Chapter 12

Technology for Public Participation in Redistricting

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Redistricting is among the least transparent processes in democratic governance. Often, politicians shape districts behind closed doors with little or no input from the public.¹ The resulting lines embody the political goals of politicians and not the public interest, as much as the goals of the two groups do not overlap.² Politicians use redistricting to realign their constituencies to further their careers, secure legislative majorities, and affect racial representation. They do so by splitting communities, not drawing politically fair plans nor drawing competitive districts. As the reform saw goes, in redistricting, politicians select voters rather than voters electing politicians.

The public is blissfully unaware of the importance of redistricting to the functioning of democracy.³ A key reason is that in the past expensive redistricting tools have been available only to well-funded organizations. Sophisticated geographic information systems manipulate complex geospatial data to draw districts that satisfy often-complex federal and state legal requirements. Lacking the tools to draw alternative redistricting plans, the public and the media are reactive to lines drawn by politicians. So, the lack of tools severely limits our ability to determine whether there is an alternative way to approach redistricting that may be better on the goals not within the choice set of politicians.

The authors seek to change this informational deficit by enabling the public to draw redistricting plans. Leveraging recent technological innovations, we have created open-source, easy-to-use redistricting software that is accessible to users through their web browsers. We have begun deploying the software to engage the public in redistricting, with our first success in educating students, the public, and policymakers experienced in Virginia through a redistricting competition. Here, we describe the potential for technology to
increase participation in redistricting, our project, the Virginia experience, and what we have learned from these endeavors.

**REDISTRICTING AND PARTICIPATION**

**IN ADVANCED DEMOCRACIES**

A number of advanced democracies, in addition to the United States, use single-member districts to select representatives to national legislatures. Of these, Canada, Great Britain, Australia, New Zealand, all have extensive records of employing bureaucratic commissions to adjust their boundary lines. The redistricting process in these countries is largely recognized as being relatively nonpartisan and predominantly uncontroversial.

Each of these countries recognizes locally-defined communities of interest and allows public review and commentary of proposed districting plans, to varying degrees. New Zealand and Australia incorporate public comments and commentary only after an initial plan is drafted—and they provide a relatively short period of time for objection and commentary. In contrast, the UK exemplifies a very participative system, in which public input and local communities of interest are an integral part of boundary creation. The UK boundary commissioners systematically seek community input through local hearings and have an extensive process for seeking out locally defined communities of interest, and for publishing and integrating commentary on provisional recommendations. Canada’s process appears to be in the middle of the spectrum, in terms of seeking and incorporating public input: Canadian commissions include academics appointed from the community and do incorporate community input, but the process for incorporating citizen input is less formalized and extensive than in the UK.

These countries managed redistricting in a nonpartisan, transparent, and participative manner long before the advent of GIS or web technology. They demonstrate that the use of advanced information technology is not a necessary condition for participative redistricting. Nevertheless, advances in information technology may create opportunities. For example, Mexico succeeded in a smooth transition both to democracy to nonpartisan redistricting recently, in 1996-2000. The creation of the nonpartisan branch of government IFE was critical to both successes. IFE identifies GIS redistricting technology and automated districting technology as critical to the ability to maintain transparency and non-partisanship in redistricting. And more generally, the potential for redistricting technology to increase equity and transparency internationally is increasingly recognized.
OPPORTUNITIES FOR INCREASED TRANSPARENCY AND PARTICIPATION

The United States is notably different from other countries in that there is no single national authority responsible for drawing districts. The authority resides in the 50 states, which use a patchwork of institutions to conduct redistricting. This makes systematically understanding, managing, and reforming the redistricting process more challenging than in countries where the electoral administration is centralized. There are reasons to believe that advances in technology offer particularly significant opportunities for increasing transparency and participation in redistricting within the United States, because of this decentralization.

Despite the distributed oversight of U.S. electoral administration, GIS technology can take advantage of commonalities in data and problem structure. Although the timetable, processes, criteria, and electoral data used in redistricting vary from state to state, all congressional and legislative redistricting plans in the United States are based on the same set of nationally produced geographic and demographic census block data. All plans require that these blocks be partitioned into roughly equal geographic districts. Once a GIS tool is developed that enables users to easily create districts for a particular state from census data, it can also be used to create plans for other states.

All congressional districts and almost all legislative districts are required by law to elect a single member. The legal criteria required in most states are drawn from a small set encompassing criteria dealing with contiguity (including single- and multi-point and the treatment of bodies of water); criteria dealing with geographic compactness (usually based on a function of the area and perimeter and/or boundary polygon of the district); criteria dealing with majority-minority districts (usually based on aggregated measures of voting-age population); criteria dealing with boundary integrity (nesting and/or splitting of county, municipality, or higher-level electoral district boundaries); and criteria dealing with electoral outcomes (usually based on a function of the projected two-party vote share within a district or across a plan). Thus, once a GIS tool is made available to evaluate a core generic set of redistricting criteria, it can easily be configured to reflect the particular legal requirements in most states.

Web-enabled mapping technologies are particularly well suited to redistricting in the United States because they provide a familiar interface, are relatively scalable, and can easily provide widespread access. Web mapping can be scaled to support daily use by thousands of mapmakers (and millions of simultaneous
viewers), can be readily accessed across the state or nation, and can be made available around the clock. This contrasts with desktop mapping applications offered through state redistricting offices, which have been typically relegated to a single redistricting office or a small number of fixed sites (posing a particular challenge for the public in large western states), often require appointments to reserve a system for use, and are available only on limited days and hours.\textsuperscript{13}

TRENDS IN REDISTRICTING TECHNOLOGY IN THE UNITED STATES

Reviewing the modern use of redistricting technology suggests that technology has evolved in each round of redistricting, in ways that have lowered costs and reduced barriers to public access. In this section, we summarize our previous explorations of the development of GIS redistricting systems.\textsuperscript{14}

The use of information technology during in the 1970 and 1980 rounds of redistricting were largely limited to experiments and academic exercises on universities’ mainframe computers (with the notable exception of Iowa, which developed redistricting software in the late 1960s and used redistricting software in the 1970s and 80s to create viable plans). By the 1990s, redistricting professionals widely adopted GIS technology developed through GIS advances that occurred during the late 1980s. Almost all states used GIS to create their 1990s redistricting plans, although these systems were still expensive and either custom-made or intensively customized.

The 2000 round of redistricting marked two technological developments. The first development was the increasing commercialization and standardization (“shrink wrapping”) of software in general. For redistricting, the commodification and standardization of redistricting software led to a small number of off-the-shelf packages being used widely across the country, with only few states opting to develop customized systems. This advance decreased the technology user costs associated with redistricting, as the systems’ development costs could be spread among a larger user base. The second major development was the creation of the World Wide Web (WWW). Eighteen states took advantage of this new technology to distribute redistricting information, such as maps and reports, effectively making the process more transparent.

The remainder of the 2000 decade also marked two software technology evolutions. The first was highly interactive web applications (or Web 2.0) and the second was the explosion of open source software development and open licensing of content. Web 2.0 has made it possible to create online interactive mapping services, like Google maps, that are available to hundreds of millions of non-expert users. The diversity and quality of open source and open content
have made it possible to build increasingly complex systems, in a transparent way, at a small fraction of the cost of developing a system from scratch.

These two technology evolutions are now showing their influence on this current 2010 round of redistricting. In particular a number of technologies have become available recently for web-based redistricting:

- “Dave’s Redistricting App” is the effort of an individual software engineer, Dave Bradlee. Released in 2009, it is the first widely available redistricting system able to run in a web browser. It is closed source, but is free and has received considerable attention and has been frequently downloaded. However, although it enables the public to create simplified redistricting plans in a number of states, it is unable to use census blocks and provides only population counts and rudimentary contiguity checking, making it difficult—if not impossible—to produce legal redistricting plans.

- Commercial vendors ESRI and Caliper (makers of Maptitude) have each created online versions of their redistricting software. As these companies seek to make a profit, their systems are closed source and proprietary. Although pricing is not stated on these companies’ websites, these programs are rumored to cost tens of thousands of dollars. Thus, these programs are not practical for the public to independently purchase, but can be purchased by well-financed governments or other organizations to enable the public to draw maps through their web browsers.

- The Florida state House has developed “My District Builder,” an online redistricting tool for Florida districts. The Florida application is a largely open source system built on Microsoft’s Silverlight, which is closed source. Much of the data are cached automatically on the user’s web browser client, but the web-hosting server requires an expensive Microsoft license to operate. Florida data and criteria are currently hard-wired into the software, so it cannot easily be deployed elsewhere.

- The Advancement Project, a nonprofit organization in California, has created an online mapping tool for California. The system is closed source, based on the “Healthy Cities” application that enables mapping of community resources. The application is designed to enable a user to create a single district or community map, not a statewide redistricting plan composed of more than one district.

- DistrictBuilder is produced by the Public Mapping Project, under the direction of the authors of this chapter, with the guidance of noted redistricting experts and members of advocacy groups recognized in the chapter’s acknowledgements. This open source software enables redistricting at the block level. It has added district scoring functionality to help users draw legal redistricting plans for their state or locality.
These advances in technology have led to an unprecedented number of online public and educational redistricting initiatives (as of May 2011), including the following:

- State and local governments have initiated public online redistricting sites for Sacramento, California; Contra Costa County, California; Los Angeles County, California; Florida, Idaho and Utah. ESRI’s software powers the Sacramento, and L.A. sites; Maptitude powers Idaho’s sites; Florida has created their in-house application; and our own DistrictBuilder powers the Contra Costa County site.\(^\text{20}\)

- Public interest groups and the media have sponsored unofficial public redistricting sites capable of creating legal plans in Michigan, Arizona, and California. Michigan’s site, a part of the Michigan’s Citizen’s Redistricting Competition 2011 (a project of the Michigan Center for Election Law and Administration in partnership with the Michigan Redistricting Collaborative) is powered by DistrictBuilder, as is the Arizona site, sponsored by the Arizona Competitive Districts Coalition (these sites are illustrated in Figure 12.1).\(^\text{21}\)

- For educational use by students and teachers, and with the support of the AWS in Education program, we have been able to field DistrictBuilder sites for Rhode Island, Oregon, South Carolina, and Virginia (thus far).
DistrictBuilder was also used to support the first online redistricting competition to yield legal plans, which is described in detail later in this chapter.

A FRAMEWORK FOR PARTICIPATION IN REDISTRICTING

“It is an odd concept to attribute to a piece of software the potential to enhance or limit public participation in policymaking, empower or marginalize community members to improve their lives, counter or enable agendas of the powerful, and advance or diminish democratic principles. However, that is exactly what has happened with geographic information systems . . .” as Sieber writes in her well-cited review of work in participatory GIS. Although the use of GIS to enable participative redistricting is just beginning, and its impact has yet to be determined, Sieber’s review provides a useful framework for thinking about types of participation and factors critical to participation using GIS.

Sieber characterizes participation and communication in the policymaking process as a ladder of increasing involvement in and influence on the creation of policy. In this characterization, degree of participation ranges from tokenism to collaboration to partial control. Public engagement with redistricting similarly falls along a continuum, and from our experience, finer degrees of participation can be observed. At one end of the spectrum are receptive interest and a willingness to learn about the redistricting process. Although far from active participation, increasing interest is important because, currently, members of the U.S. public typically know little about redistricting. Farther along the participatory spectrum, active engagement can involve information seeking and progress to active commentary on both the redistricting process and specific redistricting proposals. Farther still along the participatory spectrum are local commission-based that incorporate public input extensively into the creation of boundaries.

Sieber points out that understanding GIS participation also requires consideration of system implementation and sustainability; spatial scale and extent; stakeholders and actors; learning curve and ease of use for the technology; accessibility and appropriateness of data; representation of knowledge; and measurement and evaluation. The Public Mapping Project, conceived by the authors, addresses many of these issues as applied to redistricting, by providing the following:

- A system that is implementable at low cost. The Public Mapping project software is based on free components and is designed to be deployed eas-
ily using cloud services, which eliminates the high fixed costs of typical server infrastructure.

- A development model that is sustainable. The Public Mapping project releases both data and software under open licenses, which allows others to contribute to the development of the system and to continue to extend.
- The ability for anyone to redistrict at the state scale. This is the largest scale used for political districts in the United States. The project also works at smaller scales, such as for county districts.
- Support for use by a variety of different actors, including governments, individual members of the public, students, and good-government groups. Individuals can run the software themselves, privately or access one of the many public redistricting-servers enabled by the project and its partners. Students can access hosted educational servers, through a generous grant by the Amazon AWS in Education program. And the software is designed to make it easy for good-government groups to set up public redistricting servers and competitions, using their own data and redistricting criteria.
- A shallow learning curve for the complex task of redistricting, as much as that is possible. As a single-purpose application rather than a general GIS system, the DistrictBuilder software created by the project is designed to make the process of redistricting as simple as possible. It is also designed to enable non-expert end users to create verifiably legal plans: Plans can be created using simple familiar user interface metaphors like “paint,” “drag and drop,” or “cut and paste.” Thematic maps of district compliance with legal criteria provide instant visual feedback that helps users to create legal plans. And an easy-to-use but comprehensive verification system allows users to check that plans they have created meet all legal criteria.
- A means to represent local knowledge about spatial communities. The new version of the DistrictBuilder software, currently in development, allows users to add and share additional geographic layers that represent local communities, or important natural or administrative boundaries. This provides a means for local knowledge to be incorporated into the redistricting process.
- Building blocks for measurement and evaluation. Although the project does not yet includes a funded formal evaluation component, the data produced by the project provide building blocks for measurement and evaluation of public districting. By enabling the widespread public sharing of plans in machine-understandable form, the project is creating a body of redistricting plans for future evaluation.
Redistricting software cannot function without data. Basic principles of transparency require that all “data necessary to create legal redistricting plans and define community boundaries must be publicly available, under a license allowing reuse of these data for non-commercial purposes.” The Census Bureau releases GIS boundaries and population data that are needed to meet most states’ minimal legal requirements. However, access to appropriate election data to assess potential political consequences of a redistricting plan remains a significant challenge. The distributed and inconsistent nature of U.S. election administration continues to pose a significant operational challenge for public access to electoral data needed for redistricting. In many cases it has been difficult or impossible to obtain election data that can be reliably matched to census blocks and are detailed enough to be useful for estimating the partisan consequences of a particular districting plan. And where such data can be obtained at all the geographic matching, and normalization of election statistics requires a significant amount of effort and expertise.

Although the project is not currently funded to perform election data collection and integration with census data, we are, where possible, distributing versions of the DistrictBuilder software that have all available data pre-loaded (and publicly licensed) for a particular state. The number of states we are able to support in this manner is growing, but is currently limited by the availability of appropriate electoral data.

AN OVERVIEW OF THE PUBLIC MAPPING PROJECT

The Public Mapping Project was conceived by the authors in the course of developing the only open-source, multi-criteria automated redistricting software. Known as BARD, this is an approved module for the R statistical programming language. The goal of that project was to develop a package for scholarly evaluation of redistricting plans and for semi-automated exploration redistricting alternatives, which we had limited success with. Consistent with previous attempts at automating redistricting, we found that automatically producing redistricting plans remains an extremely complex graph-partitioning problem and that the number of geographic units needed for legal U.S. plans limited the possibilities for automated exploration.

The project may have produced software useful for research purposes but not necessarily useful for public creation of districts. However, also similar to previous attempts at automated redistricting, we found that we could build a rudimentary user interface that allowed users to draw their own redistricting plans by hand. We presented our software at an American Mathematical
Association panel on the topic of redistricting. It was there that we met Daniel Goroff who, through his role as a program officer at the Sloan Foundation, graciously funded a pilot study to create a more robust web-based user interface to our redistricting software. The pilot study was a success, and further funds (to date) from the Sloan Foundation; Joyce Foundation; Amazon Corporation; the local government of Contra Costa County, California; and private individual donors in Arizona and Virginia enabled us to successfully implement and deploy a fully functional version of the software that has been used to draw legal redistricting plans.

At the outset of the project, we convened an advisory board to develop guiding principles for the software development. The advisory board members included key redistricting experts at Common Cause and the League of Women Voters, experienced redistricting consultants, and bipartisan representation from elected officials. Thomas Mann at the Brookings Institution and Norman Ornstein at the American Enterprise Institute directed the advisory board.

The advisory board issued principles for transparency and public participation in redistricting. The advisers identified technology and data complexity as key impediments to greater transparency and public participation and directed how to create redistricting software that itself would be transparent and engage the public. The advisory board stated that such software should be easy to use and provide necessary information to users creating legal redistricting plans, have collaborative social networking features, and generate statistics that would allow users to compare plans. On the development side, they stated that the software should be open source and fully documented, that the data that it uses and generates should be publicly available in a non-proprietary format, and that the generated statistics using algorithms should be open for inspection and fully documented.

Consistent with the principles articulated by our advisory board, the software is built upon existing open source software packages and is open source. Anyone can inspect the code and suggest improvements, and we have begun to incorporate contributed enhancements to the code from the open source community. We have chosen to deploy the software by two methods. The first method is to compile the application from the source code on a computer running the Linux operating system. For most people seeking to administer the software, this will be a difficult task. To ease this burden, we have deployed precompiled versions of the software, also preloaded with state data, on the Amazon Elastic Computing Cloud. In this second deployment method, administrators copy over the Amazon Machine Image (AMI) of the software preloaded with a state’s data into their Amazon account, do some administrative setup, and then institute their own instance of the web service. While the
software is free, unfortunately, Amazon’s services are not, so organizations or individuals wishing to deploy the software must shoulder some web hosting costs. The web hosting is flexible, however, such that an organization can scale up or scale down the server size and the associated costs on the fly, depending on the user load. Furthermore, Amazon has provided the Public Mapping Project a grant for free web hosting for educational purposes.

Most users will be unaware of the administration and configuration that occurs on the back end. Instead, a typical visitor to the site will create a user account and then start mapping. (This is illustrated in Figure 12.2.) The mapping environment is designed to be familiar to someone experienced with typical online mapping software, such as Google or Bing Maps. Additional tools help guide the user through the complex task of drawing districts, and statistics and other visual tools provide clues as to how well the mapper achieves the legal requirements within a given state. Map editing is as simple as selecting a geography, grabbing it with the pointer, and dropping it...
desired district that the user wishes to add it to. Further social networking tools allow users to copy other users’ redistricting plans in part or in whole that they have made public. Districts are shaded to show how well they achieve redistricting goals, and numerous census population and election statistics are available. Users can also obtain a ranking of how well their plan compares with plans that other users have submitted for scoring.

Our advisory board also identified that access to the data is an important barrier to public participation and transparency. The Census data can be difficult to work with, particularly when constructing racial and ethnic voting-age populations, as may be required to show compliance with the Voting Rights Act. The geographic boundary data are also complex and difficult for even experienced GIS programmers to work with. Redistricting authorities often assess the underlying partisan composition of districts by measuring election results aggregated within alternative district configurations. These databases redistricting databases can be difficult to construct and are frequently only available to politicians. For some states where redistricting authorities do not provide public access to these data, we have created our own merged census and election databases. To alleviate these data processing burdens, we construct the necessary data and publicly post it so that it may be loaded it into the software (in a Linux install) or preload it (for an AMI).

THE VIRGINIA REDISTRICTING COMPETITION

The first deployment of the software was in support of a redistricting competition among Virginia’s colleges and universities. A primary reason why Virginia was our first deployment is that Virginia is one of four states that hold state legislative elections in odd-numbered years and thus must complete redistricting in a timely manner. To help these states meet their deadline, the Census Bureau releases redistricting population first for these states, typically in early February of a redistricting year.

A secondary reason why Virginia was our first deployment is that there is a robust reform community within the state. A group of moderates backing the campaign of Republican Gov. Bob McDonnell did so with an understanding that he would form a redistricting commission if elected. When it appeared that Gov. McDonnell would renege on his campaign promise, these reformers approached Quentin Kidd at Christopher Newport University and Michael McDonald at George Mason University, and one of the authors, seeking a way forward. Out of these conversations, the idea for a redistricting competition among Virginia’s college students was conceived. The goal of the competition was to educate students and the public about redistricting
alternatives by having students draw redistricting plans, divorced from the political process.

Later, once the competition was organized, Gov. McDonnell changed course and issued an executive order establishing an Independent Bipartisan Advisory Redistricting Commission (IBARC), charged with making mapping recommendations to the state legislature.\textsuperscript{29} The governor, however, provided no budgetary support for the commission and gave it two months to organize itself and make its recommendations. A knowledgeable redistricting expert might have concluded that the IBARC was designed to fail, since organizing a commission alone might take two months and redistricting is a difficult task even without such restrictive time constraints. Fortunately, the student competition infrastructure could be leveraged to support the commission’s work. Dr. McDonald was asked by the governor’s office to be an advisor to the commission, with the responsibility of drawing redistricting plans. The student competition was amended so that it could be a source for alternative plans. And as a byproduct of these developments, the IBARC became the first official government entity to adopt our Public Mapping software.

The Virginia redistricting competition was organized by four central staffers. Dr. Kidd was responsible for the overall administration of the competition. Dr. McDonald was responsible for preparing the data and managing the software. One graduate student was responsible for recruiting teams from the colleges and universities in the Commonwealth of Virginia. One graduate student was responsible for providing software training and user support. Each student team was managed by a faculty advisor, who was paid a small honorarium. Our modest expectation was that perhaps three or four student teams would compete. Instead, approximately 150 students were enlisted from 12 colleges and universities. Students were organized into 15 teams, with three institutions hosting two teams.

Student teams could submit redistricting plans for Congress and the two state legislative chambers, the senate and the house of delegates. Redistricting plans produced by the competition were initially to be judged on seven criteria. Later, a second set of judging criteria were introduced to produce plans consistent with Gov. McDonnell’s executive order. Redistricting plans were initially judged on districts’ contiguity, population equality, respect for the Voting Rights Act, respect for existing political boundaries and communities of interest, compactness, number of competitive districts, and the overall political fairness of the redistricting plans.

- Contiguity meant that all parts of a district connect, although districts were not required to be connected by transportation routes if they crossed water (which is a significant consideration with the Chesapeake Bay).
Equal population meant that districts’ total populations must be nearly equal. Valid plans had to meet threshold equal population requirements, of plus or minus 0.5 percent from the ideal-sized population for congressional districts and 5.0 percent for state legislative districts, which is mostly consistent with federal court decisions. Plans that were closer to achieving complete equality were scored higher on this criterion.

Respect for the Voting Rights Act in the context of the competition meant that a valid plan must have at least a minimum number of districts with a minority-majority voting-age population. Virginia is a state covered by Section 5 of the Voting Rights Act, which requires that the number of minority opportunity districts cannot be reduced in a proposed plan compared to the previous plan for a legislative body. These districts are assessed in terms of their voting-age population instead of their total population, since the goal is to create a district that has an equal chance of electing a minority candidate of choice. Since people under the voting age cannot vote, they are not factored into this assessment. Upon reviewing minority populations within the current districts, we determined that there was one congressional African American majority voting-age population district, five Senate African American majority districts, and 11 House of Delegates African American majority districts. A valid plan for judging must have at least these number of African American majority voting-age population districts.

Respecting existing political boundaries and communities of interest means that districts should not cross these boundaries. We defined political boundaries as the state’s counties and independent cities, which have a similar legal status as counties. We counted the number of times each district split a political boundary. This counting method has the following characteristic: if a political unit is entirely contained within a district, there is no split. If two (or more) districts are within a political unit, there are two (or more) splits. Communities of interest do not have a clear definition, so students were encouraged to discuss in their accompanying narratives how they factored in communities of interest. Some students reported interviewing their peers about what they considered to be communities in and around their home towns and then drawing districts to respect these communities.

Compactness means drawing nicely shaped (or pleasantly appearing) districts. There are dozens of mathematical compactness measures. Many of these metrics compare a district’s shape to a circle, which is considered by some to be the most compact shape. We used one such measure, called the Schwartzberg measure, which is the ratio of a simplified district’s perimeter to a circle’s perimeter with the same area as
the district. Here, simplified essentially means that odd-protuberances of district boundaries that are a consequence of water if other unavoidable geographies are removed. Each district is scored from zero to one, with one being more compact. Plans were judged on the average compactness of all districts.

- Competitive districts are those with a near balance of Democratic and Republican supporters. We measured the partisan support of districts using the two-party share of the Democratic and Republican gubernatorial candidates’ votes. Ideally, we would have evaluated more elections, but the software was still in development, and this capability had not yet been added. Since Republican Gov. McDonnell won by a large margin, we shifted the statewide two-party vote such that there was a hypothetical 50–50 election. A competitive district was one that had a partisan support score within plus or minus five percentage points. Plans with a larger number of competitive districts had a higher score.

- Partisan fairness meant that the overall plan was balanced between Democratic and Republican districts. We used the same partisan support measure used to define competitive districts and used the absolute value of the number of Democratic majority districts subtracted from the number of Republican majority districts. Plans with a smaller value for this measure were deemed more fair.

Gov. McDonnell issued his executive order in January, authorizing the establishment of an Independent Bipartisan Advisory Redistricting Commission. He provided a list of criteria in his executive order for the commission to consider, which included several of the same criteria as the student competition: contiguity, population equality, respect for the Voting Rights Act, respect for existing political boundaries and communities of interest, and compactness. On the issue of contiguity, the governor specifically cited transportation contiguity as a requirement in that a bridge must exist when a district crossed water. The governor also explicitly stated in his address to the inaugural meeting of the commission that competition and partisan fairness were political goals that were best addressed by the legislature. The supporters of the student competition also supported the governor’s commission and wished for the student plans to be considered by the commission. So, to promote the development of maps that would conform to the commission’s mandate, a second set of judging criteria was announced that were the same as the student competition, except that they excluded competitive districts and partisan fairness.

Teams submitting plans were required to write a narrative describing how they approached redistricting a legislative body. These narratives were
perhaps most informative as to how students approached the communities of interest criterion, as the other criteria could be measured directly. These narratives also provided a window into students’ decision-making processes when weighing tradeoffs between criteria, such as the value they assigned to keeping a political boundary intact versus creating a more equal populous or compact district. The narratives also illuminated a frequent tactic that students used to submit plans to the two judging categories for the original student competition and the governor’s commission. Students would often create a plan following the commission criteria and then improve it on competition and fairness for judging for the competition criteria.

The student teams submitted a total of 55 plans. All teams submitted at least one plan, but only three teams submitted plans for all six possible entries. Submissions were judged by Thomas Mann at the Brookings Institution and Norman Ornstein at the American Enterprise Institute. First and second place prizes were awarded for the best congressional, senate, and house of delegates plans adhering to the student competition criteria and the governor’s commission criteria, for a total of 12 prizes. The prize money was apportioned based on the degree of difficulty of drawing a valid redistricting plan, with the 100 house of delegates districts deemed to be most difficult, the 40 Senate districts the next most difficult, and the 11 congressional districts to be the least difficult. First place house of delegates plans received $2,000 and second place received $1,000. First-place senate plans received $1,500, and second place received $750. First-place congressional plans received $1,000, and second place received $500. In sum, $13,500 in prize money was awarded. Six of the teams won at least a first- or second- place prize, with two teams from the University of Virginia winning a total of seven prizes. The winners were announced at an awards ceremony held at the state library in Richmond, hosted by the Virginia League of Women Voters (two examples of winning plans are shown in Figure 12.3).

These winning student competition plans had an effect on the policy discourse. All three of the winning plans following the governor’s criteria were introduced as bills in the state legislature—and all students and faculty were recognized by the legislature and the governor. A winning congressional plan following the governor’s criteria drawn by a team of William and Mary Law School students became the basis of a plan adopted by the governor’s commission. This congressional plan was notable in that it reconfigured the state’s only voting rights district in such a way that made it substantially more compact, and thus enabled districts throughout the state to significantly improve their compactness. This concept of reconfiguring the voting rights district was implemented in a plan championed by the state legislative black caucus, which further created an African American influence district in the
Hampton Roads area. This was the plan adopted by the Democratically-controlled Senate.

Voting rights issues were also explored in the state legislative plans. Many students attempted to draw a Hispanic majority voting-age population district, but none were successful. A winning Senate plan authored by the University
of Virginia team created six African American majority voting-age population districts, where the current plan only had five. However, these districts were barely above 50 percent, which was significantly below the percentages that received Department of Justice preclearance under Section 5 the previous decade. The governor’s commission explored whether it was possible to increase the African American voting-age populations of these districts but did not find it was possible to do so greatly. Although it was not part of the student competition, a House of Delegates plan drawn by Dr. McDonald for Governor McDonnell’s commission demonstrated it is possible to draw 13 African American majority voting-age population districts, whereas the plans adopted by the legislature only had 12. This thirteenth district was discovered in the course of drawing districts that were compact and respected existing political boundaries, in accordance with the governor’s criteria.

The winning students’ plans appeared to be systematically different from those produced by the legislature. This is strikingly clear when the competitiveness of the plans is considered. In 2001, the legislature was unable to produce any competitive districts, yet the UVA student team was able to create a plan where 6 out of 11 districts were competitive. Similarly, the UVA team was able to produce a plan in which almost one-third of the House districts were competitive. This level of competitiveness is unprecedented in plans produced by the partisan legislative process. And other students also succeeded in producing highly competitive plans.

These plans provide evidence that greater public participation enables fresh approaches to drawing redistricting plans that may have otherwise gone undiscovered. Redistricting is an extremely complex problem. In a modestly sized state, there are more solutions than there are quarks in the universe. More eyes on the problem means more opportunities to see new solutions. These plans also illuminated paths to improve racial representation, thereby demonstrating that reformers’ goals may not necessarily be at odds with the voting rights community.

The students’ plans and the accompanying narratives demonstrate that the students learned the trade-offs between competing goals when drawing redistricting plans. Further, some faculty team leaders incorporated the competition into their courses as a class project. Supporting education materials included the Brennan Center’s A Citizens’ Guide to Redistricting—which Dr. McDonald helped create under a separate Joyce Foundation grant—and the Gerrymandering documentary film. We did not conduct pre and post assessment to measure the effect of participating in the competition on political knowledge and opinions about redistricting. At the awards ceremony at the state library, students stated to Dr. McDonald that they enjoyed participating in the contest and that they learned about redistricting and representation from...
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In their narratives in support of their submissions, students demonstrated a high degree of engagement. Students from Virginia Commonwealth University attempted automated redistricting; they failed, but their attempt was impressive. Students from many schools discussed interviewing their classmates to help them define communities of interest. The William and Mary Law School team, as future lawyers, produced a thorough legal evaluation of the history of Virginia redistricting that they used to guide their mapping.

An unexpected byproduct of the student competition was increasing public education about redistricting. Political communications scholars document that framing of stories is important to how news consumers view a story. Describing a story in terms of process can lead to different opinions and attitudes of news consumers when the same story is described in terms of how it affects individuals. Redistricting is an arcane political process important to representative democracy, but one that the public knows little about. Creating a student competition allowed the media to re-frame the redistricting story from one about the process of moving lines to be one about students struggling to balance the competing goals. The competition generated over thirty news stories and opinion editorials in national newspapers and magazines, such as USA Today, The Washington Post, and National Journal, to many local and regional papers. Students huddled around computers in mapping sessions provided a ready-made setting for reporters interested in interviewing students, such as a WAMU public radio reporter who filed stories about the George Mason team. While we have no pre- and post-test assessment of public awareness of the issue, we at least accomplished the goal of generating new and novel news coverage on this difficult topic for reporters to cover.

In sum, we successfully achieved the goals of the competition and learned many valuable lessons. Students were educated about the process. Policy-makers seriously considered the student-drawn alternatives, even to the point of introducing some of them in part or in whole as official legislative bills. We generated new and novel news coverage of redistricting that reframed the difficult process story into a human-interest story. We learned that mapping sessions produce good media coverage. We recommend that future competitions open to the general public should include recruitment of students in their strategy plan.

We also learned software administration from our experience. Virginia is a difficult state to redistrict due to its compressed schedule. Any delays could cause problems, and they did arise. The Census Bureau erroneously located nearly 20,000 military personnel associated with a Naval Base in the wrong census block. The revision to the census data delayed us a couple of days and produced cascading inconsistencies with student plans when we attempted to update the software’s database in real time while students were actively working.
editing. We would not recommend attempting a real-time update again. This
was also the first major release of the software to a large number of users,
who discovered bugs and placed demands on the software in ways that we
did not anticipate. Fortunately, we were able to meet these data and software
challenges, but for a while the software programmers were overtaxed. We
identified some errors as user errors, not software bugs. In response, we
greatly improved the supporting user guide materials for the software.

One of the accomplishments of the unprecedented extensive redistricting
activity in Virginia is that a large number of plans have been generated. In
total, among all congressional and state legislative plans, the students gener-
ated 55, the governor’s commission generated seven, and the legislative pro-
cess generated five plans. Further, two congressional plans were generated by
a group of law students at Columbia Law School, and three congressional and
state legislative plans were generated by an independent contributor.

CONCLUSION

Participation, involvement and influence in the redistricting takes a variety
of forms, from simple passive interest, to information seeking, to active
public engagement with the process, to public collaboration and control. In
the United States, all of these forms of participation have faced significant
barriers. The public has been education about redistricting has been sparse;
the information necessary to understand or create plans has been difficult or
impossible to obtain; and even interested good-government groups have had
difficulties creating plans because of the complexity of the rules and cost and
difficulty of available tools.

Technology appears to be improving this situation. Redistricting technol-
ogy was conceived in the 1960s, experimented with in the 1970s and 1980s,
professionally adopted in the early 1990s, and commercially commoditized
in the early 2000s. Finally, in the current decade, redistricting technology is
becoming widely publicly available and accessible.

The use of the World Wide Web to distribute maps and data in the last
round of redistricting made it significantly easier to obtain information about
plans and data, supporting information seeking. The public redistricting
technologies available now make it possible for the public to participate in
redistricting in new ways. Students in Virginia were able to create viable
legal plans and concretize policy proposals, some of which were actually
introduced for legislative consideration. More viable plans were produced
by this competition than by any previous recorded public redistricting effort,
ever—and by a huge margin. Moreover, the preliminary analysis indicates
that these plans are systematically different from plans produced by politics as usual; and, if adopted, would yield substantively different results.

The marginal costs of this dramatic increase in participation were modest. Because it leveraged open-source software, less than $100,000 was needed for the competition setup, host, support, and awards. If even a small part of every state’s redistricting and election administration budgets were used to increase participation, thousands or tens of thousands of alternative redistricting solutions could be developed nationally. The marginal costs of running a participative redistricting initiative will inevitably decline as the software is refined for performance and usability, election data are standardized, additional training materials are developed and shared, and hardware costs continue to decline.

This new type of participation, which involves formulating viable policy alternatives and injecting them into the deliberative political process, goes well beyond most previous public participation redistricting—which was limited largely to information seeking and commentary. Admittedly, there is still a distance between the participation technology enables and a fully consultative system in which all redistricting authorities would actively seek public information and collaborate with the public, both online and offline, in the creation of boundaries. Notwithstanding, the Virginia experience shows that technology can be used to spark more meaningful participation in redistricting, even in the absence of government support.

NOTES

1. e.g., Bruce E. Cain, The Reapportionment Puzzle (Berkeley, California: University of California Press, 1985).

2. c.f., Daniel H. Lowenstein and Jonathan Steinberg, “The Quest for Legislative Districting in the Public Interest: Elusive or Illusory,” UCLA Law Review 33 (1985): 1–22. We would like to acknowledge the Sloan Foundation, whose generous funding made this work possible, and the Joyce Foundation, which provided funding to extend this work. We would like to acknowledge the Azavea Corporation for its contributions to the development of the software. And we would like to thank the members of the advisory board for their contributions to the principles for transparency and participation: Nancy Bekavac, Derek Cressman, Anthony Fairfax, Representative Mike Fortner, Karin Mac Donald, Leah Rush, and Mary Wilson.


13. As a typical example of “desktop” access, the Indiana State House’s and State Senate’s Election Committees offered access to redistricting software through individual systems placed at three Indiana University libraries. In addition, no electronic submission or exchange process is available—plans must be submitted in person or by physical mail. See “Libraries at three IU campuses make redistricting software available to public,” *IU News Room*, March 29, 2011, newsinfo.iu.edu/news/page/normal/17883.html.


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News coverage of the Utah online site has been sparse, but the Utah State Senate has put up a web page describing the forthcoming live redistricting site, accessed June 2, 2011, www.redistrictutah.com/maps/draw.

21. These contests are described briefly in various local and national online media:


24. The Harvard Election Data Archive Project offers some hope in this regard. Accessible through project.iq.harvard.edu/eda and run by Steve Ansolabehere at Harvard and Jonathan Rodden at Stanford, the project aims to make high quality precinct-level
electoral data available for redistricting and scholarly analysis. However, while some data are available through this project, the project has not yet completed data processing and documentation, posing challenges for its timely use in early redistricting states. We are optimistic that this project will continue to improve and extend its data collection, becoming an invaluable resource for future districting efforts.


27. See Altman, Mann, McDonald and Ornstein, “Principles for Transparency,” 2010. These principles were also discussed in Michael P. McDonald and Micah Altman, “Pulling Back the Curtain on Redistricting,” The Washington Post, July 9, 2010, A17.

28. The project’s source code is available at https://sourceforge.net/projects/publicmapping.


30. The safe harbor from litigation is a one percentage point range from the highest to lowest populated congressional district and ten percentage points for state legislative districts.

31. The current House of Delegates plan had twelve African American majority voting-age population districts using the 2000 census but had only 11 using the 2010 census. In the intervening decade, one district had dropped below 50 percent. At the outset of the competition, we were uncertain whether it was possible to draw 12 such districts using the 2010 Census. However, the students demonstrated that it was possible to create 12 such districts.

32. In practice, this is an approximation of respecting the Voting Rights Act. We required only that valid plans have a certain number of districts with greater than 50 percent minority voting-age populations. In practice, statistical analyses are performed to determine the efficient percentage to elect a minority candidate of choice. Since we did not have the luxury of conducting such analyses, we instead required the 50 percent threshold.

33. Analysis of other elections discovered precinct level election returns for the governor’s election were highly correlated with other statewide elections ($p$ values over .95), including the 2008 presidential election, won by Democrat Barack Obama within the state.


39. For the official acknowledgement, see www.census.gov/rdo/pdf/VA_errata.pdf.