Political Scientists: A Profile of Congressional Candidates with STEM Backgrounds

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ABSTRACT Candidates with STEM backgrounds ran for Congress in record numbers in 2018. Understanding who participates in this form of "mobilized science," and whether they are successful, is important because these candidates may campaign—and ultimately take action—to advance science-informed policies. However, whereas there is ample journalistic coverage of individual candidates, few scholars have studied them collectively. I constructed a novel dataset that allowed me to descriptively profile almost 200 STEM candidates who ran in 2018 and to explore correlates of their electoral success. I find that three quarters of the candidates were first-time congressional candidates, most of whom were Democrats and men. Democratic incumbents and candidates endorsed by the 314 PAC were significantly more likely to advance to the general election. I also find that women Democrats with STEM backgrounds are as likely (and perhaps more likely) to advance to the general election. I conclude by discussing how these findings advance the study of mobilized science in an increasingly partisan era.

Congressional candidates with STEM backgrounds ran for office in record numbers in the 2018 midterm elections (Mervis 2018a; Rauf 2018), leading some to dub 2018 the "year of scientists running for Congress" (Guarino and McGinley 2018). Journalistic profiles of individual candidates have greatly advanced our understanding of this unique moment in American electoral history. Nevertheless, few scholars have attempted to study congressional candidates with scientific backgrounds *as a collective group.*

Systematically studying congressional candidates with STEM backgrounds is important for political science research. When candidates with STEM backgrounds run for Congress, they have the opportunity to draw attention to issues that are relevant to the scientific community and/or that enhance the role that scientists might play in making policy decisions on politically contentious issues related to the environment, public health, and even national security. If they win elected office, they also have an opportunity to take legislative action to advance those policy goals.

For example, Representative Chrissy Houlahan (D-PA)—an Air Force veteran and MIT-educated engineer—ran for Congress for the first time in 2018. Since winning election to the US House in Pennsylvania's tossup sixth district (Wasserman 2018), Houlahan has used her position, for example, to push the Trump administration to report how it plans to enforce the general principles of the (abandoned) Paris Climate Agreement (via an Amendment to the Climate Action Now Act). She also has expressed concern that the poor representation of members of Congress with STEM backgrounds may lead to the underestimation of bioterrorism threats (Riley 2019).

More generally, systematically studying STEM candidates can help us better understand the prevalence, nature, and effectiveness of "mobilized science" in congressional elections. Mobilized science refers to the public actions that members of the scientific community take to advance their political and policy interests (Motta 2018). The Trump administration's decisions to pull out of the Paris Climate Agreement (Roberts 2018), place restrictions on the conditions under which government scientists can share scientific research (Davenport 2017), and seek dramatic cuts to federal science funding (Ledford et al. 2019) appear to have inspired at least some candidates with STEM backgrounds to run for office in 2018 (Mervis 2018b; 2018c; Sifferlin 2018).

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Whereas mobilized science has received attention in the context of protest movements including the March for Science (Brulle 2017; Fisher 2017; 2019; Motta 2018; Thoni and Livingston 2019; Stenhouse and Heinrich 2019), we know far less about another form of mobilized science: running for congressional office. The goal of this article is to advance our understanding of this form of mobilized science by (1) descriptively profiling those individuals with STEM backgrounds who were sufficiently motivated to seek congressional office in the 2018 midterm elections, and (2) generating testable predictions about how STEM candidates might fare if (and when) they run for office in the future.

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DEFINING AND IDENTIFYING CANDIDATES WITH STEM BACKGROUNDS

To systematically study candidates with STEM backgrounds, it is first necessary to define who does (and does not) count as having a background in STEM. I considered candidates to have a STEM background if they have either an educational (master's degree or higher) or employment background in the "natural" sciences (e.g., physics, chemistry, or medicine), technology (e.g., computer science), engineering, or mathematics. I also included candidates who have only a bachelor's degree but *only* if they also are employed as scientists in a STEM field.

This definition, of course, is not the only way to operationalize whether a candidate has a STEM background. An alternative approach focuses on only those candidates who have graduate-level training in a science, technology, engineering, or mathematical field. *Science Magazine* used this approach in its recent reporting on STEM candidates (Koerth 2018). Given the subjective nature of identifying STEM backgrounds—and the importance of how we define "who counts" on the descriptive conclusions we draw—my definition errs on the side of inclusivity. By pursuing a more inclusive definition, researchers can use the data I make available along with this piece to subset or otherwise alter the data pursuant with alternative definitions (Motta 2020).

It also is important to recognize that my definition is conceptually limited to candidates with backgrounds in the "natural"—as opposed to the "social"—sciences. As a social scientist, I want to be clear that it is *not* my intention to imply that social scientists are not worth studying. Indeed, we have recently had cause to mobilize on behalf of our politically relevant interests—for example, the now-infamous "Coburn Amendment" that temporarily limited National Science Foundation (NSF) political science funding (Mervis 2014).

Instead, I prefer to focus my conceptualization of STEM on the natural sciences because natural scientists have become the "public face" of mobilized science in recent years (Motta 2018; Nyhan 2017). Demonstrating this point, Brulle (2017) and Fisher (2017) showed that recent examples of mobilized science (e.g., the March for Science and the People's Climate March) were largely a reaction to concerns about the Trump administration's attempts to interfere with the role that scientists—especially climate scientists—play in shaping policies related to the environment.

Additionally, it is important to note that my definition of who counts as a STEM candidate is consistent with several existing political, governmental, and other research-related standards. For example, interest groups like the 314 PAC (i.e., an advocacy group devoted to recruiting, training, and endorsing candidates with STEM backgrounds) and VoteSTEM (i.e., an informational group that provides information to the public about STEM candidates) include only science, technology, engineering, and mathematics when defining STEM candidates in their official mission statements; so also does Conroy (2018) in her analyses of who ran in the 2018 midterm elections. Moreover, whereas it certainly is true that some federal agencies (e.g., the NSF) define STEM to include social-scientific research, it is important to note that other agencies do not include the social sciences in their definitions (e.g., Department of Homeland Security and Immigration and Customs Enforcement).

THE "POLITICAL SCIENTISTS" DATASET

To facilitate the systematic study of these candidates, and working with my definition, I assembled a new dataset profiling 194 candidates with STEM backgrounds who ran for Congress in 2018 (see https://osf.io/84twz). Summary data for all variables included in the dataset are in table 1.

To initiate the process of identifying candidates whose backgrounds matched my definition, I first created a candidate list based on information from the nonpartisan group VoteSTEM.org. VoteSTEM considers a candidate to have a STEM background if that person has a bachelor's and/or advanced degree in a STEM field or who works professionally in that field.

Recognizing that these data may be imperfect or incomplete, I supplemented this list by appending data from *FiveThirtyEight*'s list of Democrats running for Congress in 2018 (Conroy 2018). These data identified STEM candidates by noting whether they made some type of public statement regarding their scientific expertise. I cross-validated this list by researching candidate biographies on Ballotpedia.org and retaining only those candidates (N=37) whose scientific backgrounds matched the previous definition.

Of course, because *FiveThirtyEight* profiled only Democratic legislative candidates, under-coverage on the Republican side is possible. However, because Republicans comprised only a small percentage of observations in the VoteSTEM data, and because the Democratic Party tends to place a higher priority on scientific credentials than the Republican Party (Koerth 2018), I suspect that under-coverage issues were minor.

MEASURES

To systematically study candidates with STEM backgrounds, the Political Scientists dataset includes several measures profiling

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Table 1

Variable List and Summary Statistics in the Political Scientists Dataset

Variable	Mean	SD	Min.	Max.	Valid N	Type
Candidate Name	–	–	–	–	–	Nominal
State	–	–	–	–	–	Nominal
District	–	–	–	–	–	Nominal+
State + District	–	–	–	–	–	Nominal
Field of Expertise (Specific)	–	–	–	–	–	Nominal
Field of Expertise (Broad)	–	–	–	–	–	Nominal
Bachelor's Degree	0.251	0.435	0	1	191	Indicator
Master's Degree	0.262	0.441	0	1	191	Indicator
Doctorate (PhD/MD/JD)	0.487	0.501	0	1	191	Indicator
Female	0.258	0.439	0	1	190	Indicator
Male	0.742	0.439	0	1	190	Indicator
Advanced to General	0.288	0.454	0	1	191	Indicator
Lost Primary	0.623	0.486	0	1	191	Indicator
Withdrew/Disqualified	0.089	0.285	0	1	191	Indicator
Democrat	0.796	0.404	0	1	191	Indicator
Republican	0.152	0.360	0	1	191	Indicator
Third Party	0.052	0.223	0	1	191	Indicator
Endorsed by the 314 PAC	0.141	0.349	0	1	191	Indicator
% Voted for Trump in District	48.885	12.355	5.4	76.7	183*	Interval
% College Educated in District	33.384	10.623	9.121	62.429	183*	Interval
District Ideology (PVI)	3.742	11.763	-43	28	182*	Interval

Notes: *Indicates that district-level variables are calculated for House candidates only (i.e., senators do not belong to districts). +Indicates that although this variable is theoretically nominal, it is listed in the dataset as a numeric value, encoded as a "string."

candidates' social and political backgrounds. This section discusses how I operationalized each one of these measures.

Endorsement from the 314 PAC

I created a binary indicator of whether candidates received campaign contributions from the 314 PAC based on campaign-contribution records according to the Center for Responsive Politics.

Partisanship, Gender, Education, and Expertise

I created binary indicators of candidate partisanship—that is, whether candidates affiliated as a Democrat, a Republican, or a third-party candidate—and gender based on information from their campaign websites.

If this information and/or the website were not available, I instead retrieved it from Ballotpedia. I repeated this procedure to document the highest educational degree that each candidate obtained, as well as the stated area of scientific specialization.

Performance

Based on election returns listed on Ballotpedia, I coded candidates as either disqualified from the race (e.g., failing to appear on the ballot); withdrawn; lost in a primary; advancement to the general election; and whether they won the general election.

Electoral Histories

By referencing electoral histories on Ballotpedia, I created dichotomous indicators of whether candidates had previously run in statewide (e.g, governor, Congress, or attorney general) or congressional races in past election cycles.

District-Level Factors

After identifying a list of candidates with STEM backgrounds, I then merged it with district-level variables pertaining to the district's partisan lean (known as "PVI" according to the nonpartisan Cook Report), the percentage of the population that is college educated (from the US Census), and the percentage who voted for Trump in the 2016 general presidential election (Donner 2018).

DESCRIPTIVE ANALYSIS: THE FACE OF MOBILIZED SCIENCE IN THE 2018 MIDTERM ELECTIONS

Figure 1 summarizes several important descriptive findings about the types of candidates with STEM backgrounds who ran for Congress in 2018. First, concerning the candidates' partisan affiliations, I found that the majority (about 80%) were affiliated with the Democratic Party (panel A). However, it is important to note that the candidates were not *exclusively* Democrats; approximately 15% were affiliated with the Republican Party and 5% were third-party candidates.

Second, panels B and C profile the candidates' scientific backgrounds. Almost half of these candidates have a doctoral degree (49%; see panel B)—43% of whom hold a doctoral degree in a STEM field and an additional 6% of whom hold at least a bachelor's degree in a STEM field with a doctoral degree in another field. Moreover, panel C shows that whereas the candidates' range of scientific expertise was broad, a majority came from

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only three fields: engineering (28%), medicine (25%), and computer science (11%).

Figure 1 also displays a prominent gender gap (panel D). About one quarter of the STEM candidates who ran for Congress in 2018 were women (26%). This stands in notable contrast to the number of women who sought elected office more generally in 2018. For example, a recent study found that almost half (48%) of all Democratic nominees for federal and gubernatorial races were women (Conroy 2018).

In addition to describing the background of STEM candidates who ran for Congress in 2018, these data provide the opportunity to ascertain whether they were *successful*. Figure 1 (panel E) shows that less than one third of the STEM candidates who ran for Congress in 2018 advanced beyond the primaries. Although some (9%) were eliminated before primary contests, most lost in primary elections (62%). Only 12% ultimately won election to Congress.

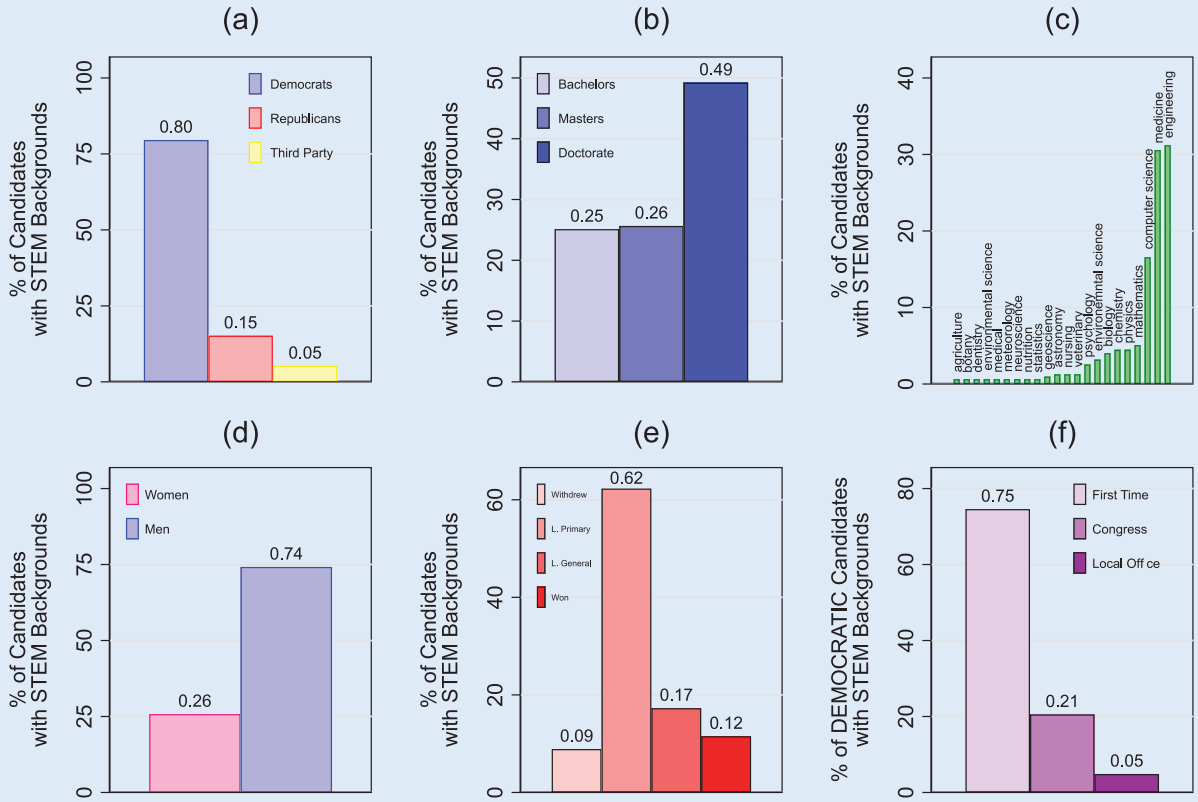
Finally, panel F in figure 1 profiles the campaign histories of STEM candidates who ran in 2018. Consistent with journalistic reporting on the race, I found that the overwhelming majority of STEM Democrats who ran in 2018 never sought elected or congressional office before Trump's presidency. Three fourths (75%) of the STEM candidates who ran for office in 2018 had no previous experience with electoral politics, and one fifth (21%) had run for congressional or statewide office in the past. An additional 5% previously ran for local office.

Consistent with journalistic reporting on the race, I found that the overwhelming majority of STEM Democrats who ran in 2018 never sought elected or congressional office before Trump's presidency.

Table 2 presents the results of several logistic-regression models that regress a binary indicator of advancement beyond the primaries on candidate- and district-level factors that could potentially influence electoral success. We might expect, for example, that candidates who receive campaign contributions from the 314 PAC may gain a visibility and/or funding advantage that contributes to their success in primary or general-election contests. District-level factors also could influence candidate success if candidates with STEM backgrounds in less-educated districts—or those that more strongly supported Trump over Clinton in 2016—have difficulty finding an audience for pro-science campaign messages. However, the disproportionate share of STEM candidates who are men, Democrats, and/or first-time

Figure 1

A Descriptive Profile of Congressional Candidates with STEM Backgrounds



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candidates makes it difficult to predict how gender, partisanship, and campaign histories might factor into electoral success. Because these candidate-level traits are better represented overall, they also may be well represented among those who experience success. Alternatively, because most candidates I observed did not win reelection, it could be the case that these factors have no discernible bearing on election success—or are even negatively associated with it.

predicts advancing to the general election. Consequently, it is important to note that conceptually, of all results observed in table 2, none are as strong as the effects of being an incumbent on electoral success.

These results suggest that receiving support from the 314 PAC was associated with a positive and statistically significant increase in the likelihood of advancing beyond the primary (row 1). Substantively, 314 PAC endorsement (N=27) was associated with a

Additionally, although most candidates were men and first-time congressional candidates, neither gender nor (in)experience limited the prospect of electoral success.

Before turning to the results, five caveats warrant mentioning. First, due to the low frequency of Senate candidates (N=11), I focused my analyses on *only* House races. Second, because some states and districts featured multiple candidates with STEM backgrounds, I accounted for the possibility of geographically correlated errors by clustering standard-error estimates at both the district (models 1 and 2) and state (models 3 and 4) levels. Third, because all candidates who received 314 PAC funding were Democrats, and out of an abundance of caution regarding the possibility of undercounting Republicans, I included only Democratic candidates in these analyses. Fourth, to avoid collinearity concerns, I modeled district-level educational attainment (models 2 and 4) and support for Trump in the 2016 (models 1 and 3) because these two were highly correlated (r=-0.51). Fifth, I excluded incumbents (N=11) from these models. Because all incumbents in the dataset won reelection, incumbency perfectly

40% to 42% increase in the likelihood of advancement, across modeling strategies.

Because these models necessarily exclude incumbents, it is interesting that no evidence that first-time Democratic candidates were less successful than those who had previously run for Congress or local office. Similarly, I found no consistent evidence that women candidates with STEM backgrounds were any less or more effective at winning congressional office than men. In fact, in some modeling strategies, both groups at times appear *more* likely to be successful than their counterparts.

Finally, regarding district-level factors, I found that—contrary to what might be expected—Democrats from more-educated districts were *less* likely to advance beyond the primaries, whereas candidates from districts that more strongly supported Trump were *more* likely to advance. A potential explanation for this phenomenon could be that Democrats strategically only ran in

Table 2

The Effect of House Candidate and District-Level Factors on Electoral Success (Democrats and Non-Incumbents Only)

DV = Advance to General	1	2	3	4
Contribution from 314 PAC	2.95*	2.50*	2.95*	2.50*
	(0.71)	(0.76)	(0.62)	(0.82)
First-Time Candidate	1.87	2.61*	1.87	2.61*
	(0.99)	(0.99)	(1.00)	(1.01)
Female (versus Male)	1.14*	0.75	1.14*	0.75
	(0.55)	(0.51)	(0.52)	(0.46)
District Trump Vote Share	10.21*	-	10.21*	-
	(2.24)	-	(1.98)	
% College Education in District	-	-5.20*	-	-5.20*
		(1.52)		(1.69)
Constant	-11.07*	-2.33*	-11.07*	-2.33*
	(1.89)	(1.15)	(1.69)	(1.13)
$N_{Advanced}$	30	30	30	30
N_{Total}	136	136	136	136
Clustered SEs	District	District	State	State

Notes: *p<0.05, two-tailed. Logistic-regression coefficients presented with robust (i.e., clustered) standard errors are in parentheses. Models are restricted to House races and Democratic candidates only. All models also exclude incumbent candidates (i.e., all incumbents in the dataset won their respective races). Additional information about the measurement of each variable is in table 1. All variables were recoded to range from 0 to 1, including district-level factors (in which observed minima were assigned to a value of zero, maxima were assigned to a value of 1, and all other items were rescaled proportionately to fall somewhere in between.)

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Trump-supporting districts—which somewhat (yet imperfectly) reflects educational attainment—if they are of particularly "high quality" and therefore more likely to win (e.g., Maestas et al. 2006). Future research should systematically unpack STEM candidates' motivations for seeking congressional office.

DISCUSSION

This analysis offers several important conclusions about the STEM candidates who ran for Congress in 2018. Although most candidates did not advance beyond primary elections, those endorsed by the 314 PAC were significantly more likely to do so.

Additionally, although most candidates were men and first-time congressional candidates, neither gender nor (in)experience limited the prospect of electoral success. Consequently, groups promoting STEM candidacies for congressional seats may want to consider finding ways to increase women's representation in these endeavors. These data, of course, are not without limitations. Although I attempt to provide transparent and consistent coding decisions, determining who counts as a STEM candidate is—on some level—subjective. I hope that scholars who consult these data will view them not as the final word but rather as a blueprint for future research. Additionally, my analyses of the factors that shape electoral success are correlational, limiting the inferences that can be drawn. It could be the case, for example, that endorsements from the 314 PAC provide candidates with electoral resources that enable success. However, alternatively, it may be the case that the 314 PAC strategically chooses to expend its resources on candidates that it views as *more likely* to win election.

Efforts to study the strategic motivations of groups such as the 314 PAC over time could disentangle this pattern of results. Likewise, because my data profile STEM candidates at a single time point, continued efforts to track them can contextualize these results relative to past and future election cycles. Limitations notwithstanding, this study suggests that mobilized science in congressional elections has the potential to elect candidates to office who take policy action relevant to members of the scientific community. Of course, whether the candidates who ultimately may win seats in Congress take legislative action to advance pro-science causes is an open question. In the future, scholars might consider linking indicators of legislative performance to the "political scientists" dataset to gain leverage on this important question.

DATA AVAILABILITY STATEMENT

Replication materials can be found on Dataverse at https://doi.org/10.7910/DVN/2ASZ9B. ■

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