Contextual priming: Where people vote affects how they vote

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American voters are assigned to vote at a particular polling location (e.g., a church, school, etc.). We show these assigned polling locations can influence how people vote. Analysis of a recent general election demonstrates that people who were assigned to vote in schools were more likely to support a school funding initiative. This effect persisted even when controlling for voters' political views, demographics, and unobservable characteristics of individuals living near schools. A follow-up experiment using random assignment suggests that priming underlies these effects, and that they can occur outside of conscious awareness. These findings underscore the subtle power of situational context to shape important real-world decisions.

voting | psychology | automaticity | decision making | political science

Voting decisions are among the most important choices people make. They determine who governs the country, which issues receive attention, and how resources are allocated. Most rational theories of voting assume people have stable preferences that determine the votes they cast at the ballot box. But could a seemingly innocuous factor, the type of polling location where people happen to be assigned to vote, actually influence how voters cast their ballots?

When people make choices, they do so in particular environmental contexts. People may enroll in a health plan while at work or at home, select a potential mate while at a bar or park, and cast their ballot while at a church or school. Researchers have long recognized the power of the situation (1) and have demonstrated many blatant and powerful ways situations can influence behavior (2, 3). For example, even caring and empathic people may commit acts of cruelty if the situation constrains them to be obedient (4). More recently, researchers have discovered a much more subtle means of situational influence. Stimuli in the environment have been shown to prime or activate content in memory, making related constructs more accessible and doing so even outside conscious awareness (e.g., ref. 5).

Building on this work, we show that subtle environmental cues can have a significant influence on consequential real-world decisions. Specifically, we show that the type of polling location (e.g., church, school, etc.) where people happen to be assigned to vote in a U.S. general election influences how they cast their ballots.

Campaigns spend millions of dollars each election trying to shift even a percentage of the electorate to their side, but is it possible that the type of place where people are assigned to vote could have a similar effect on vote choice? There are many reasons why the answer to this question should be "no." Campaigns not only persuade, but they also disseminate information, and rational approaches to decision making would suggest that such available political information should determine votes. Similarly, many perspectives suggest that people have stable preferences that should be insensitive to irrelevant environmental features.

From a psychological perspective, however, the environmental stimuli associated with different polling locations could potentially affect vote choice for a variety of reasons. Voting at a school, for instance, could activate school-relevant norms (e.g., that one should support education; ref. 6) or relevant aspects of self-concept (e.g., as one who cares about children; ref. 7). Once activated, these concepts could then influence support for related initiatives. Voting at a school, for example, could increase support for school spending through such automatic construct activation.

To test this possibility, we analyzed the results of a recent general election (Study 1) and conducted a controlled voting experiment (Study 2). This combination allows us to demonstrate the power of contextual priming to influence real voting behavior while also underscoring the causal role of context in vote choice and examining the mechanism underlying these effects.

Results

Study 1: Arizona 2000 General Election. We analyzed precinct-level election results from the 2000 general election for the state of Arizona. This election included a ballot initiative (Proposition 301) that proposed raising the state sales tax from 5.0% to 5.6% to increase education spending. We predicted that voting in a school, as opposed to another type of polling location, would increase support for this initiative.

Results. People who voted at schools were more likely to support the education funding initiative. Although 53.99% of people who voted at other locations supported the initiative, this number increased to 56.02% for people who voted at schools. However, because people who vote at different polling locations could differ in a number of ways besides the place they are assigned to vote (e.g., existing political preferences), we used a regression framework to estimate the influence of polling location on voting while controlling for these other potential factors.

One possibility is that regional differences in political preferences could be correlated with both initiative support and polling location assignment. Liberal areas, for example, could be more likely to both support school funding and use schools as polling locations. To address this possibility, we controlled for regional differences in political preferences using votes on other initiatives and for president as well as three-digit zip-code fixed effects. Even after controlling for these factors, those assigned to vote in schools were still more likely to support the school spending initiative (Table 1, first row, first column).

Another possibility is that the effect could be due to unobserved heterogeneity among voters assigned to cast their ballots at different locations. People are assigned to vote near where they live, for example, and people who live near (and hence are more likely to vote at) schools could have different preferences toward education spending than people who live further away.

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Table 1. Additional percentage likelihood of supporting education initiative (Proposition 301) when voting in a school

	Comparison precincts			
	All nonschools	School within 0.20 miles	School within 0.40 miles	Distance polynomial
Baseline	0.845***	0.583**	0.556***	0.427*
	(0.184)	(0.277)	(0.209)	(0.222)
Include demographics	0.788***	0.560**	0.529**	0.424*
	(0.185)	(0.276)	(0.209)	(0.223)
Exclude zip-code dummies	0.964***	0.628**	0.480**	0.423*
	(0.206)	(0.310)	(0.234)	(0.248)
Linear regression	0.859***	0.599**	0.565***	0.449**
	(0.190)	(0.260)	(0.203)	(0.224)

The first column, first row, indicates that, holding fixed revealed preferences on other initiatives, people who voted in schools were 0.845 percentage points more likely to support the school-funding initiatives. Weighted aggregate marginal effects reported for grouped logit regressions. Distance polynomial specification uses all non-schools as comparison precincts. Standard errors in parentheses, $*P < 0.10$, $**$, $P < 0.05$, $***$, $P < 0.01$. Demographic information includes percentage white, percentage population 5–17 and 65+, percentage owner-occupied properties, and median household income.

We addressed this possibility in three ways. First, we took advantage of the quasi-experiment that some voters who live near schools are assigned to vote in schools, whereas others who live equally near are assigned to vote in other types of polling locations. Using zip-code information, we calculated the distance between each polling location and the nearest school and constructed two sets of comparison precincts (within 0.2 and 0.4 miles of a school). Voters in these comparison precincts live in similar proximity to a school as voters assigned to cast ballots in schools, and thus using these groups as comparisons isolates the effect of voting in a school itself from the effect of preferences of voters who live near schools. Second, we used a cubic polynomial specification to directly control for the proximity of a polling location to a school. This ensures that our findings using the previous specification are not driven by individuals in our comparison groups living slightly further away from schools on average. Third, we matched polling locations with area demographics. Including these factors in the regression allows us to reasonably ensure that the demographic composition of the voters in schools was not driving the results.

Even with these additional controls, the effect of polling location on voting persisted (Table 1). People were more likely to support Proposition 301 if they were assigned to vote in schools as opposed to nonschool locations that had schools nearby (row 1, columns 2 and 3) or controlling for proximity of a polling location to a school (row 1, column 4). The estimates also remained significant when demographic data were included as controls (row 2).

To further test whether differences in the preferences of school vs. nonschool voters could be driving our results, we examined whether voting in schools influenced voting on other initiatives. If our model were inadequately accounting for existing preference differences among people assigned to vote in schools vs. other locations, there should be significant effects of voting in a school on other initiatives. There were not. There was no consistent effect of voting in schools on the other initiatives across our comparison precincts or when census block demographics were included as control variables. These results demonstrate that our model accounts for preference heterogeneity between school and nonschool polling locations.

The effect of polling location on vote choice was also robust to a variety of alternative specifications. We ran the regressions excluding three-digit zip-code fixed effects (row 3) and used alternative estimation strategies (linear regression) to test the robustness of our results to functional form assumptions (row 4). Across all specifications, voters in schools were still more likely to support Proposition 301.

Ancillary analyses also cast doubt on the possibility that the effect was a result of informational cues provided by the polling locations. Voting at poorly maintained schools, for example, could lead voters to consciously re-evaluate the need for school funding, which could lead them to increase their support for the initiative. To examine this possibility, we acquired data on the age and condition of each school in our sample and tested whether the effect of voting in a school was greater in older compared with newer schools. Contrary to what one would expect from a consciously driven school effect based on information, there was no significant difference in initiative support among people who voted in older vs. newer schools.

The results also do not seem to be due to differential turnout in school polling locations. Although one could argue that certain types of people might be more likely to turn out at schools vs. other types of polling locations, that we did not find that any consistent effects of polling location on the other initiatives cast doubt on this possibility. Further, additional data we collected regarding turnout suggest that the percentage of registered voters who turned out was similar among school polling locations (71.4%) and nonschool polling locations located near schools (e.g., 0.2 miles, 71.9%).

Study 2: Voting Experiment. To strengthen our suggestion that contextual priming can have a causal effect on vote choice, we manipulated exposure to different voting environments. In the context of rating a variety of images, participants in different experimental conditions were randomly assigned to be exposed to either images of schools (e.g., lockers or classrooms, school prime condition) or control locations (e.g., office buildings, control condition). Then, in the context of an ostensibly unrelated study, participants voted on the target education initiative that proposed a tax increase to fund public schools. We also collected additional measures (i.e., participants' attitudes toward taxes, how important they thought it was to fund public schools, and whether they were a parent) 2 weeks before the main study, which allowed us to examine the mechanism behind any observed effects.

Results. As we anticipated, participants were more likely to support the school funding initiative if they had been exposed to school voting environments ($M = 63.6\%$) as opposed to control environments ($M = 56.3\%$; $B = 0.86$, $P = 0.05$). In addition, and not surprisingly, control participants were more likely to support the

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school funding initiative if they were parents ($B = 0.52$, $P = 0.06$), had positive attitudes toward taxes ($B = 0.34$, $P < 0.001$), or thought it was important to fund public schools ($B = 0.33$, $P = 0.04$).

Additional analyses provide deeper insight into the mechanism behind this effect. An attitude activation account (8) would suggest that exposure to school-related cues should activate existing school funding attitudes, and thus these attitudes should be more predictive of voting among participants in the school prime condition. This, however, was not the case. The effect of school funding attitudes did not differ among people primed with school vs. control images ($B = 0.27$, $P > 0.45$).

Instead, the results appear consistent with a priming account. Although attitudes toward taxes and parental status influenced voting in predictable ways in the control condition, these factors had significantly weaker (tax attitudes × image $B = -0.34$, $P = 0.05$; parental status × image $B = 0.52$, $P = 0.06$), and nonsignificant links to voting behavior when people were primed with schools (tax attitudes: $B = 0.04$, $P > 0.77$; parental status: $B = -4.17$, $P > 0.36$). This indicates that school cues led participants with differential baseline propensity to support the initiative to cast their votes similarly (i.e., to support the initiative). Further, a funneled debriefing (9) indicated that no one thought that exposure to school images increased their support for Proposition 301, suggesting environmental stimuli can influence voting choice outside of awareness.[‖]

Discussion

These results illustrate the dramatic and unexpected influence that the environment can have on behavior. Seemingly trivial environmental contexts were found to have significant effects on consequential real-world decision making. The type of polling location where people were assigned to vote influenced how they ended up casting their ballot. The results were robust across a variety of specifications and persisted while controlling for a host of potential alternative explanations. A controlled experiment with random assignment further supported our causal claim and indicated that these effects can occur outside of conscious awareness.

Priming research has primarily been conducted in carefully controlled laboratory settings, but this paper extends this literature to demonstrate how priming plays out in complex, messy real-world environments (10, 11). Everyday environments contain numerous cues that can activate various conflicting constructs in memory. Further, individual cues can activate different content for different individuals (12). The fact that contextual primes can have measurable impacts on behavior despite these complexities underscores the importance of construct activation in directing real world behavior.

These complexities also deserve consideration when evaluating the size of polling place effects. Although the magnitude of the Arizona general election effects is smaller than some other documented influences on voting (e.g., ballot order; ref. 13), this does not imply that the influence of automatic behavior processes on real-world behavior is tiny. If anything, the simplicity of our approach (i.e., testing one main effect of location on behavior) probably underestimates the actual magnitude of nonconscious influences. If one could accurately measure the exact environmental cues seen by each individual (e.g., whether they saw children) and account for the exact mental constructs that they activate for that person (e.g., whether children are linked to school-relevant norms in their mind), one would likely conclude that their impact on real-world behavior is considerably larger.

Our findings show that voting in schools increases support for a school-funding initiative, but more research is necessary to determine whether these effects extend to other polling locations and ballot measures. Could voting in a church, for example, influence support for gay marriage or stem cell research? Could these effects extend to preferences for candidates strongly associated with educational or religious issues? Polling location effects should be more likely when locations strongly activate fewer constructs which are more directly linked to particular issues or candidates, but the exact instances when such effects will occur remain to be seen. Although our results indicate that polling locations can influence voting behavior, further research is necessary to determine when they will do so, and how large an effect they may have.

The results also have important policy implications. The government currently goes to great lengths to eliminate undue influence on voting by prohibiting campaigning, posting signage or using sound-amplification devices within a certain distance of polling locations. The U.S. Supreme Court has upheld such restrictions of free speech on the grounds that government has a compelling interest to secure the right to vote freely and effectively.[††] These data suggest that parties interested in avoiding undue influence may also want to attend to a more inconspicuous influence—the polling environment itself. If certain polling locations are clearly related to initiatives or candidates, administrators could use more neutral locations (if equally convenient and accessible) to minimize bias.

This does not mean that electoral officials should rush to eliminate schools as polling places, however, particularly because it is unclear that any polling location is context-free. In addition, because the observed effects are smaller than some other potential voting influences (e.g., turnout), one must weigh the benefits of changes to the current system against these other factors. If potentially biasing locations are used, however, one could take steps to minimize their influence. For example, having people vote in a generic multipurpose room rather than a school hallway filled with children or a church room containing religious images.

In summary, these findings illustrate that consequential real-world decisions can be influenced by subtle environmental features even outside awareness. Although such influences can be interpreted in a negative light, they also play positive roles, promoting goal pursuit (14), for example, and enhancing social coordination through shared actions (15). This research provides an initial look at how environmental inputs influence important decisions with significant social and economic consequences. In doing so, it suggests these generally adaptive tendencies to nonconsciously adapt to the environment can lead to important and surprising outcomes.

Methods

Study 1. ***Data.*** We acquired polling location data from all 15 counties in Arizona and, for each of 2,027 precincts, coded the type of polling location used. Churches (40% of all votes cast), schools (26%), community centers (10%), and government buildings (4%) were the most common locations. We also obtained precinct-level vote outcomes from the Arizona Secretary of State's web site. These data included votes for president and statewide initiatives.[‡‡] We also used census block information to match polling locations with demographic data from the 2000 Census for the census block in which the polling location is located.[§§]

To identify nonschool polling locations that resided near schools, we obtained addresses for all schools in Arizona from Arizona's Department of Education. Using a U.S. Postal Service web site, we attempted to find nine-digit

[‖]Ruling out an informational account, ancillary data show that exposure to school-related images did not affect participants' perception of school conditions ($F < 0.05$, $P > 0.80$) or how well schools use their tax dollars ($F < 0.50$, $P > 0.55$).

[††]*Burson v Freeman*, 504 US 191 (1992).

[‡‡]See www.azsos.gov/election/2000/Info/pubpamphlet/english/contents.htm for the full text of the initiatives.

[§§]Precinct-level data were not available. Census block boundaries are not drawn identically to polling precincts, so census demographics do not perfectly match a precinct's voters. They do, however, provide a good indicator of similarity between the areas surrounding different polling places.

zip codes for each school and polling place in the state of Arizona. Because not all precincts reside in areas with nine-digit zip codes, this information could not be obtained for all polling places. We then matched zip codes to a longitude, latitude, and U.S. census block using software from Geolytics. We used the corresponding coordinates to calculate an approximate distance from each polling place to the nearest school, which we used in our analyses involving comparison groups and our cubic polynomial analysis. Our final matched sample included 1,617 precincts.[¶¶]

Analysis. We used grouped logit specifications (16) to examine whether the differences between vote choice in school polling locations and near-school polling locations persist after controlling for other political preferences. The grouped logit is a weighted least-squares estimator that accounts for two features of our data. First, the percentage of voters supporting Proposition 301 is bounded between zero and one, and second, the number of voters in each precinct is variable.

$$\ln\left(\frac{\%\ \text{Yes Prop } 301_{j,z}}{1-\%\ \text{Yes Prop } 301_{j,z}}\right) = \alpha + \lambda \text{School}_j + \delta 1(\text{School Distance}_j < \text{X}) + \sum_{k=1}^{N} \beta_k\ \%\ \text{Yes Prop}\ k_j + \sum_{k=1}^{N} \theta_k\ \%\ \text{Yes Prop}\ k_j\ *\ 1(\text{School Distance}_j < \text{X}) + \gamma_z + \nu_{j,z}. \quad [1]$$

We used two different methods to control for the proximity of polling locations to schools. Eq. **1** compares voting behavior on Proposition 301 in school polling locations with those in comparison precincts (e.g., $X = 0.2$ or $X = 0.4$ miles). We included three-digit zip-code fixed effects to account for any regional variation in initiative support. We also included dummy variables School_j, equal to one if voters in precinct j voted in a school, and $1(\text{School Distance}_j < X)$, an indicator equal to one if precinct j's polling location is located within X miles of a school. In this specification, λ captures the treatment effect of voting at a school relative to a polling location in the comparison group

$$\ln\left(\frac{\%\ \text{Yes Prop } 301_{j,z}}{1-\%\ \text{Yes Prop } 301_{j,z}}\right) = \alpha + \lambda \text{School}_j + \delta_1 \text{School Distance}_j + \delta_2 \text{School Distance}_j^2 + \delta_3 \text{School Distance}_j^3 + \sum_{k=1}^{N} \beta_k\ \%\ \text{Yes Prop}\ k_j + \gamma_z + \nu_{j,s}. \quad [2]$$

We alternatively used Eq. **2** to estimate the effect of voting in a school. Eq. **2** uses a distance polynomial function to control for the effect of a polling location being near to a school. Again, λ captures the treatment effect of voting at a school relative to a polling location in the comparison group. Estimates of λ from regressions of Eqs. **1** and **2** are reported in Table 1.

Effects on other initiatives. To test whether our control adequately accounted for existing differences in voter preferences, we also estimated Eq. **1** using each of the other 13 initiatives and Al Gore's two-party vote share as the dependent variables. These results further demonstrate that our model accounts for the preference heterogeneity between school and nonschool polling locations.

Turnout analysis. Although most counties had not retained their voter registration data, we were able to obtain the number of registered voters by precinct for the largest county in Arizona (Maricopa County). Voter turnout did not differ between school and polling locations located near schools, and we found similar effects in an experimental context where turnout cannot possibly play a role.

Study 2. ***Participants.*** Three-hundred and twenty-seven people from a cross-national United States sample completed a two-part study online in exchange for the opportunity to win a $25 gift certificate.

Procedures. Two weeks before the main study, participants completed the attitude and demographic measures. This information was collected before the experiment to avoid the possibility that participants' reports could be influenced by exposure to school cues. In addition to completing filler items (included to mask the purpose of the study), participants reported how favorable their attitudes were toward taxes, how important they thought it was to fund public schools, and whether they were a parent.

Two weeks later, participants completed two ostensibly unrelated studies as part of a larger group of experiments. In the first study, they were given the cover story that the experimenters were investigating personality and brightness perception. After completing several unrelated personality measures, they viewed a number of images and rated how bright each image appeared. Participants were randomly assigned to either a target or control condition. Everyone viewed the same filler images (e.g., generic buildings) to mask the purpose of the study, but the content of the other images varied by condition. In the target (school) condition, the remaining images were taken from well maintained schools (e.g., lockers). In the control conditions, the images were either from generic buildings or churches (because churches are the main polling locations used). As expected, vote choice did not differ between these two control conditions, and they were collapsed for further analyses·

Participants then completed a second, seemingly separate study on voting. After responding to filler items, they read a description of the education initiative, which was taken directly from the wording on the Arizona ballot. They then indicated how they would vote. Finally, to assess whether the effects of school cues could be due to information contained in the images themselves, participants rated their perception of the condition of schools today, as well as their perception of how well schools use tax dollars.

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[¶¶]The demographic data illustrate that the comparison groups provided a closer demographic fit to school polling locations [see supporting information (SI) *Text* and Table S1]. Further, using the distance polynomial provides even greater assurance that any differences due to polling location are not driven by people in our comparison groups living slightly further away from schools on average.

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