The Science of Voting: Coursetaking, Literacy, and Behavior

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Postsecondary science education is often viewed as supporting the nation's economic competitiveness and individual social mobility. Yet science literacy also helps voters be more informed about policy issues involving climate change, global pandemics, vaccines and preventive health, and women's reproductive health. This article analyzes a nationally representative sample of adults from the 2016 U.S. Scientific Literacy Study to show that taking postsecondary science classes positively correlates with science literacy as it relates to climate change. Although climate science literacy was not related to voter turnout in the 2016 primary or general election, it did relate to candidate choice.

Keywords: correlational analysis; factor analysis; higher education; postsecondary education; regression analyses; science education; secondary data analysis; survey research

Science education is often valued for economic reasons; however, it also plays an important role in supporting civic engagement. The National Research Council's (2007) *Taking Science to School* report argued that science proficiency is a prerequisite for "participat[ing] in society as educated citizens" (p. 2). In fact, the twin goals of using science and higher education to pursue economic competitiveness and civic engagement are not mutually exclusive. During the Cold War, the United States funded university research to ensure national security and prepare democratic citizens for the post-World War II international landscape (Loss, 2011).

Baker (2014) argues that researchers overlook the importance of exposure to science in understanding the relationship between higher education and civic engagement. Higher education can inform the ways students think about social problems and the way they exhibit greater "reflexivity stemming from . . . exposure to scientific methods and authoritative knowledge production of the university" (Baker, 2014, p. 250). From this perspective, higher education's relationship with civic engagement may operate through exposure to science; that is, postsecondary science may inform how students understand political issues and choose candidates during elections.

Data and Method

I analyzed existing data from the 2016 U.S. Scientific Literacy Study (SLS). The survey was administered to a nationally representative sample of adults (N = 2,840) and designed to assess "civic scientific literacy," which "refers to the ability of a citizen to find, make sense of, and use information about science or technology to engage in a public discussion of policy choices involving science or technology" (Miller, 2016, p. 2). Specifically, the survey asked: "How many college-level science courses have you taken since you left high school?" Additionally, the SLS asked respondents to self-report whether they voted and which candidate they supported in the 2016 presidential election. Table 1 reports descriptive statistics for variables in the analysis.

The data were used to address three research questions:

Research Question 1: Was there a positive relationship between taking more science courses and climate science literacy?

Research Question 2: Was there a positive relationship between taking more science courses (and climate science literacy) and voter turnout in the 2016 primary and general elections?

Research Question 3: Was there a positive relationship between taking more science courses (and climate science literacy) and candidate choice in the 2016 general election?

To develop a measure of climate science literacy, I used exploratory factor analysis (EFA) with eight SLS survey items addressing climate science knowledge and concern. During EFA,

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Table 1
Descriptive Statistics for Variables Included in Analyses

	Yes		No	
	n	%	*n*	%
Voted in primary election	1,349	62.86%	797	37.14%
Voted in general election	1,745	82.27%	376	17.73%
Voted for Clinton	907	58.33%	648	41.67%
	M		*SE*	
Climate science literacy	0.00		0.02	
Age	50.23		0.37	
Attention to election	3.00		0.02	
Conservativism	5.25		0.06	
Science classes taken (standardized)	0.09		0.02	
	n		%	
Number of science classes (categories)				
0	1,320		47.77%	
1 or 2	543		19.65%	
3 or 4	372		13.46%	
5 or more	528		19.11%	
Educational attainment				
Less than high school	110		4.10%	
High school diploma or equivalency	607		22.63%	
Some college	839		31.28%	
Bachelor's or above	1,126		41.98%	
Sex				
Female	1,550		55.20%	
Male	1,258		44.80%	
Marital status				
Married	1,339		47.69%	
Not married	1,469		52.31%	
Race				
Black	389		13.85%	
Hispanic	389		10.29%	
Other	246		8.76%	
White (non-Hispanic)	1,884		67.09%	
Income				
<$30,000	846		30.13%	
$30,000–$49,999	536		19.09%	
$50,000–$99,999	854		30.41%	
>$100,000	572		20.37%	
Political party				
Democrat	1,051		39.01%	
Republican	662		24.57%	
Independent	649		24.09%	
Other/decline to state	332		12.32%	

three items were below the 0.4 factor loading threshold. Therefore, I proceeded with confirmatory factor analysis using Mplus to develop a five-item measure of climate science literacy. Before using the new climate science literacy variable, I tested for measurement invariance to check that construct could be measured similarly across those who self-reported voting for Hillary Clinton and Donald Trump. The factor held for Clinton and Trump voters. To address my first research question, I regressed the factor scores on number of science classes. To address my second and third research questions, I used climate science literacy scores in logistic regression models predicting voter turnout and candidate choice. Finally, I used path analysis to examine the interrelationships (direct and indirect relationships) among number of science classes, climate science literacy, and candidate

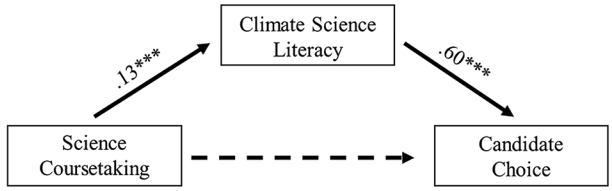

FIGURE 1. *Direct and indirect relationships among science coursetaking, climate science literacy, and candidate choice.*
Note. Figure 1 summarizes findings from path analysis using Stata's sem command with only the three variables above (omitting controls included in other analyses in this article). The parameter estimates are standardized coefficients. $^{***}p < .001$.

choice. Taken together, these approaches allowed me to examine multiple direct and indirect correlational relationships among different variables using secondary data; however, none of the findings should be interpreted as supporting causal inference. See the methodological appendix, available on the journal website.

Results

After controlling for demographic characteristics typically used to analyze voting (listed in Table 1), ordinary least squares regression showed that taking five or more college-level science courses correlated with a 0.20 *SD* ($p < .001$) increase in *climate science literacy* (see Table A5, available on the journal website) but did not relate to candidate choice. The climate science literacy measure was not statistically significantly related to voter turnout. A 1 *SD* increase in climate science literacy related to between 3.32 and 3.34 times higher odds of voting for Clinton than Trump (see Tables A4 and A5, available on the journal website). Path analysis indicated that number of science courses indirectly correlated with candidate choice through climate science literacy. See Figure 1.

Discussion

Federal policy has long sought to leverage higher education to support scientific competitiveness and to give "citizens needed educational training to help make democracy safe" (Loss, 2011, p. 135). In this article, I examined how science coursetaking may serve both purposes. Relative to not taking any postsecondary science classes, taking five or more science classes after high school (what would typically go beyond general education course requirements) was found to positively relate with a novel measure of climate science literacy. After controlling for race, gender, income, and political orientations, a 1 *SD* increase in climate science literacy related to around 230% higher odds of voting for Hillary Clinton in 2016. Although taking more science classes did not directly correlate with voter turnout or candidate choice, path analysis suggested science coursetaking indirectly related to candidate choice through its direct relationship with climate science literacy.

However, most of the sample did not complete five or more science classes or have climate science literacy scores that were 1 *SD* above the mean, so only a small percentage of the sample would show the full influence of climate science literacy on candidate choice. Because of secret ballots, candidate choice is difficult to measure, and social desirability bias may have led respondents to hide their support for President Trump (e.g., Kennedy et al., 2018). Future work should examine science literacy along other domains and incorporate other college experiences and contexts.

After the Second World War, the United States recognized that supporting higher education and science was integral to promoting civic engagement and democracy (Loss, 2011). Prior work focused on supporting civic engagement through fields such as political science (Fernandez, 2021). However, this study reminds us that federal support for broadening participation in science coursetaking may be an important part of preparing informed citizens to participate in democratic elections.

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