effort was important

to multiple entities in California, not merely to one private foundation.

Newly developing programs that are open to accepting corporate funding should consider engaging corporate partners early, while being careful to design a mechanism to protect the program from corporate influence. To avoid misperceptions, a consortium of different types of funders with "arm's-length" involvement in management of the program is ideal. But management of a program funded by such a consortium of funders can be burdensome unless the consortium members agree on a unified approach for reporting requirements, including the content and format of the required reports. The development of a single report format that satisfies all funders will minimize the administrative overhead for the program.

As these new programs emerge, it is easy to imagine a future network of S&T policy fellowship programs that form a powerful web of science policy expertise—a network that, following the seminal model of the AAAS Science & Technology Policy Fellowships program, could have a great impact. Establishing many state programs will allow the increasingly complex policy-making arena to benefit greatly from embedded S&T expertise, producing not only new career opportunities for our nation's PhD graduates, but also stronger problem-solving partnerships between academia and policy makers.

Acknowledgments

In 2007, three of the authors were affiliated with the Gordon and Betty Moore Foundation, either as a Member of the Board of Trustees (B.A.) or as program staff developing the California Science & Technology Policy Fellows Program concept (B.D.G. and M.E.M.). B.A. continues to serve as a member of the Board of Trustees, and B.A. and M.E.M. are members of the Science & Technology Policy Fellows Program advisory committee. L.L.M., with CCST in 2009, was the lead staff member responsible for the launch of the California Science & Technology Policy Fellows Program. The views expressed are those of the authors and do not represent those of the organizations with which we were previously or are currently affiliated. We acknowledge Donna Gerardi Riordan (CCST staff in 2008) for her role in codeveloping the fellowship program vision and preliminary implementation plan, along with Christine Casey, Katy Christiansen, Rick Kempinski, Amber Mace, Jennifer Pearl, and Michael Rodemeyer for their contributions to this work.

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