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Any device, anywhere, any time: A responsive, accessible ballot design

Dana Chisnell, CivicDesigning.org

Drew Davies, Oxide Design Co.

Kathryn Summers, University of Baltimore

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The Information Technology and Innovation Foundation
1101 K Street NW, Suite 610
Washington, DC 20005
(202) 449-1351

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Final Report

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University of Baltimore
Dana Chisnell, CivicDesigning.org
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Summary

Major insight: Plain language, plain interaction

Our goal for this project was to create an open-source online ballot template using current web standards that voters could use to mark a ballot on their own web-connected device, using their own, familiar, assistive technology. By optimizing our design for voters who have low literacy skills or mild, age-related cognitive impairment, we improved ballot usability across many audience groups. Our goal was to use the principles of "plain language" and "plain interaction"[1] to create a ballot that would be universally usable.

Key team members were involved in seminal ballot design projects over the last 10 years that helped us know what it is like for people to use ballots and other forms. Our project team also included researchers with experience designing online information and interactions for those who don't read well. In combination, the project principals have worked on hundreds of printed forms and digital interfaces with a huge range of user groups. Starting with a ballot design based on existing research gave us a head start. Iterative testing of our prototypes revealed flaws in the design we could have discovered no other way. We are proud of the final product—a usable, digital ballot template, accessible to people with low literacy and mild cognitive issues.

We drafted the first prototype (of two) based on insights from earlier research, especially that done by Design for Democracy for the Election Assistance Commission (EAC) in *Effective Designs for the Administration of Federal Elections*, published in 2007 [1]. Our design is based on Design for Democracy's design for a "rolling DRE," which anticipated mobile user interface design as we know it now, along with results from the findings from NIST IR 7556 *Report: Language of Instructions on Ballots* by Redish, Chisnell, Newby, Laskowski, and Lowry, which the National Institute of Standards and Technology (NIST) published in 2008.[2]

Our central design technique was rapid, iterative usability testing.[3] [4] This is a technique in which a design team makes changes at the end of each individual usability study session in response to observations during that session. Those new design changes are then tested in the next session.

The participants who came to the University of Baltimore lab – some of them with low literacy, some with cognitive issues – helped us unlock many of the challenging puzzles of creating a digital ballot. Thirty-three sessions with real people gave us moments of discovery that clarified language and interaction in the two rounds of prototype testing

[1] We are indebted to Shaun Kane for the term "plain interaction," which he used in a phone conversation with our team to sum up the interaction design findings we were sharing from our study.

we conducted. The Anywhere Ballot is quite successful for voters with high *and* low literacy, and voters with mild cognitive issues.

The concept of *plain interaction* comes from paring the design down to only the essentials. Plain interaction is the distillation of the fewest, simplest steps to complete an action, and it allows maximal focus on the voter's immediate interaction with the ballot. We started by trying to make a ballot fit on a tiny smartphone screen. But we realized as we worked with voters with cognitive issues that simplicity and clarity translated to minimalist look, feel, and interaction.

The result looks like no other ballot that we know of, and yet it is highly usable for all kinds of voters. We started by incorporating what we know from the body of research about accessibility for people who are blind and who have low vision. We also tried to take into account design factors for people with mobility and dexterity problems. But the focus of our project was to work with people with low literacy and cognitive disabilities. Many of the participants had some cognitive limitations: they had low literacy, or they had age-related cognitive issues; one participant had experienced a stroke and had short-term memory loss.

Here is where we encountered some interesting limits of design. Plain language and plain interaction helped us make a usable ballot for people with low literacy. But the session with the stroke victim was difficult. She would not have been able to vote on this ballot independently. We have some theories about what might help her – perhaps something as simple as an audio interface that gives her instructions but didn't read the ballot – but this was more than we could do in our project. We're certain that it is possible to design a ballot that will work for her *and* all the other voters, but it will be difficult. In short, we have – along with the researchers on whose shoulders we stand – addressed a lot of the accessibility problems on the way to creating a voting system that all voters can use. We think that the Anywhere Ballot will work for 90% of all voters. Designing for the remaining 10% will be more challenging than any design work to date.

We do envision a time when all voters can use the same voting system when they get to the polling place. Now, poll workers are trained on at least two different systems. People with disabilities are segregated, voting on a different voting system from people who don't identify as disabled. We believe there will be a time, soon, when using a ballot like the Anywhere Ballot on touchscreen technology that is readily available and relatively inexpensive will make it possible for almost everyone who can get to the polls to vote privately and independently.

We want to thank ITIF and the Election Assistance Commission for supporting this project.

Highlights

- Building on the existing research on ballot design and plain language instructions (rather than starting from scratch) worked very well.
- Low-literacy participants acted on every single word – they were unable to make inferences, and took the meanings of words and sentences literally. They were not able to shift understanding between two meanings of the same word.
- Instructions for voting in their sparest form helped voters. Positive, specific, prescriptive wording was the most helpful to participants.
- "Choices" was a surprisingly difficult word. "Votes" was understood much more readily. Word choice matters, and needs to be tested.
- Some features that high-literacy voters might enjoy were severe distractions to low-literacy voters.
    - Voter education content about candidates embedded in the ballot (available through blue "i" buttons) did not help people with low literacy and reading disabilities. The ease with which it was available was actually seriously problematic for voters with short-term memory loss.
    - Participants expected blue "i" buttons (which provided additional information about the candidates or options) next to each candidate name to mark their vote and got confused when something else happened, especially lightbox messages that had a lot of text in them.
    - Illustrations in the Help were not helpful; participants expected them to be interactive and became frustrated and confused when the illustrations were not interactive.
- Highlighting five key words in a message helped low-literacy voters to recover quickly when they needed to deselect a choice to make a new one.
- Plain interaction eliminated non-essential interaction and visual elements, minimized text and illustrative content, and streamlined layout to focus voters' cognitive resources on the immediate task.
- Other studies (Redish, et al. 2008 [2]; Center For Information & Research On Civic Learning And Engagement [6]) have shown that people with low education are missing some basic civics concepts. We saw support for this finding in our study, where we observed that voters don't have a clear understanding of the hierarchy of government. This makes navigating an electronic ballot difficult.
- There are several areas of study that we would like to perform on this ballot to refine it further:
    - Testing with people with short-term memory loss and aphasia.

- Testing with people who use screen readers and other audio interfaces.
- Testing with people who use assistive technology to make their selections.
- Understanding what would compel voters to thoroughly review a summary of ballot choices before casting their votes.
- Piloting in real elections with real choices that voters relate to.

Background

The idea for this project came out of workshops held in Atlanta in January and February 2012 that were organized by the Center for Assistive Technology and Environmental Access (CATEA) and facilitated by ITIF in its Accessible Voting Technology Initiative (AVTI) project. The workshops included designers, developers, vendors, and lots of people with disabilities (or who were advocates for communities of people with disabilities). In the workshops, we all sought to answer the question, *How might we design an accessible voting experience for everyone?* One answer was another question: *What if voters could vote on any device, any time, anywhere?* If people could vote on their own devices, especially mobile ones that are typically highly personalized, wouldn't they be more comfortable and make fewer mistakes than they would if they used a typical commercial voting system?

When we looked at how to make that happen, the common denominator was a web browser. All computing devices available off the shelf have web browsers. And many devices have accessibility features built in. We proposed designing a responsive (meaning that the content resizes for the size of the screen it is displayed on), standards-compliant ballot front end that would be accessible to people with low literacy and mild cognitive disabilities.

We designed in two formative phases. The first – paper – prototype was based on work done by Design for Democracy for the Election Assistance Commission (EAC) in *Effective Designs for the Administration of Federal Elections*, published in 2007 [1]. We combined Design for Democracy's design for a "rolling DRE" with findings from NIST IR 7556 *Report: Language of Instructions on Ballots* by Redish, Chisnell, Newby, Laskowski, and Lowry, which the National Institute of Standards and Technology (NIST) published in 2008.[2]

In November 2012, the team gathered at the University of Baltimore's usability lab to test paper prototypes [5] of the ballot design. We refined the design considerably across those 18 individual rapid, iterative usability test [3] [4] sessions with voters, working through about 16 different versions of the ballot. Some pages went through 4 or 5 variations before we settled on designs that worked well for participants.

Working on paper helped us try some big ideas and throw out a lot of unworkable ideas without committing to writing a lot of code. We could easily move elements around and try out ideas between sessions. We could also focus on wording in headings, instructions, button labels, and messages before creating a digital prototype. Using a paper prototype helped us narrow the content for each page and work on broad strokes of visual design, proximity and white space, and color.

Then we developed a digital prototype, based on a WordPress template, implementing CSS3 and HTML5, and tested it in 15 more individual sessions in January 2013. With the digital prototype, our focus was the flow through the ballot – both forward and backward – and how that flow worked with information architecture, visual design, and interaction design. Through 4 iterations, we simplified language throughout and refined the behavior of the ballot, including the mechanics of microinteractions (such as scrolling embedded lists of candidates).

This study was highly exploratory and iterative. Conducting it assisted greatly in helping us determine whether the ideas we had about how a digital ballot should look and behave would work for voters who are among the 43% of American adults who have difficulty reading.[7] The prototype that we exited the study with is available to try out at anywhereballot.com.

In addition to covering our methods and findings, we include examples of the main page types with key instances of design iterations and improvements.

Goals

Our research and design activities for this project were focused on making voting easier for low-literacy voters and those with cognitive disabilities. Ultimately, we are working to design a digital ballot front end that meets current web standards, such as Web Content Accessibility Guidelines (WCAG) 2.0 (available at http://www.w3.org/TR/WCAG20/).

The primary outcome of this project is a digital prototype of a front-end user interface for a ballot that can be used on any device. A voting system using this ballot template would present a ballot to the voter on their own device, when and where they chose, up to the close of polling on Election Day.

The Anywhere Ballot is designed to work for low-literacy voters. It also includes options to supply supplemental content that explains the different sections of the ballot and levels of government. In addition, this ballot makes it easy for voters to confirm their votes.

Participants

Across two rounds of usability testing, we had 33 individual sessions.[2] Three were pilot participants, helping us work out the logistics and protocol for the test sessions. Those

[2] It is customary in reports on usability tests to report demographics in tables, by participant. However, we were especially concerned with protecting the anonymity of the participants in this study. Aggregating the demographics seemed the best way to do that.

sessions were instructive, and we made a few changes to the script as a result of what we learned from the participants.

In the first round of testing, we had 11 women and 7 men. The average age was 43.4. Five participants were white; the remaining 13 participants were black (11), black-Hispanic (1), or Asian (1).

All said that they had voted before, but 2 said they weren't sure whether they were currently registered to vote. Fourteen had voted in the most recent, presidential election on November 6, 2012. Of those, 11 had used touchscreen voting systems to vote; 3 had voted on paper optical scan ballots.

None reported having any physical or cognitive limitations (using classifications from the U.S. Census Bureau on our demographics questionnaire).[3]

In the second round of testing, there were 11 women and 4 men. The average age was 59.3; 3 participants were in their 70s; 1 was 83. All of the participants were black. All said they had voted before, 12 in the November 2012 presidential. Of those, 9 had used touchscreen voting systems; 2 used paper optical scan ballots (voting absentee); and 1 could not remember the voting system she used.

One participant said she had difficulty learning; 1 said she had seizures and another said she had some physical limitations; 1 said she had serious vision issues, physical limitations, and difficulty learning. Three participants said they had difficulty working[3] (they were age 59, 65, and 83).

We assessed each participant on the REALM test (see Appendix, page 78), a test commonly used to evaluate health literacy.

The scores equate to reading grade levels:

Score	Reading level	Round 1 participants	Round 2 participants
0-18	3rd grade or below		
19-44	4th grade to 6th grade	2	1
45-60	7th grade to 8th grade	5	6
61-66	9th grade and above	11	8

[3] We used wording from the Census Bureau survey for our demographic questionnaire to ask, "Do you have any difficulty with learning, remembering, or concentrating; dressing, bathing, or getting around inside the home; going outside the home alone to shop or visit a doctor's office; working at a job or business?"

In the first round of testing, 2 participants scored 44 or lower; 5 participants scored between 45 and 60; 11 participants scored at least 61 on the REALM. That is, 7 participants read at the 8th grade level or below; the rest read at the 9th grade level or above.

Participants in the second round of testing scored about the same as first round participants. One participant scored 44 or lower; 6 participants scored between 45 and 60; 8 participants scored 61 or higher. Seven participants read at the 8th grade level or below; 8 read at the 9th grade level or above.

Methods

We conducted 2 rounds of usability study [3] [4] to develop the Anywhere Ballot. The first was on a paper prototype. [5] The second was on a digital prototype.

Mimicking voting at home

The physical arrangement of the lab was meant to loosely mimic voting at home. We arranged the space so that the participants sat in a comfortable chair, using the "tablet" on their lap, or hand held, as they might in real life. (See photos starting on page 14.)

Recording sessions and opening up to observers

We recorded the sessions on video. All the video was recorded using Morae. We also had a GoToMeeting session set up, to which we invited our partners who are election officials and vendor partners to observe sessions.

The protocol allowed for exploration, feedback, and quick iteration

Each session had one participant with the researcher who conducted the interview.

We gave participants a slate to vote from, but also left some of the choices to the participant. This slate was the same as the one used in NIST research on the language of instructions on ballots.[2]

- See the Appendix page 83 for the directions for voting.

In addition to simple selection of candidates, we gave participants tasks related to straight-party voting (which is not used in Maryland, where we conducted the study), and writing in candidates, as well as reviewing votes and changing them before casting the ballot.

The tasks and slate were originally designed for a performance test in which the researchers investigated whether plain-language instructions helped voters make fewer mistakes than conventional instructions.[2] Though we were conducting a formative study rather than a performance test, because our goals were similar, we borrowed the tasks and slate for this project. However, we did not measure performance in this study because we changed something in the design in every session. Using the same tasks and slate anchored the rapid iterations, and the maturity of the protocol gave us confidence in the design decisions we made.

The moderator interacted extensively with the participants, restating tasks, asking follow-up questions, and probing more deeply when interesting and surprising things happened. We used what we learned in each session with a "voter" to make changes to

the design of the ballot for the next session, continuously iterating until the ballot design optimally supported voters' tasks and mental models.

Often the team members observing sessions agreed on and made changes during a session in reaction to something a participant did that we then tested in the next session. The research team also debriefed between each session to come to consensus on observed issues and to generate inferences about why the issues were happening, which in turn led us to generating design iterations or documenting issues to explore in our next round of testing.

Most of the major page types went through at least 3 iterations. A few of the pages or sections of the ballot gave us as many as 4 or 5 versions before we completed our 18th session. We generated 4 more iterations as we tested the digital prototype.

The ballot specification and content were based on earlier studies

Participants used a version of the NIST medium-length ballot, which implements realistic but fictional names and contests. It had 11 contests, 3 judge retention contests, 1 referendum, and 2 ballot measures. Some of the contests on the ballot were party-based, and some were not. We used colors for party names rather than real party names (a common practice in voting research).

The contests and the text for instructions came from the results of NIST research on the language of instructions.[2]

- The ballot specifications start on page 85.
- Images of the ballot iterations are in the Outcomes section, starting on page 29.
- We have also developed a pattern library that documents the major design elements of the ballot, which we describe on page 92.

Paper prototype testing

For the first round of testing, on a paper prototype, the "tablet" computer we used was a simple frame made of foam core that held the paper pages of the prototype as they were served by the "computer." To interact with the paper prototype, the participant simply pointed or tapped with their finger in the place where they might on a real touchscreen tablet.[5]

Our "computer" was a human[4] who stacked pieces of paper on top of the pile in the frame or took pieces of paper away in response to what the participant did on the previous piece of paper.

[4] Played by Megan McKeever, who did a masterful job.

Using paper rather than programming a digital interface at this stage gave us great flexibility to try new designs and wording, and to respond quickly to observations.

We captured video of what participants did from a document camera suspended on a boom over the back of the chair, effectively looking over participants' shoulders. We also had a camera in a potted plant across from the participant to capture their faces and bodies.

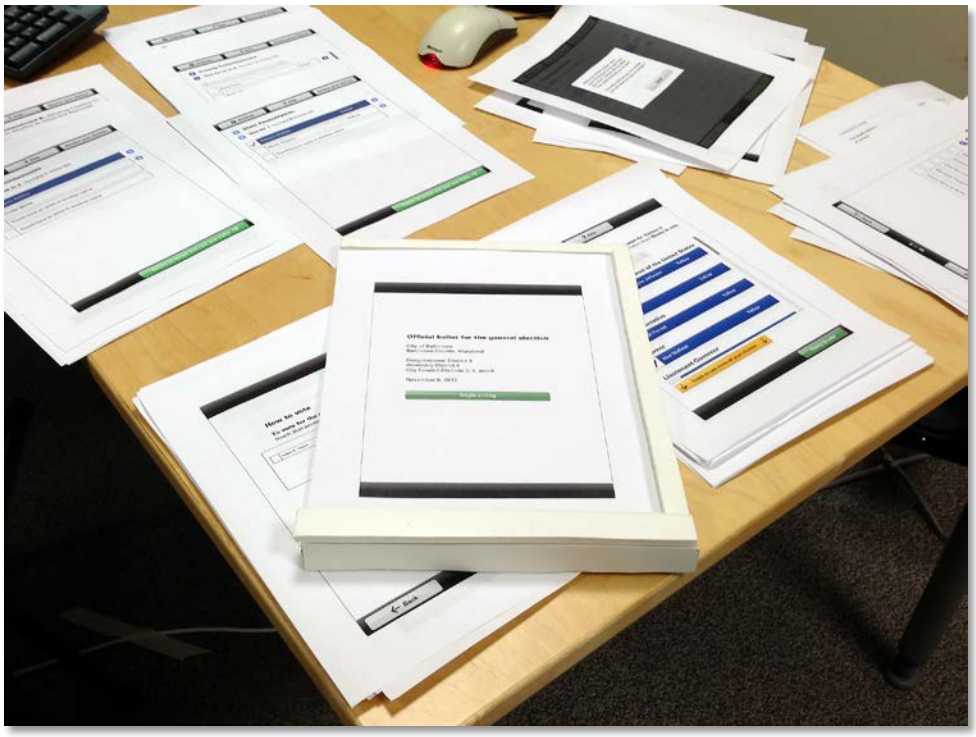
Digital prototype testing

We incorporated what we learned from testing with the paper prototype to a digital prototype with the same content that looked and felt like a real ballot, as participants voted using it on an iPad.

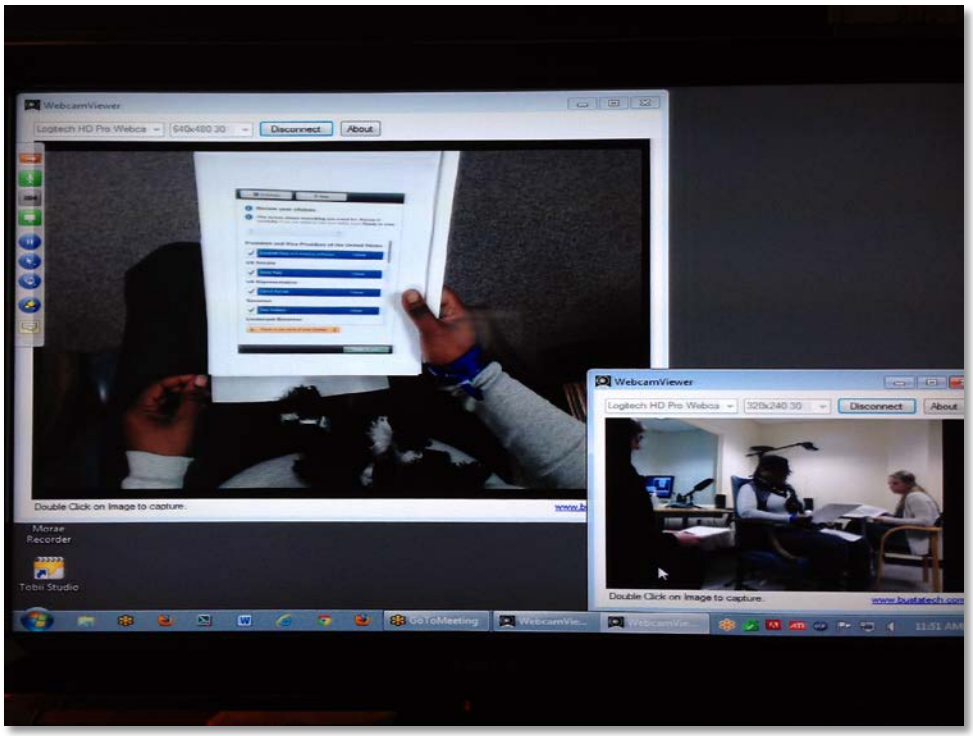
The room setup was similar to the setup for the paper prototype. Rather than watching over the participant's shoulder with a document camera as we did for the paper prototype, we captured what was happening on the screen of the iPad using an app called Reflector.

The setup: moderator on the left, participant center, "computer" on the right.

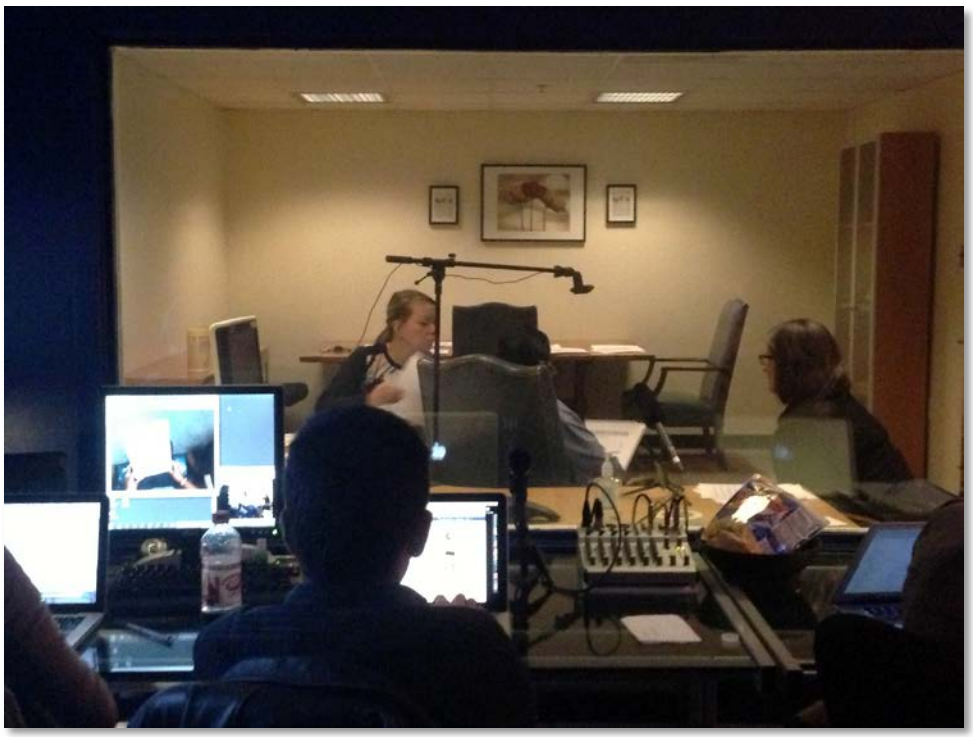
Stacks of screen prototypes were organized for easy serving by the "computer."



The "tablet computer" to be used by the participant in paper prototype testing, with the first screen of the ballot showing.



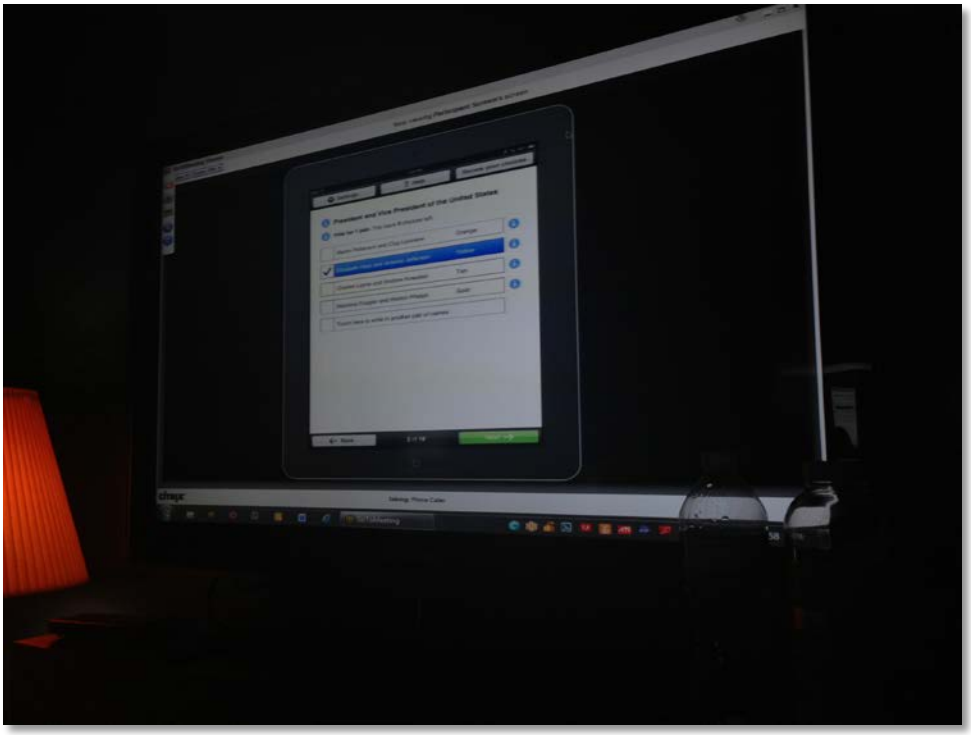
Monitors in the observation room showed what the cameras were seeing for paper prototype testing.



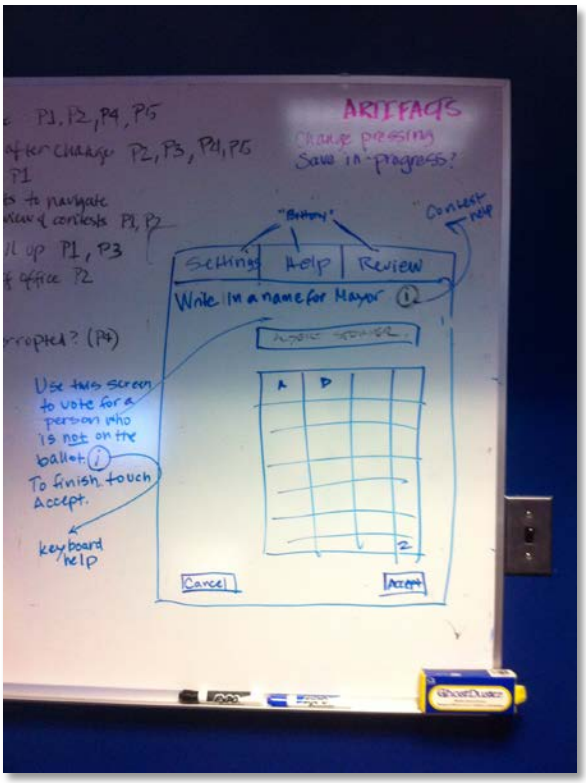
The view from the observation room.

A session in progress: "Computer" on the left, participant in the comfy chair in the middle, moderator on the right. The moderator can see the overhead camera view in the monitor on the left. Remote observers could hear the session through the speakerphone on the table.

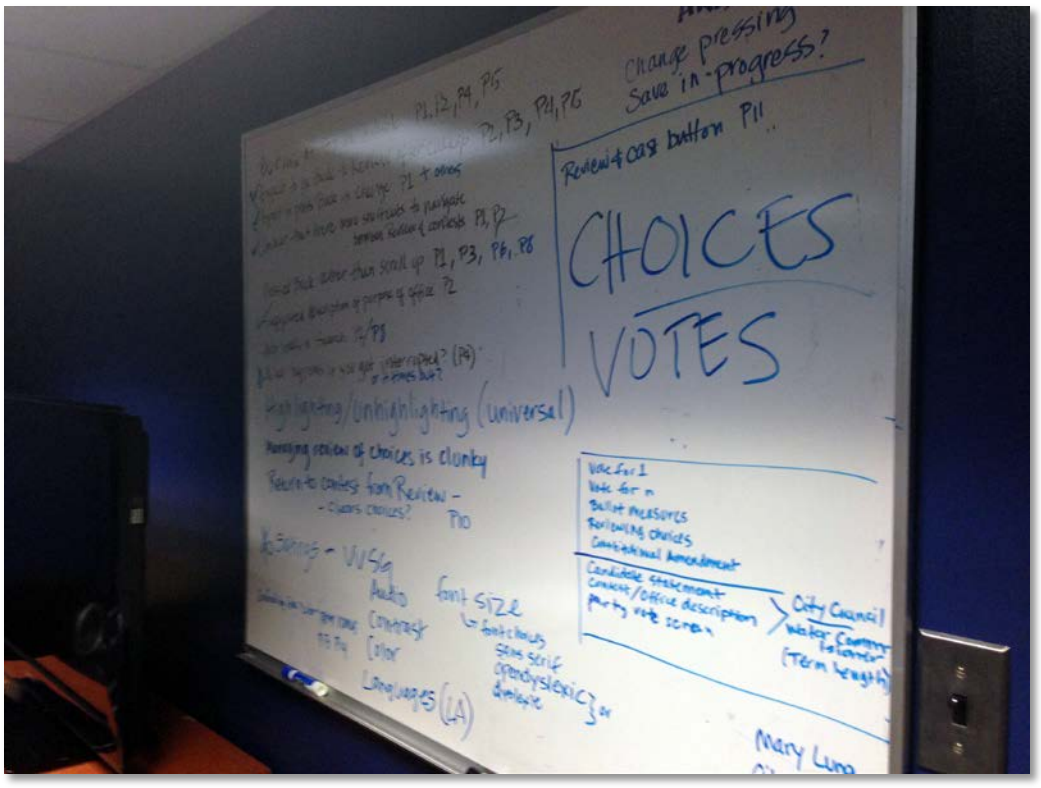
The scene was slightly different for the digital prototype. We no longer needed a human computer.



People in the observation room and watching through GoToMeeting could see what was happening on the iPad screen through an app called Reflector



The team tracked observations and made design decisions between sessions to iterate the design



A eureka moment about language: "votes" works better than "choices."

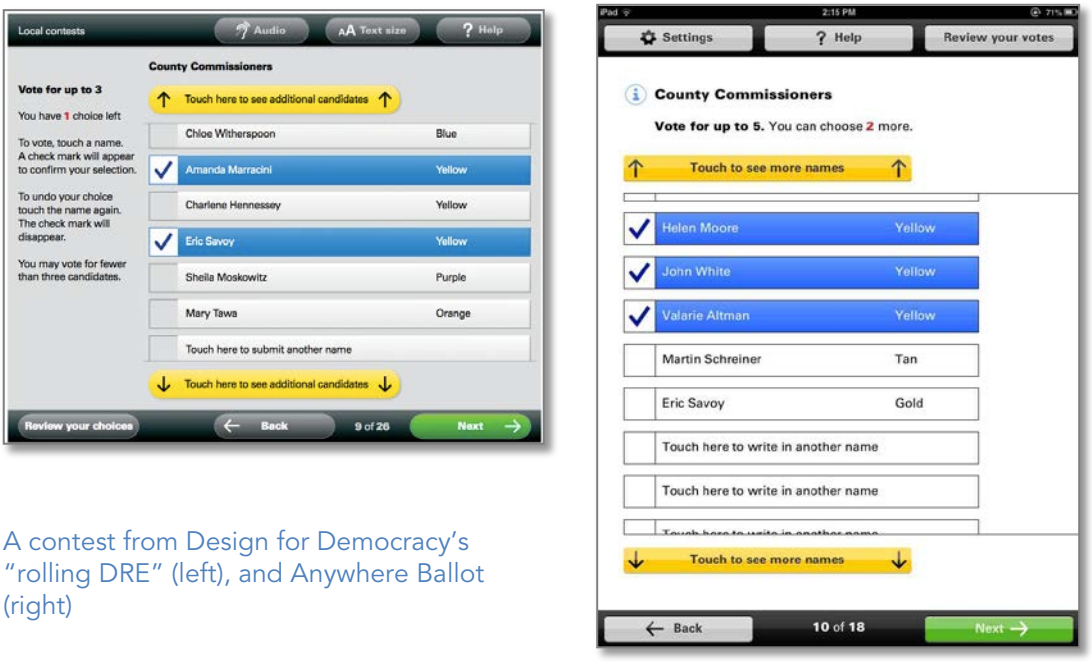
Major insights

The combination of plain language and plain interaction worked very well – but it took us several iterations to get to the sweet spot.

Building on the existing research on ballot design and plain language instructions worked well

Most voting research reinvents ballot design with every experiment. We chose to start with earlier work and refine from that point.

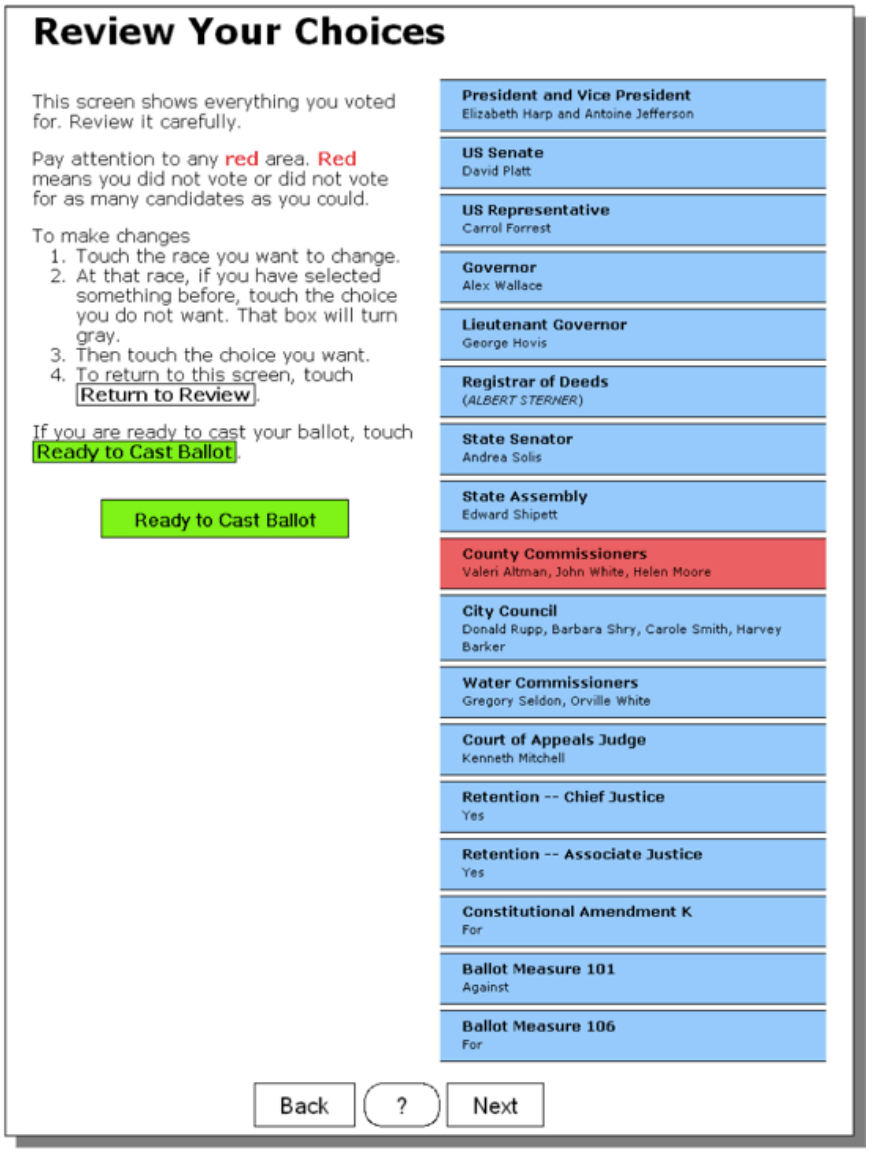
The bones of the visual design and interaction design for the Anywhere Ballot came from the work of Design for Democracy for the Election Assistance Commission in *Effective Designs for the Administration of Federal Elections*. The Design for Democracy research involved hundreds of different types of voters on dozens of design iterations and variations. The project delivered the most widely used template for paper optical scan ballots. But it also generated a hypothetical design for an electronic ballot interface that looked amazingly like the iOS user interface does now. It is remarkable that the design that Design for Democracy created pre-dated iOS by 2 years.



A contest from Design for Democracy's "rolling DRE" (left), and Anywhere Ballot (right)

Every ballot needs instructions. But a digital ballot also needs instructions for using its interface, as well as button labels and messages that paper just doesn't need. Redish, et. al.[2] tested conventional instructions for ballots against plain-language instructions for ballots on a touchscreen tablet voting system. They found that voters performed better with plain-∂language instructions. But they also learned that their instructions weren't perfect. At the end of their report, they include a "Ballot C" set of instructions

that refines their plain-language set based on the research results. That report was published in 2008. In the meantime, mobile devices have become widely available, and it was clear fairly quickly that the amount of instruction Redish, et al. recommended simply wasn't going to fit on small screens. But we did get guidance from that earlier work that was invaluable.



Redish, et al. went for thorough and complete instructions

We hope that other voting research projects use Anywhere Ballot as a "test bed ballot." We are confident it will deliver predictable results.

Low-literacy readers take words literally

Low-literacy participants acted on every single word – they were unable to make inferences, and took the meanings of words and sentences literally. Language tweaks were essential. For example, we changed "Touch to see additional candidates" to "Touch to see more names." Both "additional" and "candidates" were above the reading level of some participants and created obstacles for those voters. Through this change, we simplified the language and eliminated jargon.

"Choice" was surprisingly problematic. We had inadvertently peppered the interface with the word. There was a button labeled "Review your choices." "Choices" showed up in various help and messages. The heading on the review page was, "Review your choices." This is where we ran into the largest problem: Participants got stuck in reviewing.

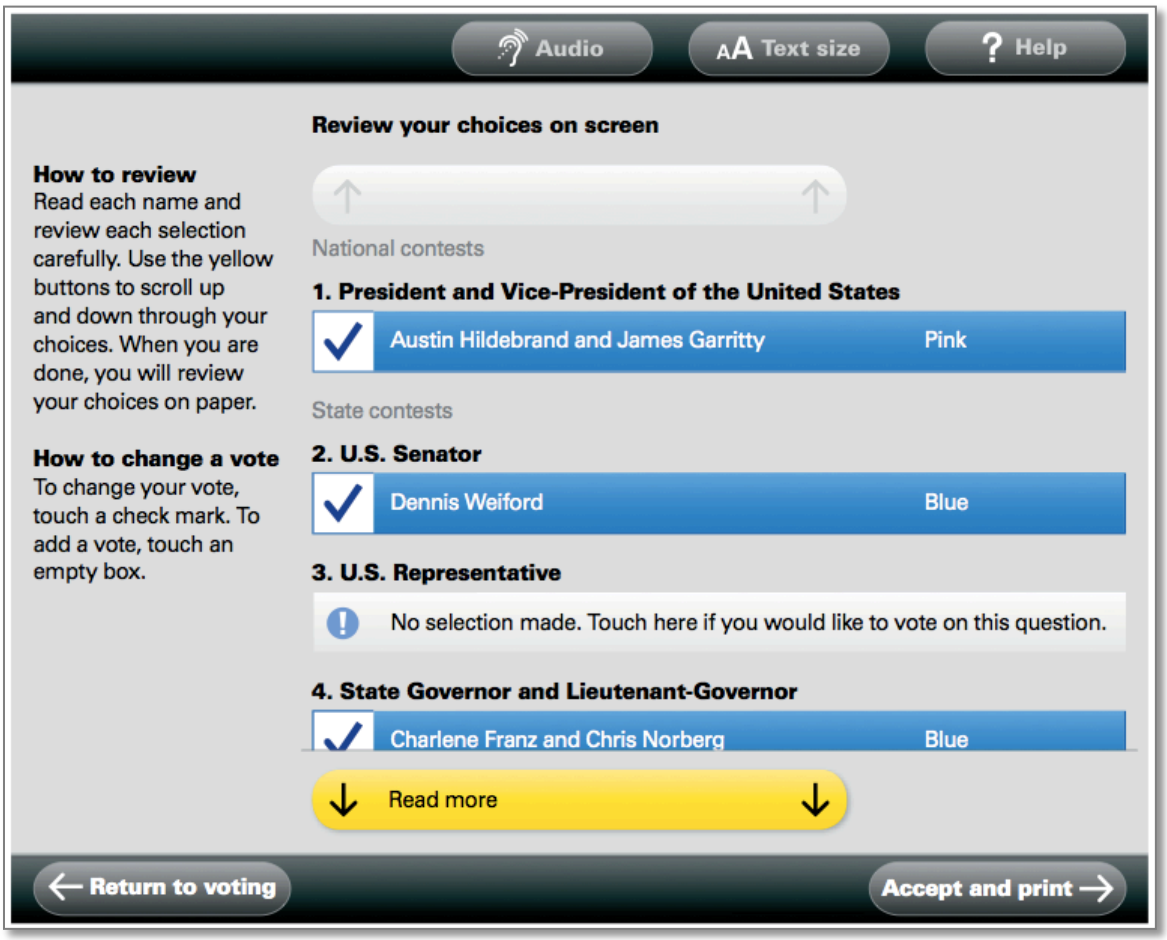
The word "choices" has different meanings in different modes in the interface: options that you can choose from, and then selections that you have chosen. When you are marking your ballot, you are choosing and making decisions between different options/choices. When you are at the point of reviewing, you are done making decisions – there shouldn't be any more options. Calling the review page "Review your choices" confused our low-literacy participants because there should be no more options at that point. High-literacy participants easily made the transition in modes, understanding that it meant "Review your selections," but low-literacy participants read it as "Review your options." When we changed it to the more descriptive, accurate, and concise "Review what you are voting for," participants moved through the review stage without difficulty.

Minimalism in all things, especially instructions

Instructions for voting in their sparest form helped voters. Positive, specific, prescriptive wording was the most helpful to participants.

There is a temptation to explain a lot when you suspect users – in this case, voters – need education, background, or justification for interacting with a design. Software often errs on the side of adding instructions to interfaces when there's a very large audience with a wide range of skills or domain expertise.

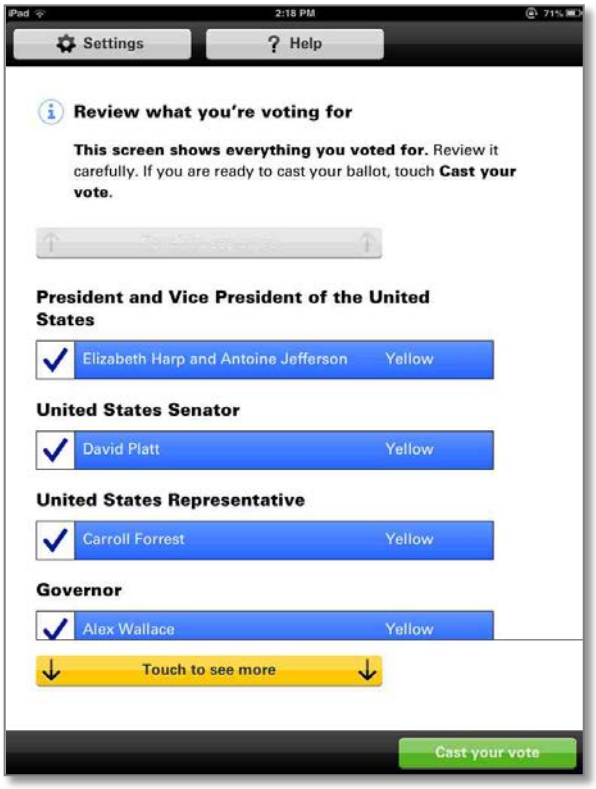
Redish, et al. and EAC's *Effective Designs* before it both assumed that more was better as long as it was in plain language. They thought that instructions should be complete and should cover how to mark the ballot as well as how to use the system. But when the system and the ballot design are tightly integrated, and then when the interface design of the ballot is simple and plain, there is less need for instructions and embedded assistance. And when instructions or messages *are* needed, they can be minimal and prescriptive.



Design for Democracy's proposed design for a "rolling DRE" review panel from 2007 showed interaction features similar to what many are now familiar with on iOS devices.

For example, on the review screen, we went from lots of explanations to one sentence, as shown in the images below.

The design of the Review page that we went into the very first session with included extensive instructions.



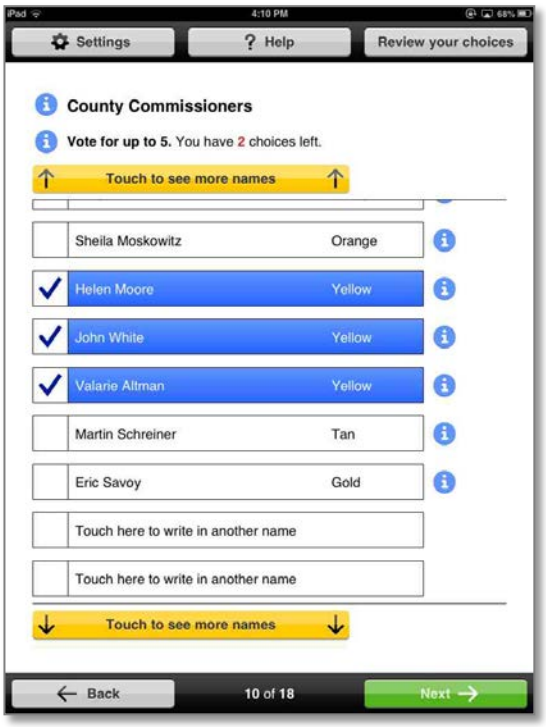
By the time we completed the last session, we had not only changed the wording on the heading, but had boiled the instructions down to 3 short sentences.

Sometimes designing for efficiency and preventing errors are not the same thing

We had to introduce a necessary hurdle for changing votes. On other interfaces, to make a change, a design would allow a user to simply touch a different option. But in voting, we want to be absolutely sure that the voter intended to make the change. In the Anywhere Ballot, if the voter tries to change a vote without deselecting first, we show a message with instructions. But the early versions weren't helpful to low-literacy participants because they required too much reading. Eventually, we simplified and shortened the message and bolded the key actions. We made it easier to return to the ballot from the message by adding a large Close button. We also allowed voters to touch anywhere outside the message to close it and return to the ballot.

Things we thought would help were actually disruptive and distracting

All great design comes from intent. Our intent was to help ensure the voter's intent. We formed a theory that layering in supplemental voter education content about the candidates or measures along with information about the contest itself would be helpful to voters. Consistent with other studies (Redish, et al 2009[2]); Center for Information & Research on Civic Learning and Engagement[6]), we had seen in our various interactions with voters that people with low education are missing some basic civics concepts. This means they don't have a clear understanding of the hierarchy of government. For example, they confuse U.S. Senator with State Senator. This issue can make navigating an electronic ballot difficult.



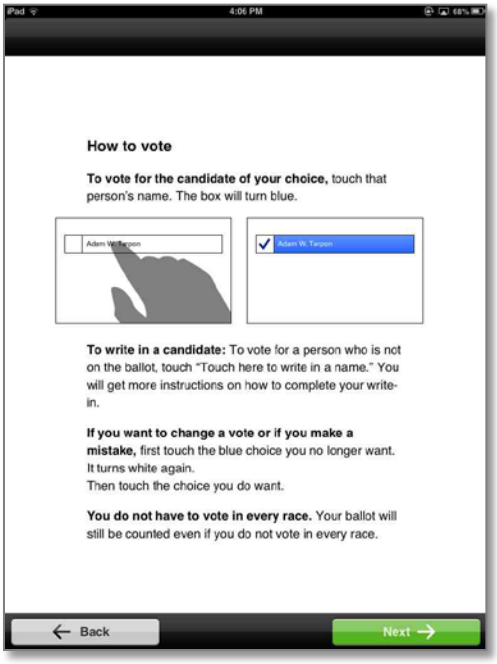
Voters can tap the blue "i" buttons to get to help on the contest or instructions or to see candidate statements.

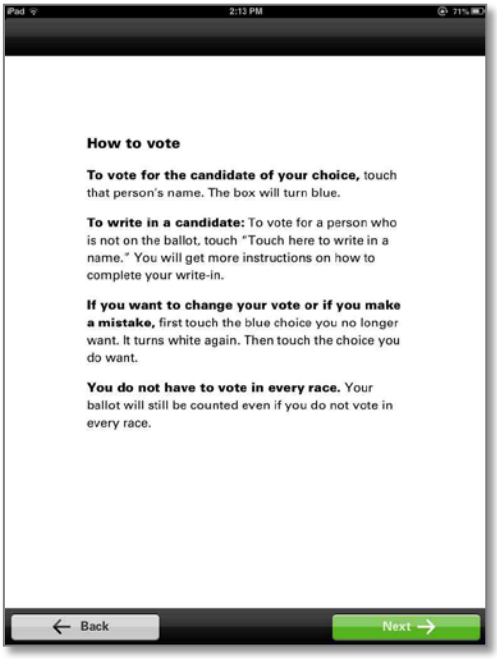
To address this lack of civic education, we borrowed content from voter guides we found online, and looked at conventions used in other mobile apps for helping users discover supplemental content.

As with so many theories – proving out the usefulness of testing – adding educational content to the ballot actually distracted our low-literacy voters:

- Participants expected blue "i" buttons next to each candidate name to mark their vote and got confused when something else happened, especially lightbox messages that had a lot of text in them.
- Lengthy content about candidates did not help people with low literacy and reading disabilities. It was painful for voters with short-term memory loss.

We also found that having illustrations in the Help to show how to mark the ballot was not helpful. Participants expected them to be interactive and became frustrated when the illustrations were not interactive.



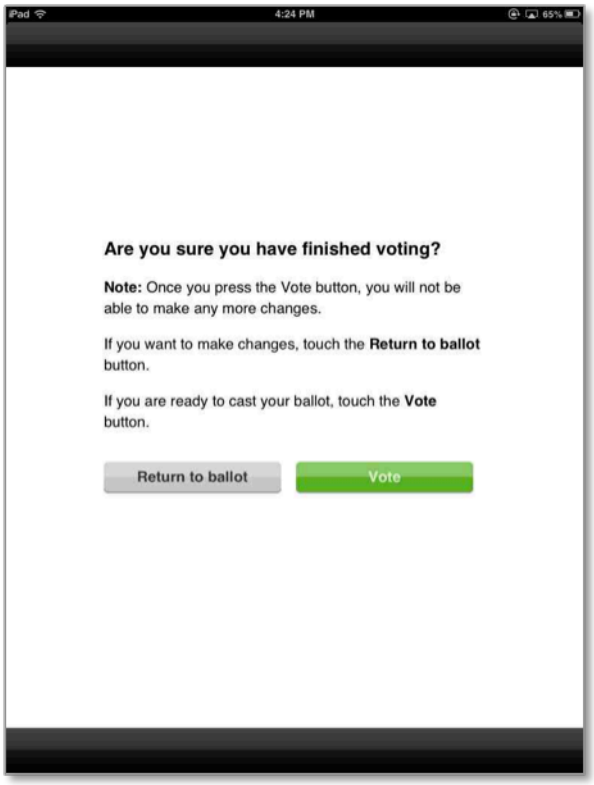


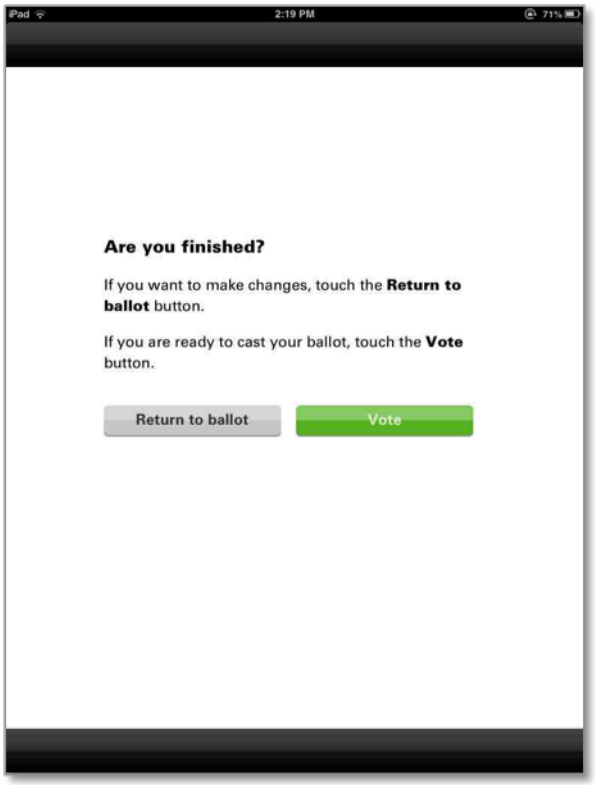
Surprisingly, the illustration not only didn't help, it got in the way. The instructions without the illustration were easier to scan, and participants were more likely to find the answers they needed.

Niceties can be intimidating

It has been a convention of operating systems for 30 years to offer confirmation messages. It can be difficult to get the wording right. But generally user interface designers have settled on wording similar to "Are you sure…?" We adopted this in our confirmation message that comes up after the voter taps the Cast Vote button without thinking much about it. But it turns out in this context that wording can feel intimidating, which makes voters anxious. Anxiety blocks cognitive function.

When we replaced what we thought was considerate wording with telegraphic wording, we saw considerably less anxiety from participants. They voted more confidently.





Minimizing the words and focusing on the behavior we wanted voters to perform helped voters know what to do and feel confident about it.

Conclusion: Plain interaction helps voters flow through the ballot

Much of this design project was about taking things away rather than adding them to make voting easier. When we were able to pare the language, interaction, and steps to the essentials, voters were effective and efficient in marking and casting their ballots. They were satisfied that they had voted the way they had intended.

In a post hoc conversation with Shaun Kane, in which we described our ballot and how some participants interacted with it, Shaun asserted that the design implemented "plain interaction," a parallel to plain language. When language is plain, people who are the audience can find what they need, understand what they find, and act appropriately on that understanding.[5] Plain interaction includes:

- minimizing content so there is less to pay attention to
- putting everything you have to pay attention to in a linear reading path or linear information path, so that everything happens where the user is already paying attention

[5] Center for Plain Language, http://centerforplainlanguage.org/about-plain-language/

- designing to minimize the user's reliance on working memory
- clear instructions and affordances
- simple messages about what you're supposed to do
- telegraphic feedback about results of actions taken

Focusing on designing plain interaction means that it is easy for users to infer what to do from how the design looks and behaves. There is very little learning to do. Users can still do what they need to do even if they don't grasp the larger structure or context of the specific interaction within a larger application.

Guidelines for designers

While the Anywhere Ballot is available as a template (and you can borrow from our pattern library described on page 92 and available online at anywhereballot.com/library), observations from our study indicate some guidelines for designers of ballots (and similar forms) for this audience of voters.

Plain language must be simple and short

For decades, people in the plain language movement have urged simple words and short sentences. In this study, our participants demonstrated that working strictly best practice isn't enough. We are experts. We've studied, we've practiced, we've taught. And we started with the simplest, clearest language we could think of. And yet, participants misunderstood headings and buttons that we thought were good. Testing allowed us to

- observe people interact with the design
- understand the importance of the embedded assistance, clear headings, and labels.

These insights made the difference in the success of our final design.

Minimal text, short sentences

A telegraphic, concise style worked best. Direct sentences or labels, with tight, positive, active construction made it easier for participants to be effective. They could easily scan the page, take in the headings and instructions (probably without being conscious of it), and act. People with low literacy could easily see what to read, read it, and then act on what they read.

Before

You could have voted for 5 candidates, but you only voted for 3.
If you want to vote for more, touch here.

After

You voted for 3 people. You can vote for 2 more.
If you want to vote for more, touch here.

Specific, concrete, familiar words

English is loaded with words that have multiple meanings, depending on context, mode, case, and other factors. As a high-literacy person, it is easy to forget just how nuanced meaning can be. It is impossible to emphasize this point too much: Use plain words that are specific to the action.

Avoid ambiguity. Using vocabulary that is specific, concrete, and familiar helps everyone. People with low literacy and cognitive issues recognize letters, words, and meaning more quickly because there's less to parse. People with better literacy can act without conscious thought about the meaning.

Before
Review your choices

After
Review what you voted for

No jargon

When you're inside a domain, it is easy to forget what is and what is not a term of your art. Voters, even the kind who vote in every election, aren't fluent in election terminology. Studies besides ours show that even college-educated voters don't know terms such as "partisan," "over vote," and "under vote." Some terms are unavoidable, such as "write-in," but there are ways to use them that suggest meaning in a helpful way.

Before
Add a write-in candidate.

After
Touch here to write in another name.

Plain interaction flattens and streamlines for flow

With HTML5 and CSS3, there's the temptation to include cinematics and fancy moves in a digital interface. (Cinematics are elements added to user interfaces to convey movement, action, or a change in state or mode. For example, when an image bounces when a user hovers over it with a mouse, this is a kind of cinematic feature.)

Also, in this period of emerging user interface conventions for small devices, there are options galore for layering content into an application or an interface. It is *possible* to do, and it seems like more features must be a good thing. But we actually found that *less* is *more.*

We started out with a fairly simple and clean interface and interaction model, and just kept taking things away. First, we took away words. Then we took away buttons. Then we took away more words. Then we took away what we considered to be bonus content – voter education information about candidates and lengthier instructions. We took all of these things away because they were not helpful to our study participants, and in some cases got in the way.

We ended up with a flatter interface with a more streamlined flow than we started out with. And when we simplified the microinteractions as much as we knew how, it all came together as what we think of as *plain interaction*.

Plain interaction puts users into flow. It is easy to infer what to do without consciously having to ask what to do, where to go, or how to move forward in the activity path. Plain interaction allows users to focus on the immediate interaction by

- eliminating extra visual elements and non-essential interaction
- minimizing content, leaving less content and interaction to pay attention to
- streamlining to focus all cognitive resources on the activity at hand through linear layout of the page[9] [10]

For our ballot design, a key property of the layout that supported plain interaction was putting everything voters have to pay attention to in a linear reading path or linear information path.

Large (enough) type size

Small print is hard to read for many voters, and on a digital interface, you may have glare to contend with, too. Use 3.0 to 4.0mm for screens.[8]

Also, avoid centered type. Left-aligned type is more legible than centered type, which forces the eye to hunt for the start of the next line. Mixed case also helps readers recognize word shapes more quickly than words in all uppercase.

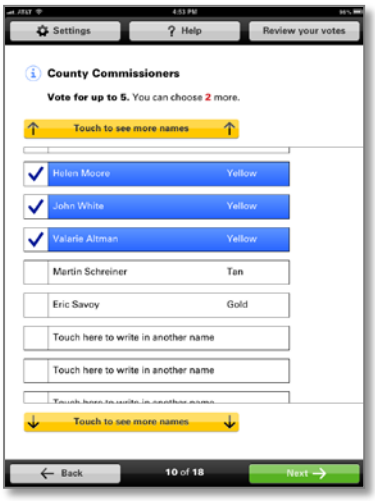
Before

After

Support actions users take

For voters who are familiar and comfortable with a gestural, touch interface, we supported dragging the scrollbar and flicking a finger near the content area. But not everyone knows how to use a gestural or touch interface, so we included buttons for scrolling and specific interaction for selecting. Likewise, having reasonably large button targets that didn't rely on subtle physical motion helped voters with dexterity or coordination problems.

Good example

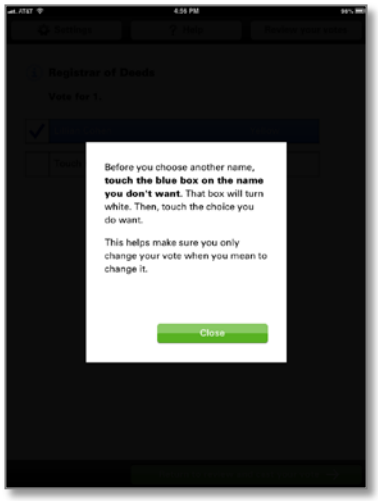


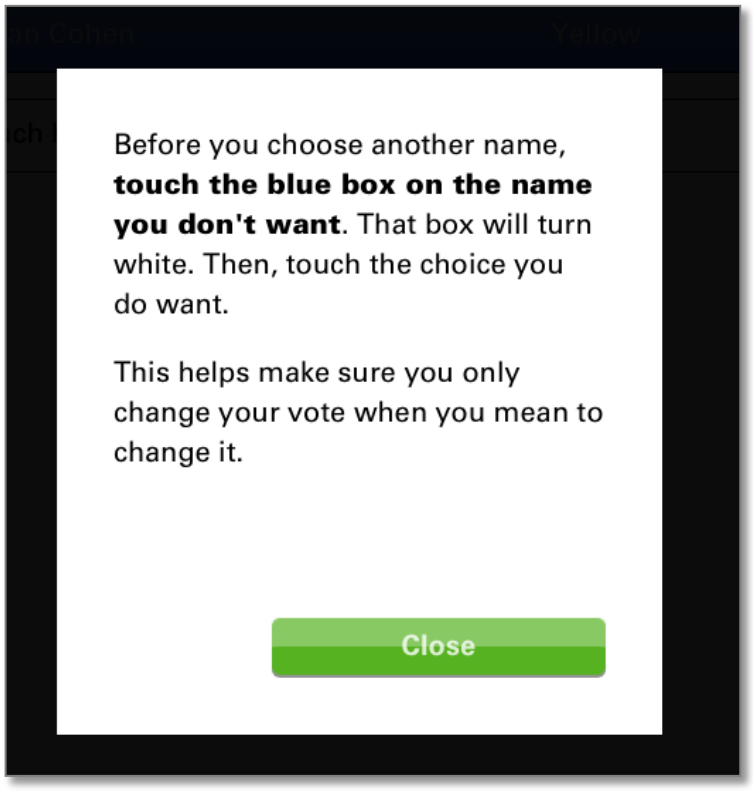
Support immediate action (where possible)

Ideally, users can read and do in the same place at the same moment. This means it is easy for them to infer what to do because there are clear affordances (it's easy to see what is tap-able and what isn't) and feedback (the choice is selected; the message copy confirms or explains the result of an action). In addition, all of the interaction happens where the user is already paying attention. There should be no need to shift attention and then try to find your way back. Users can do what they need to do even if they don't grasp the larger structure or context.

We did create our own exception to this rule: forcing voters to deselect to change their vote. Because we wanted the voter to be clear in her intentions, and to avoid mistakes in marking choices on a very sensitive surface, we forced voters to deselect one choice so they could make a new choice. So, while the interaction design here is unconventional, it is deliberate. The message voters get gives clear, simple instructions about what to do and how to do it.

Good example

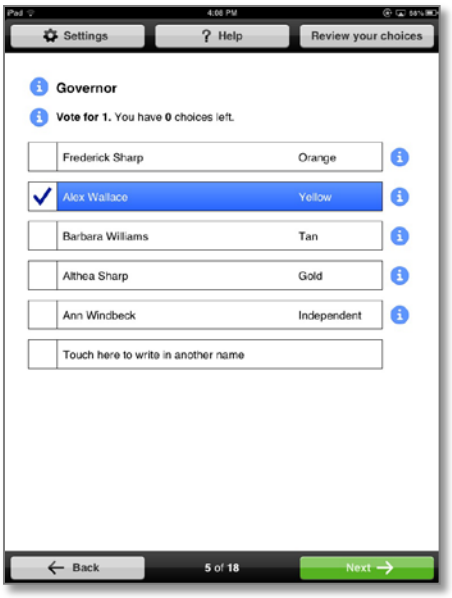




Eliminate distractions and disruptions

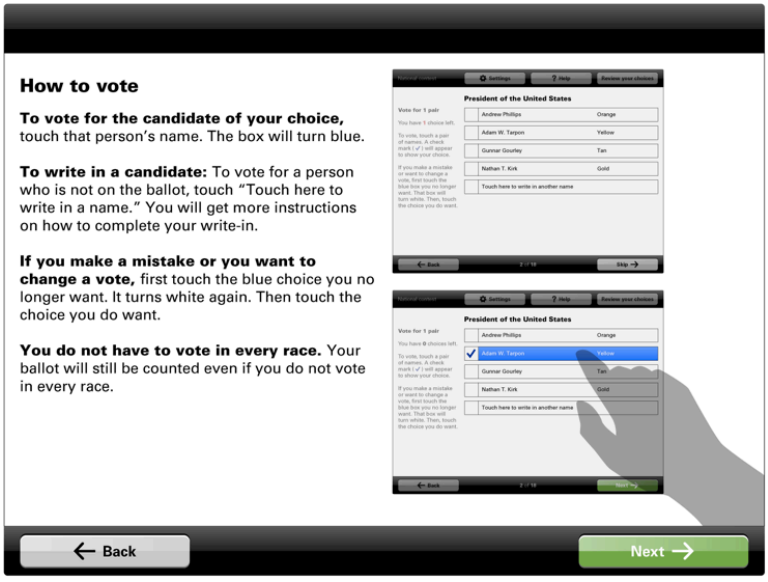
We had included features we thought would be useful, but testing showed they were distracting and prevented participants from marking their choices. Features may be fun or interesting, but on smaller screens, it is best to offer only what is essential for the task and specific interaction.

Before – contest example

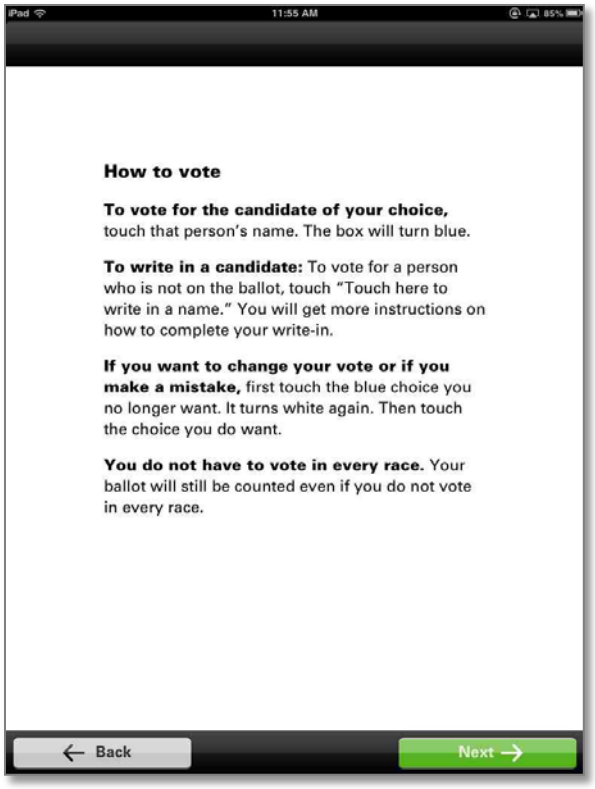


After – contest example

Before – help content example



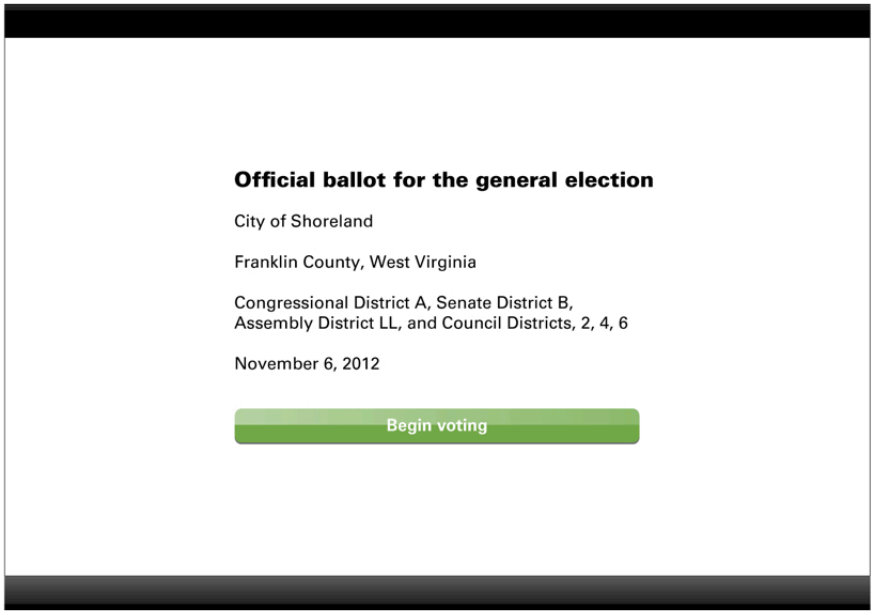
After – help content example



Outcomes

This section documents the main page types in the ballot and the major design iterations they went through – notably, the successes. Not all of the iterations succeeded, of course. Many of those versions are not worth documenting. However, taken together, the major insights (starting on page 20) and these illustrations should help designers and research teams who decide to use the Anywhere Ballot see the rationale for the design we ended up with.

Opening screen

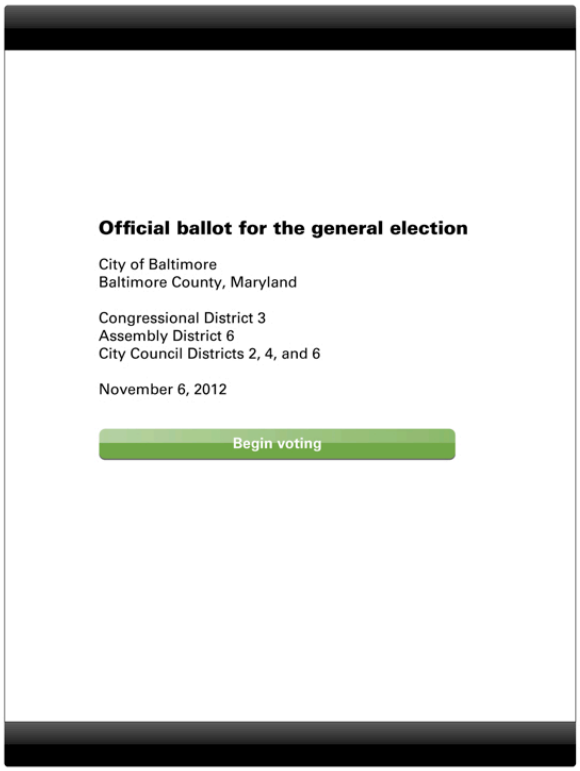


Iteration **1**

We customized the ballot for the location, making it for an election in Baltimore, and reflecting real districts.

We also shifted from a landscape format to a portrait one, partly in preparation for moving to tiny screens.

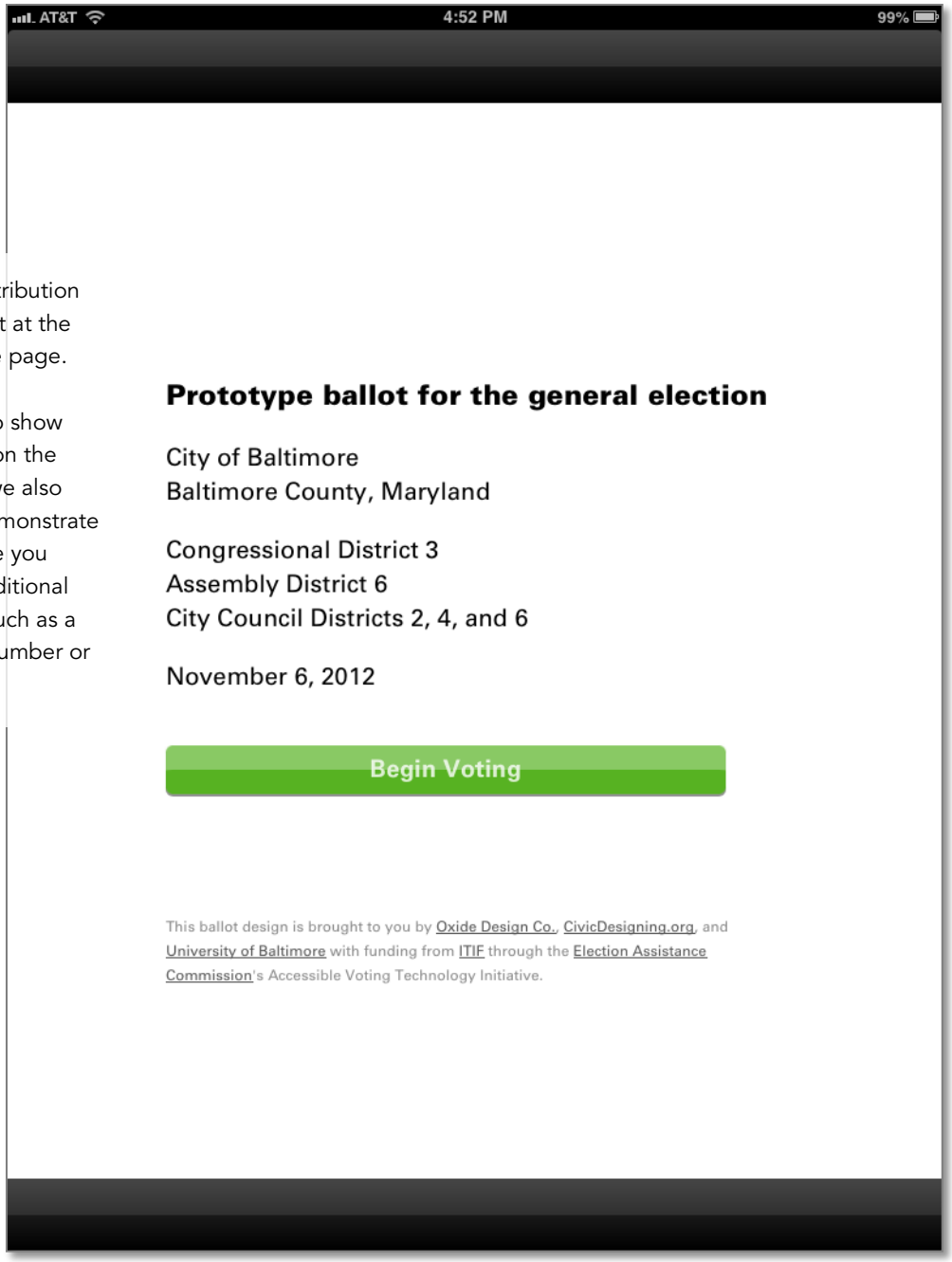
Iteration **3**



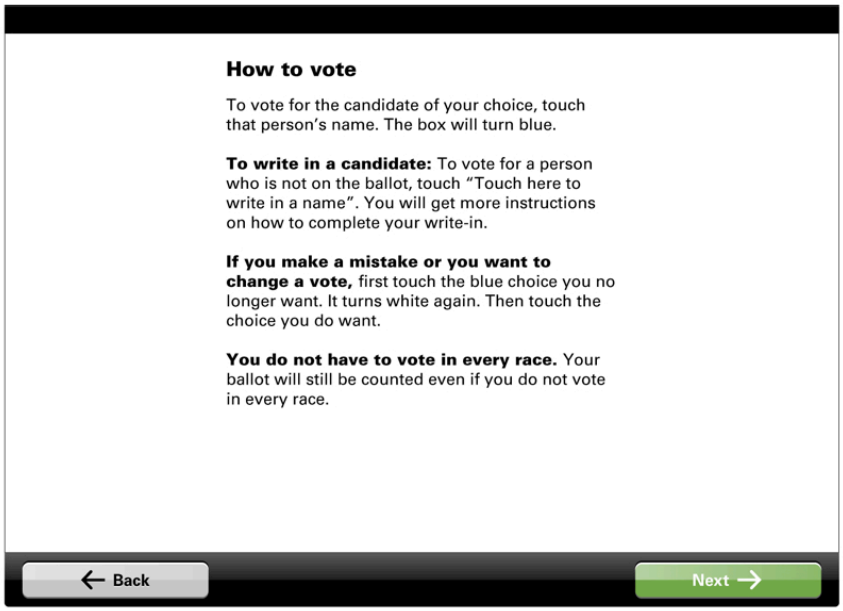
Final

We added attribution for the project at the bottom of the page.

We wanted to show who worked on the project, but we also wanted to demonstrate an area where you might put additional information such as a help phone number or link.



Instructions to voters

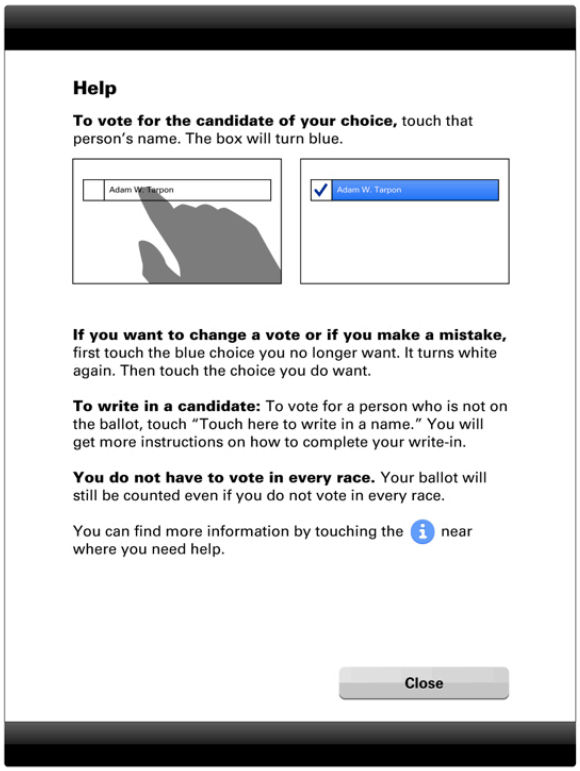


Iteration 1

How to vote appears after the title screen. We took the text from a study NIST commissioned on the language of instructions on ballots by Redish et al.

We created a similar, but separate version to come up when the voter touches the Help button. In addition, we added a pointer to context help (the blue "i").

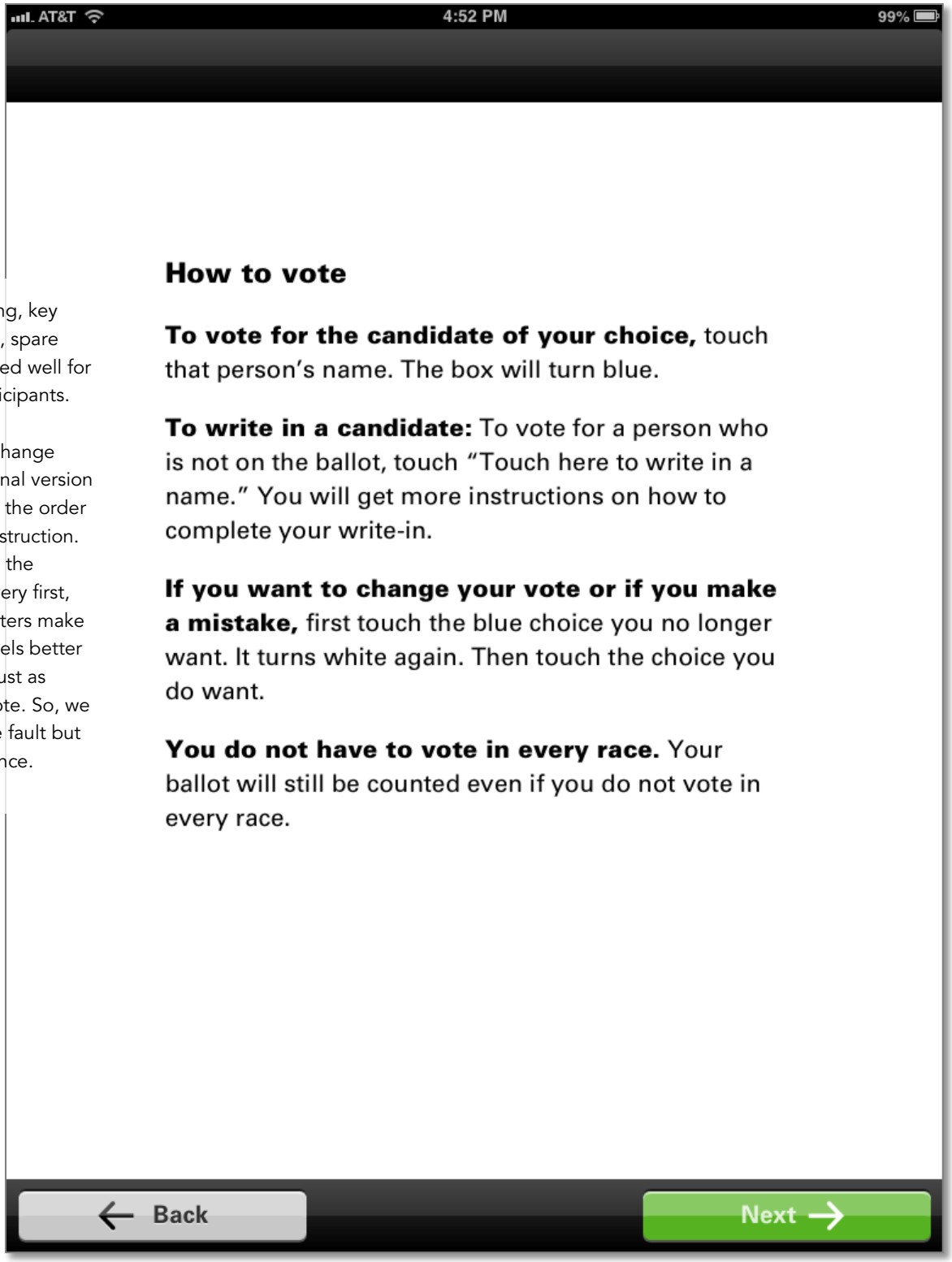
Help version



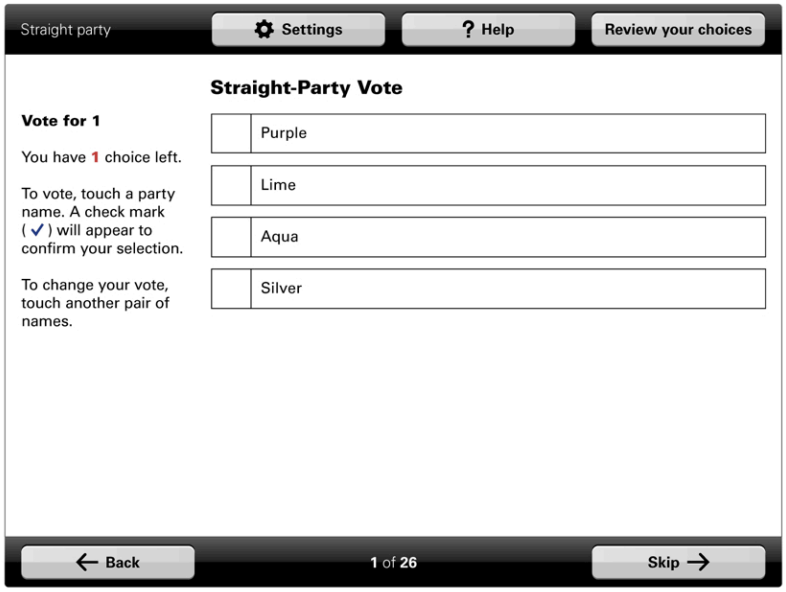
Final

Simple heading, key words in bold, spare wording worked well for all of our participants.

The biggest change from the original version was changing the order of the third instruction. It started with the mistake recovery first, but even if voters make mistakes, it feels better to think of it just as changing a vote. So, we took away the fault but kept the essence.



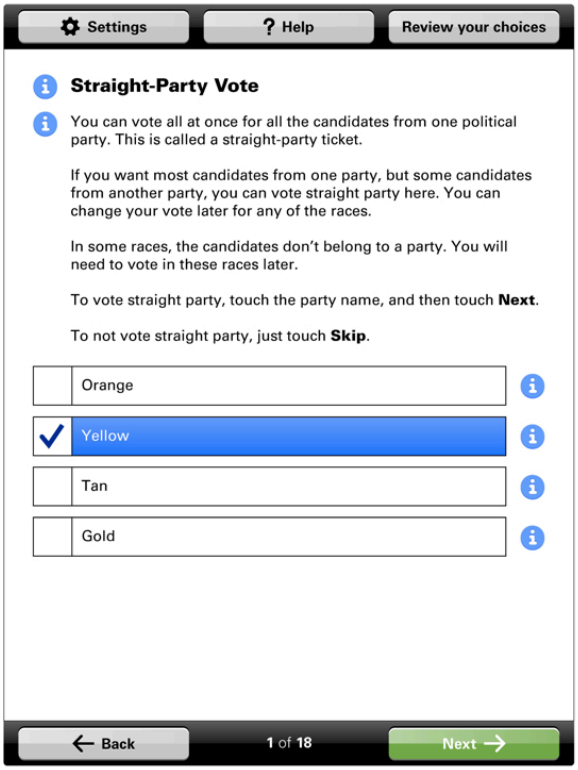
Straight-party voting



Iteration **1**

Our ballot was based on the NIST medium ballot, which includes straight-party voting. Even though Maryland doesn't use it, we wanted to test the concepts and flow.

The vertical layout enforces order. Here you can see we also added the "i" buttons for supplemental content (context help).



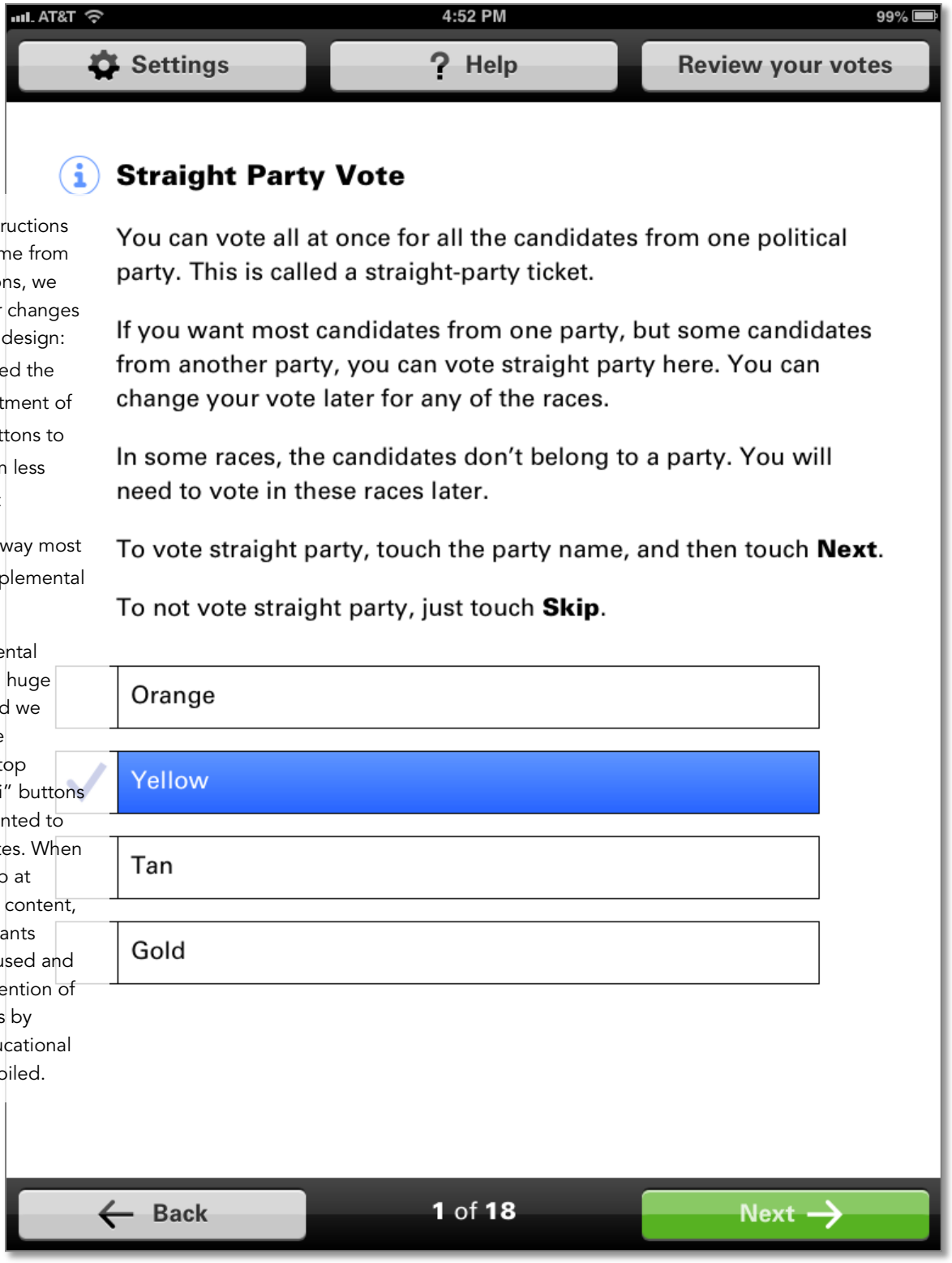
Iteration **5**

Final

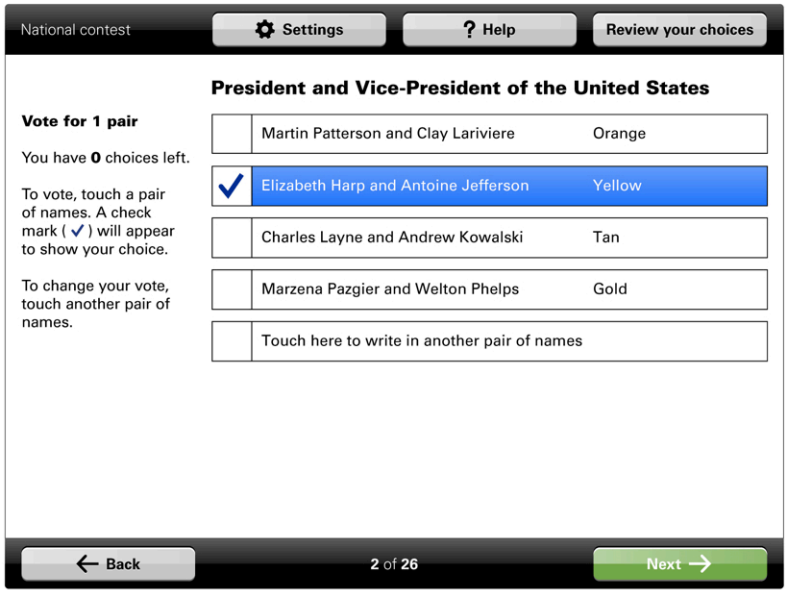
While the instructions stayed the same from earlier iterations, we made 2 major changes to the overall design:

- We changed the visual treatment of the "i" buttons to make them less prominent
- We took away most of the supplemental content.

The supplemental content was a huge distraction and we couldn't make participants stop tapping the "i" buttons when they wanted to mark their votes. When they ended up at supplemental content, some participants became confused and stuck. Our intention of helping voters by providing educational content was foiled.



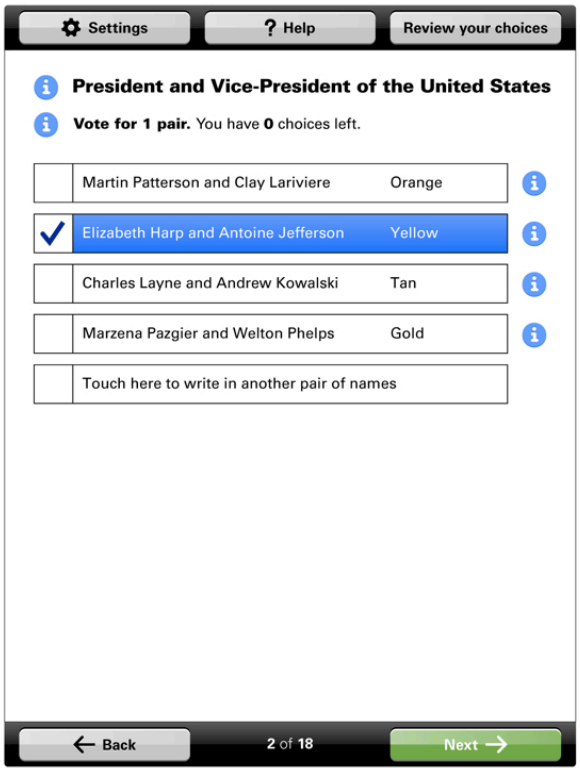
Vote for 1



Iteration **1**, selected state

While voting straight party needed more instructions, typical *Vote for 1* contests needed fewer instructions.

We found showing the number of choices remaining to be helpful to participants.

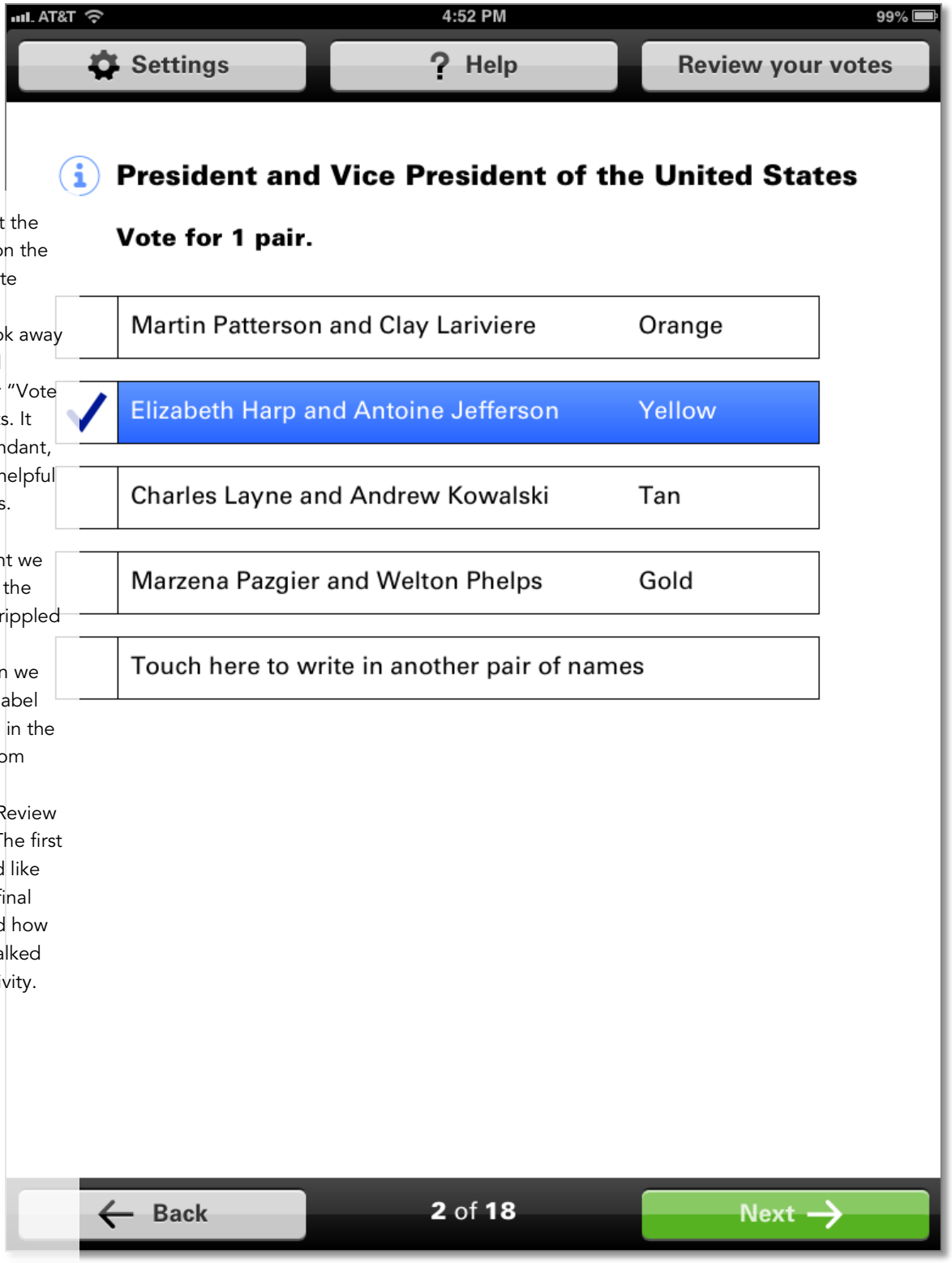


Iteration **4**

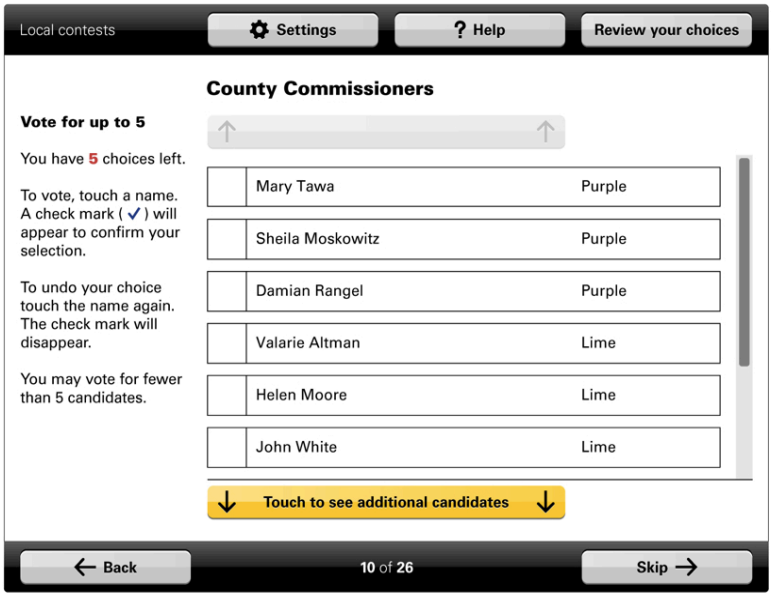
Final

While we kept the countdowns on the multi-candidate contests, we eventually took away the additional instruction for "Vote for 1" contests. It seemed redundant, and it wasn't helpful to participants.

A major insight we gained about the Review page rippled through the interface when we changed the label on the button in the upper right from "Review your choices" to "Review your votes." The first label sounded like options. The final label reflected how participants talked about the activity.



Multi-candidate contests

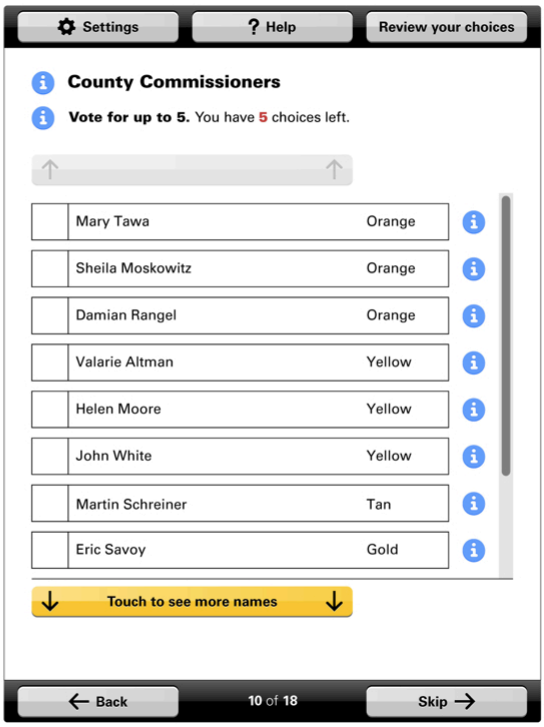


Iteration **1**

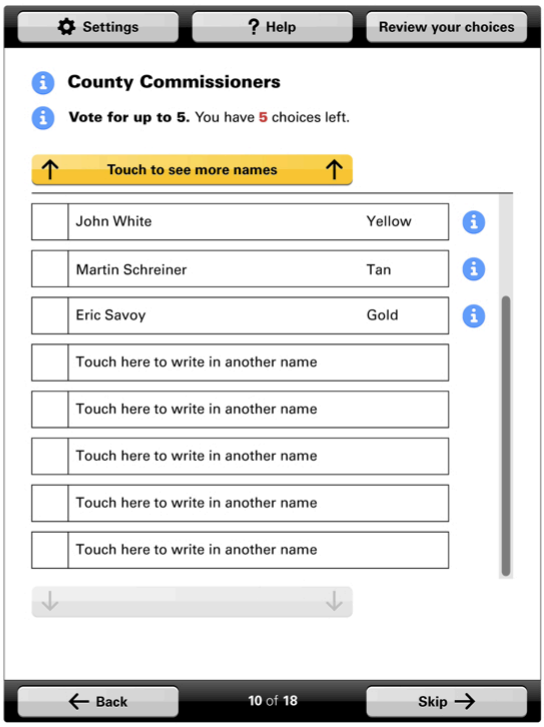
Iteration **1**, selected state

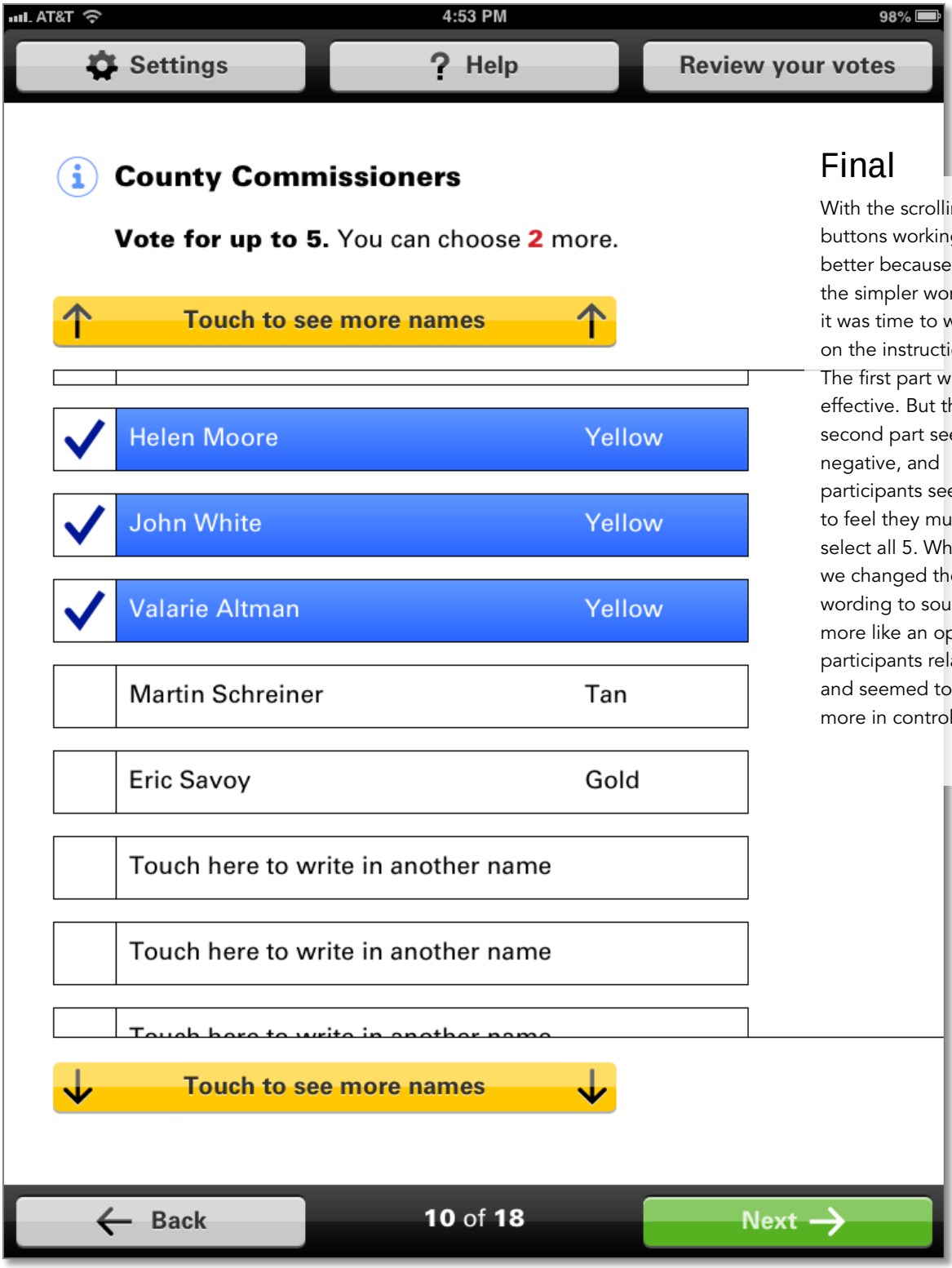
The final iteration on multi-candidate contests removes a lot of instructional text. It also simplifies the label in the scrolling buttons, going from "additional candidates" to "more names."

Iteration **4**



Iteration **4**, scrolled

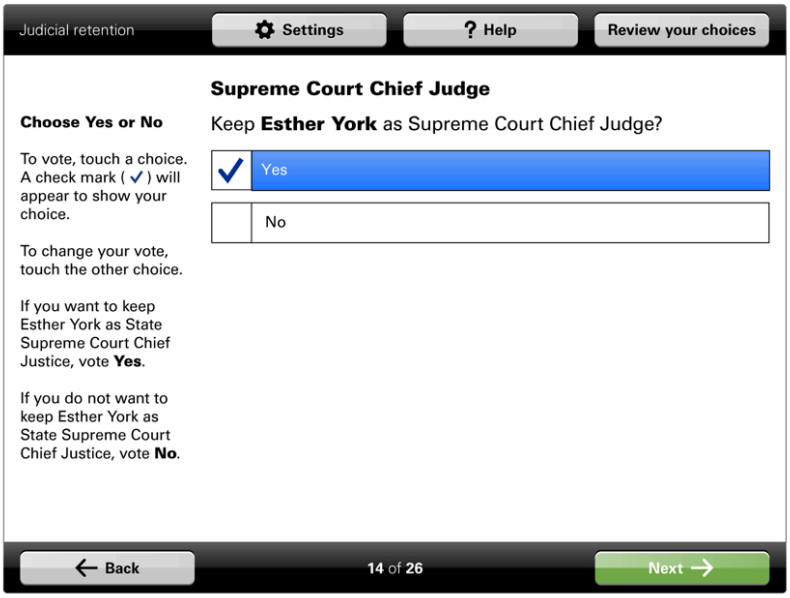




Final

With the scrolling buttons working better because of the simpler wording, it was time to work on the instruction. The first part was effective. But the second part seemed negative, and participants seemed to feel they must select all 5. When we changed the wording to sound more like an option, participants relaxed and seemed to feel more in control.

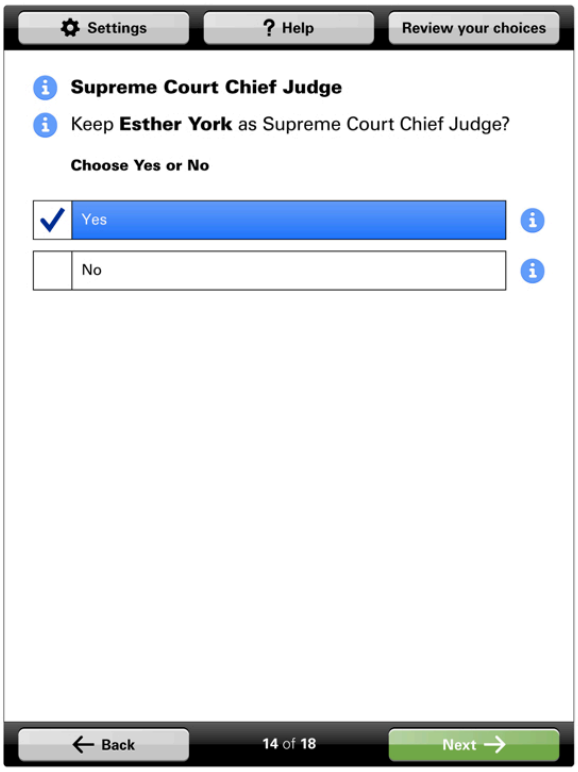
Judge retention contests



Iteration 1

Again, we removed the instructions here – with the exception of "Choose Yes or No" – but allowed for supplemental content.

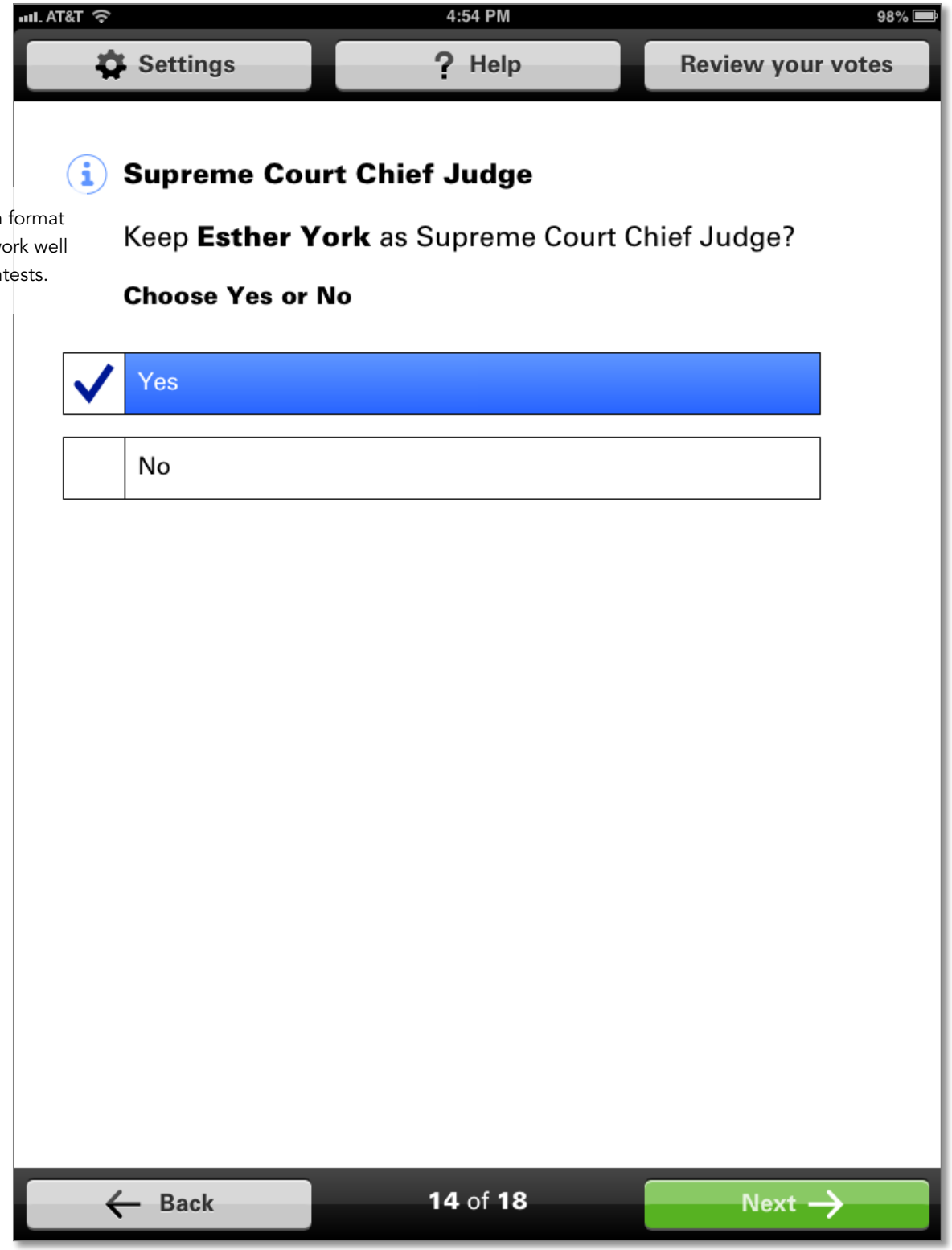
Touching the "i" next to the question gives instructions for voting in the contest.



Iteration 3

Final

The question format seemed to work well for these contests.

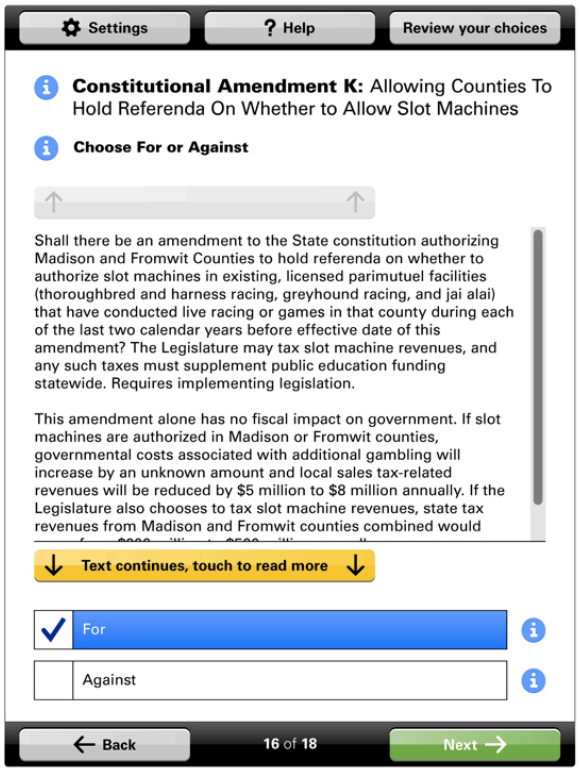


Referenda

Iteration **1**

The vertical layout gives room to have more text for ballot questions.

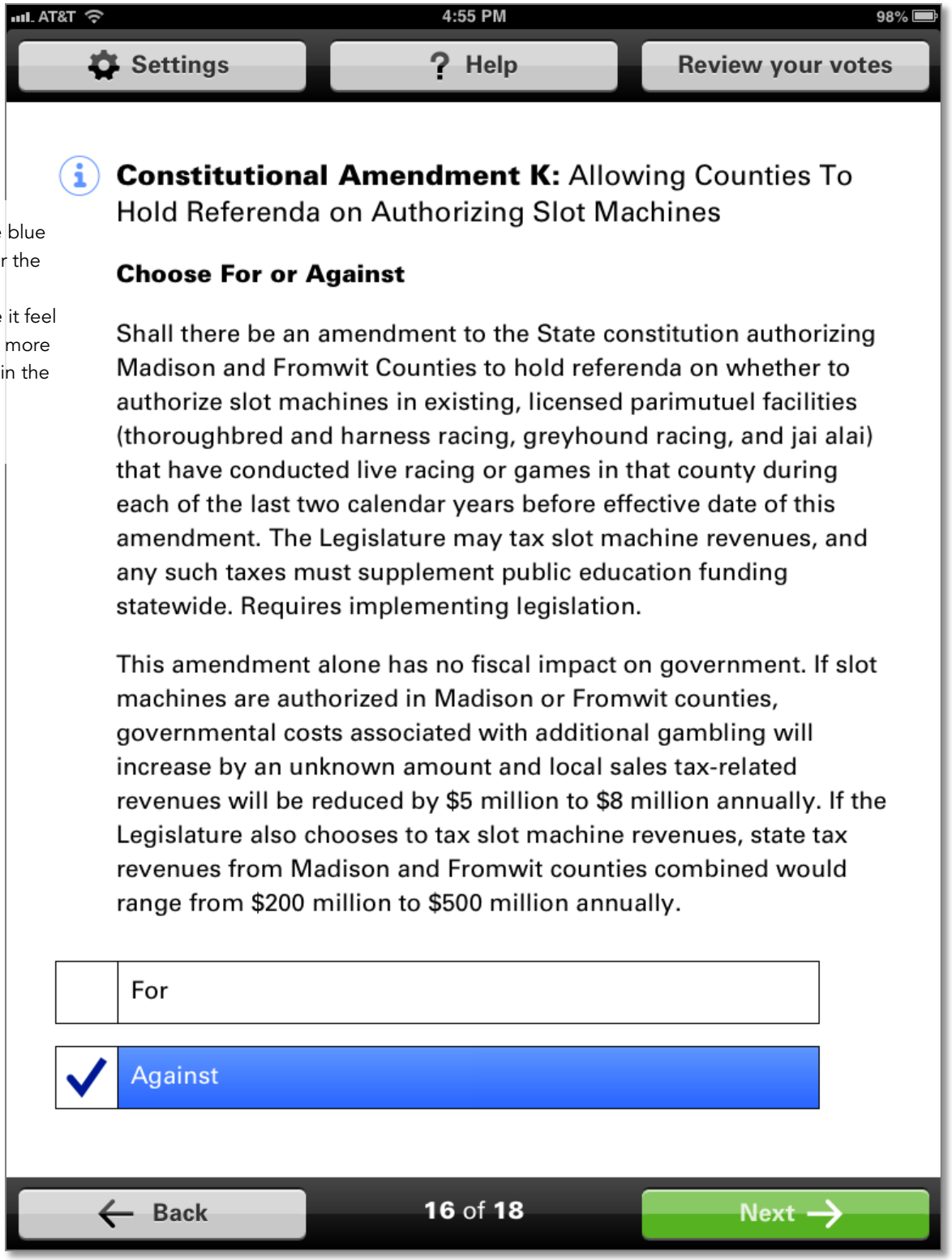
Again, we pared the instructions down to the minimal "Choose For or Against."



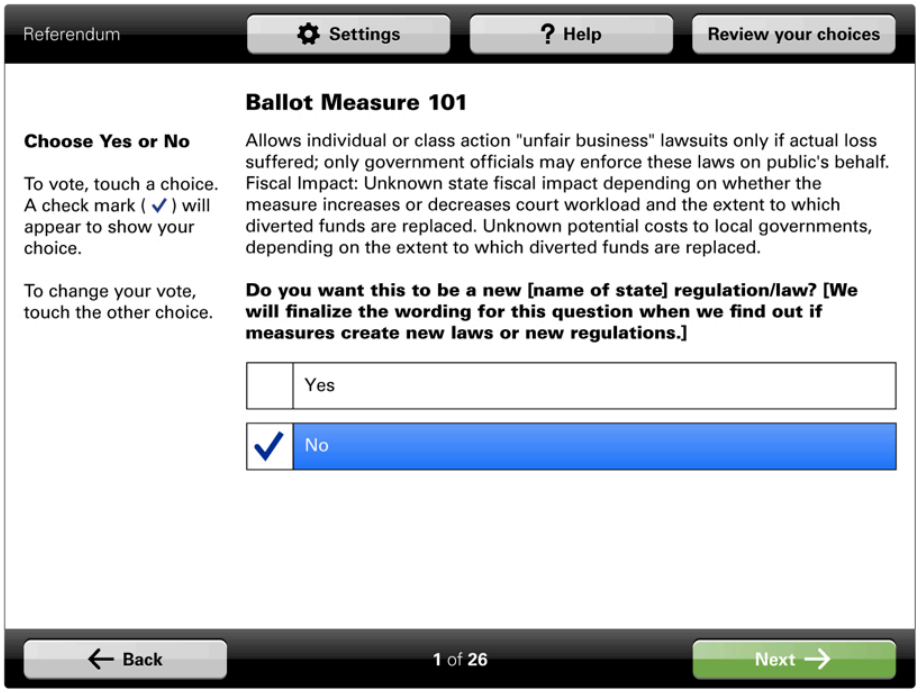
Iteration **4**

Final

Removing the blue "i" buttons for the supplemental content made it feel like there was more room for text in the question.

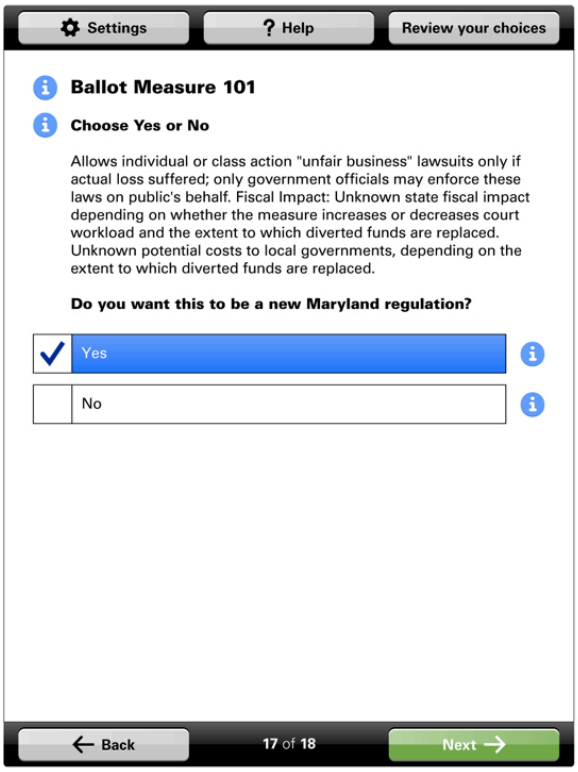


Ballot measures



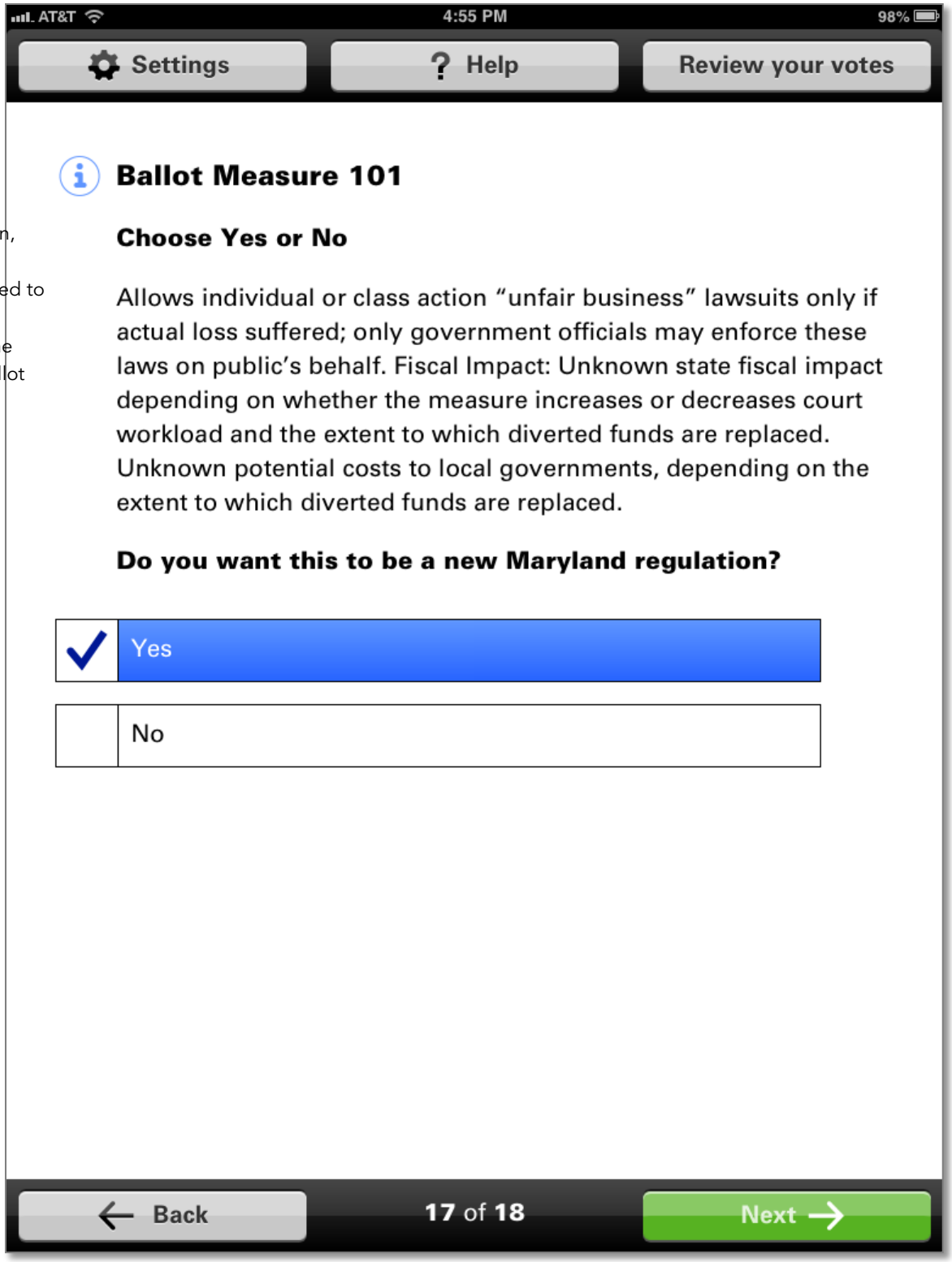
Iteration 1

Iteration 4

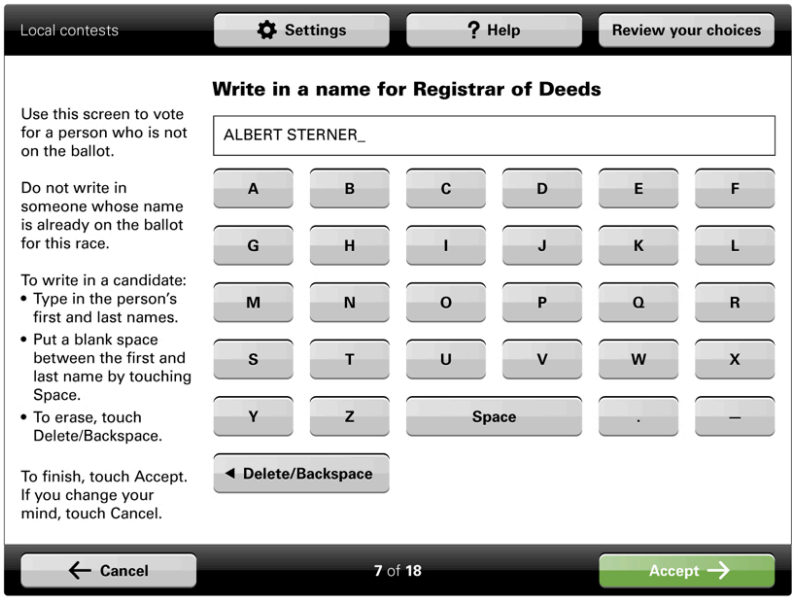


Final

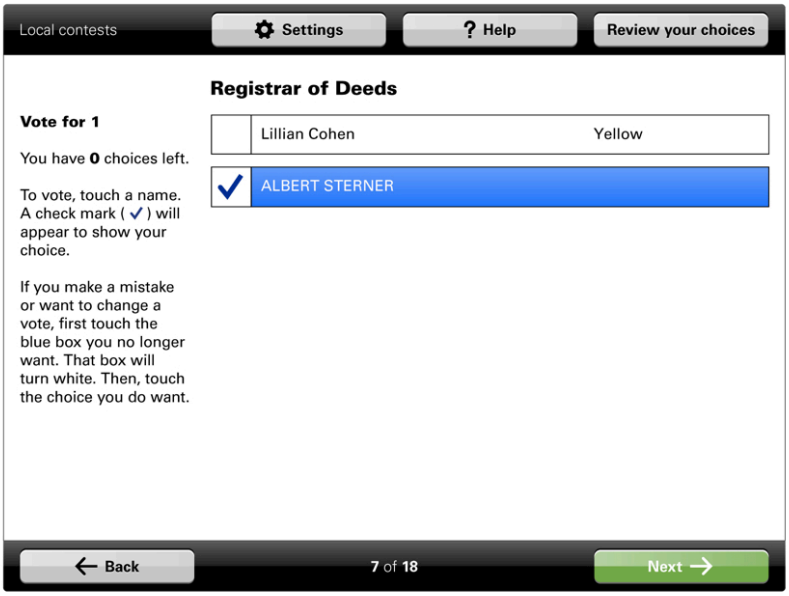
The instruction, question and choices seemed to work well throughout the testing for ballot measures.



Write-ins



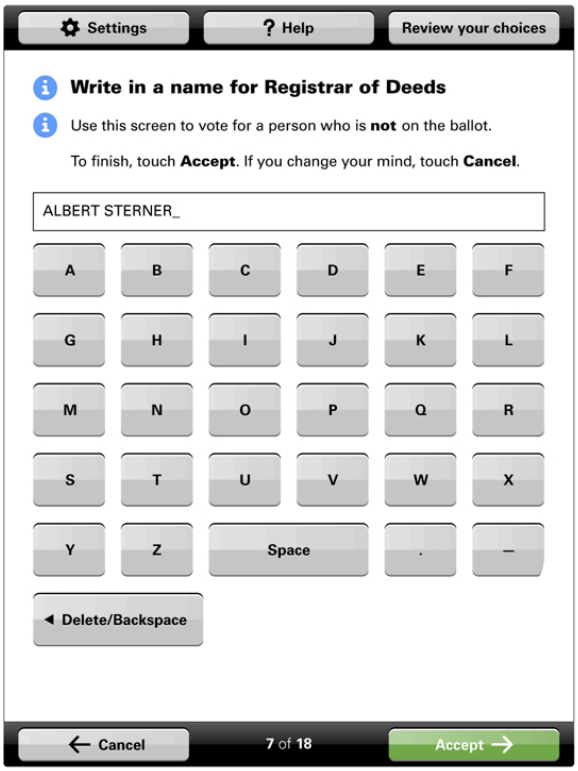
Iteration **1**



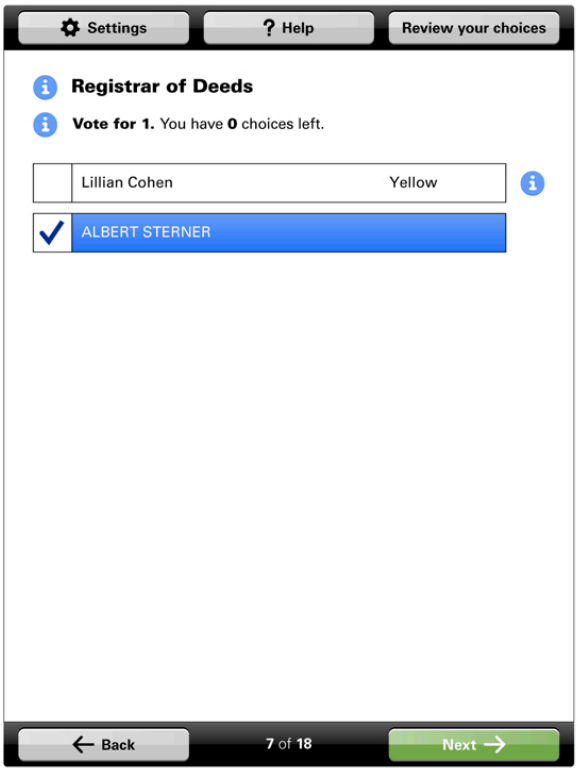
Iteration **1**

One task was to write in a candidate. We decided that the essential instruction was about not writing in someone already on the ballot, and moved everything else to supplemental content.

Iteration **2**

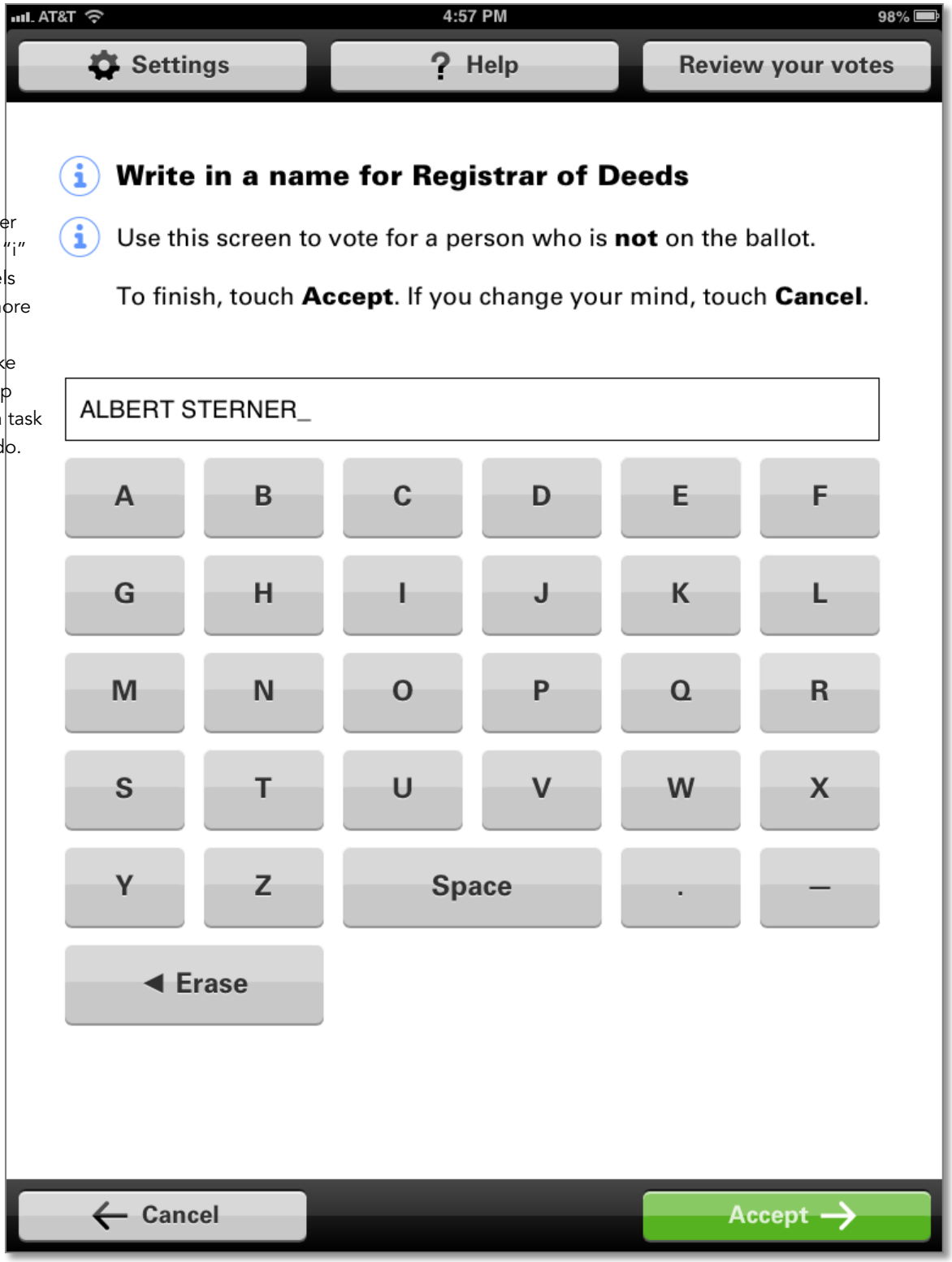


Iteration **2**



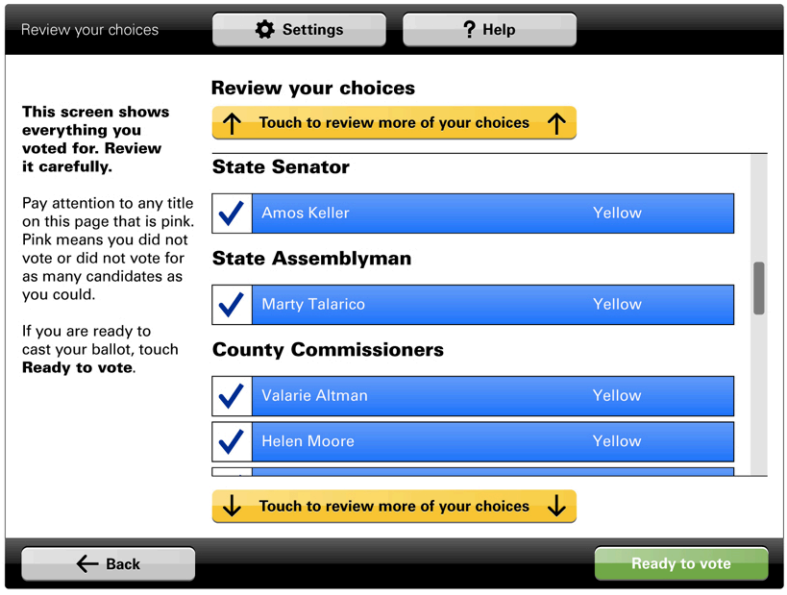
Final

With the lighter weight of the "i" buttons, it feels like there is more room, but we could still make additional help available for a task voters rarely do.

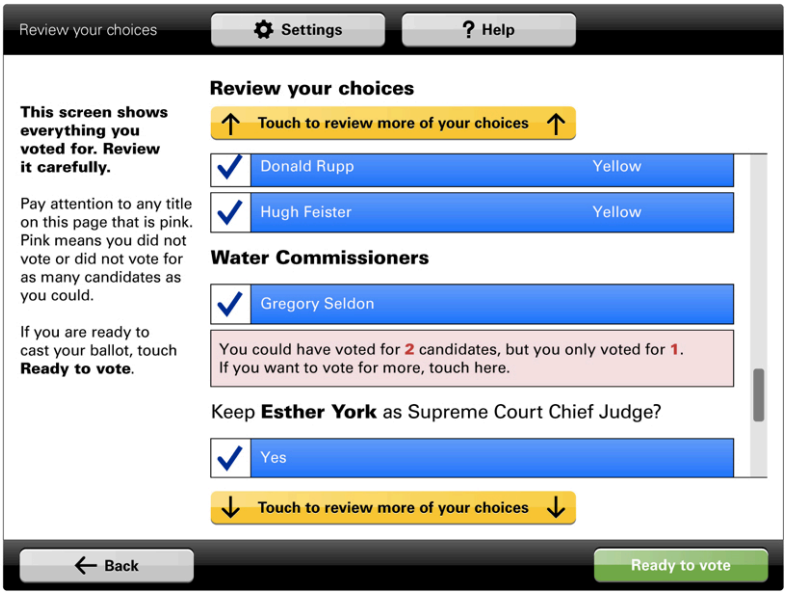


Reviewing votes

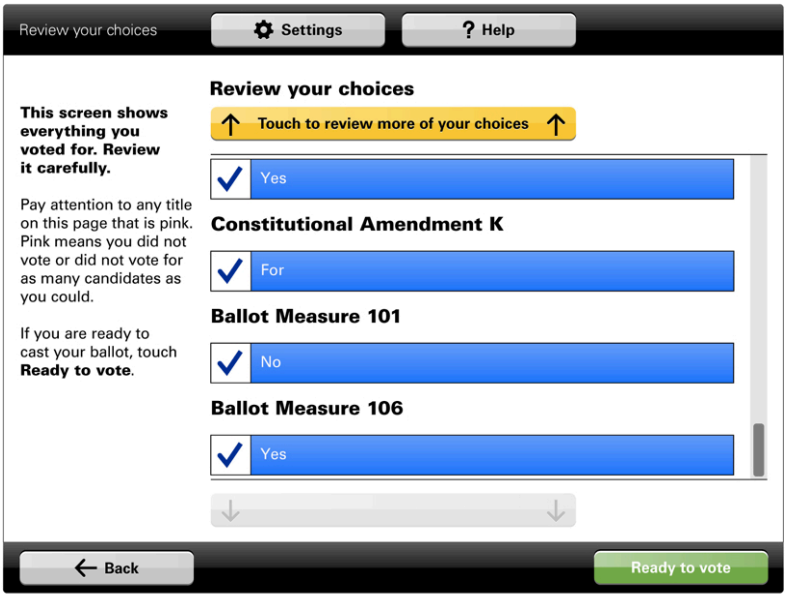
Iteration **1**



Iteration **1**, scrolled down (page 2)



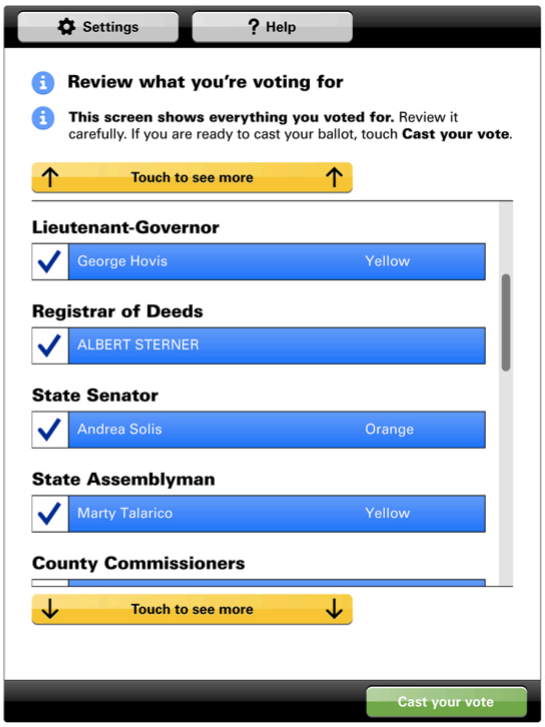
Iteration **1**, scrolled down (page 3)



Iteration **1**, scrolled to the end

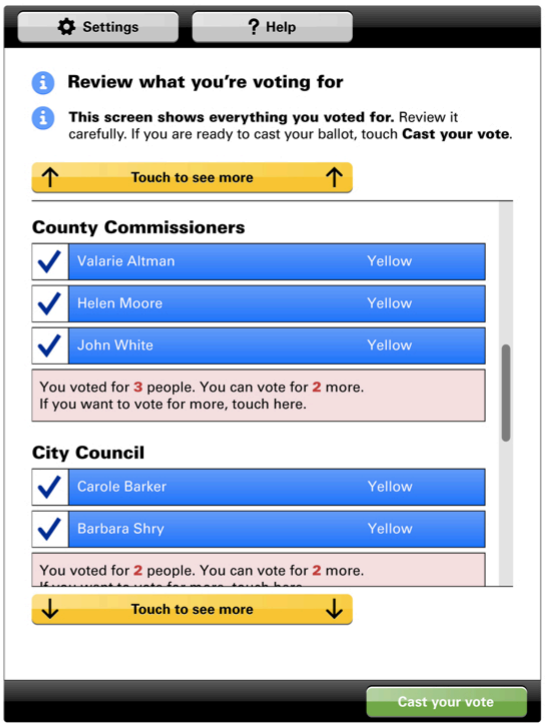
By far the most problematic part of the ballot was the review screen. Some of the issues had to do with the visual design in the earlier versions, such as the spacing and leading between the titles and names in the contests.

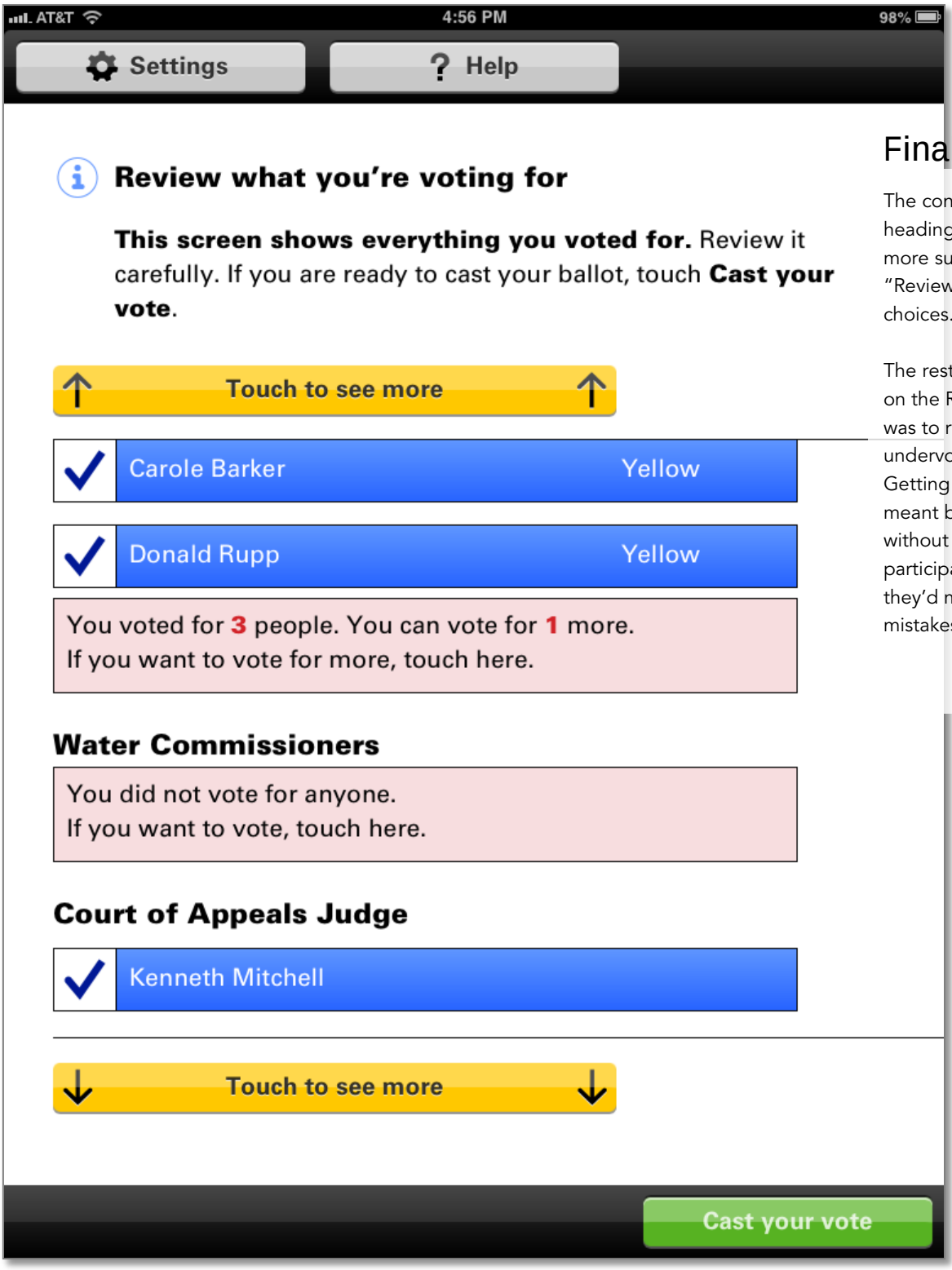
Iteration **4**, scrolled down (page 2)



But we found that participants still had a very difficult time understanding the purpose and use of this screen until we realized that "reviewing choices" suggested that there were still decisions to make. This "ah ha" moment gave us words to change the heading and button labels. They worked.

Iteration 4, scrolled down (page 3)





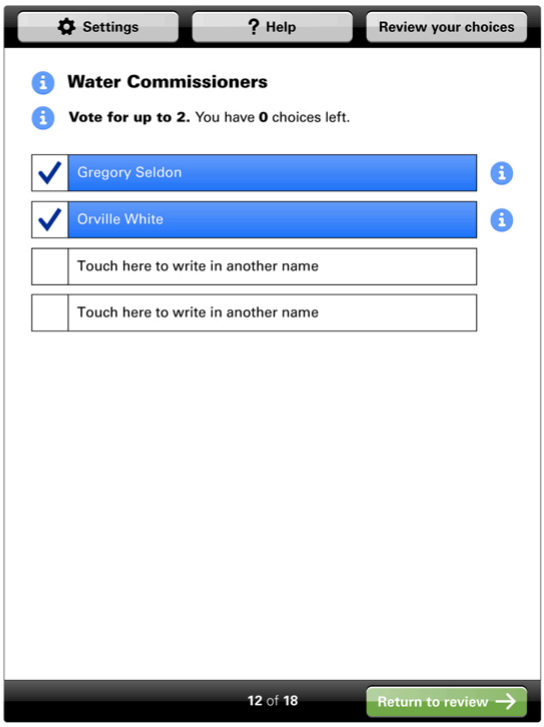
Final

The concise, specific heading was much more successful than "Review your choices."

The rest of the work on the Review page was to refine the undervote messages. Getting the text right meant being clear without making participants feel as if they'd made mistakes.

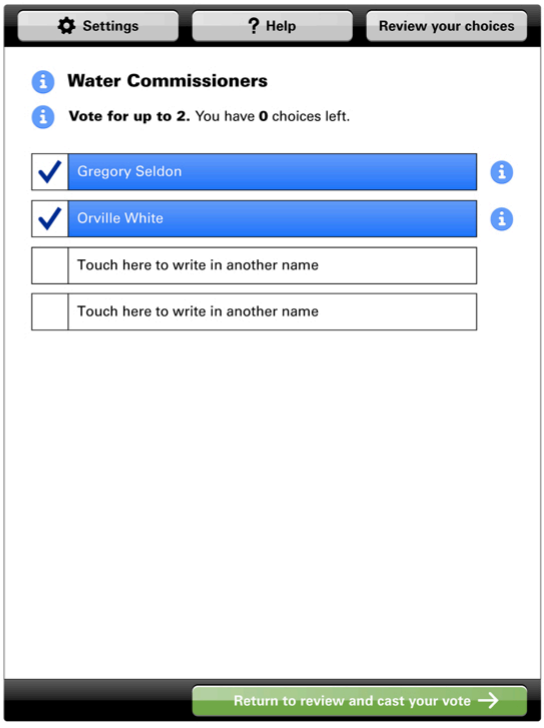
Changing a vote

Iteration 1



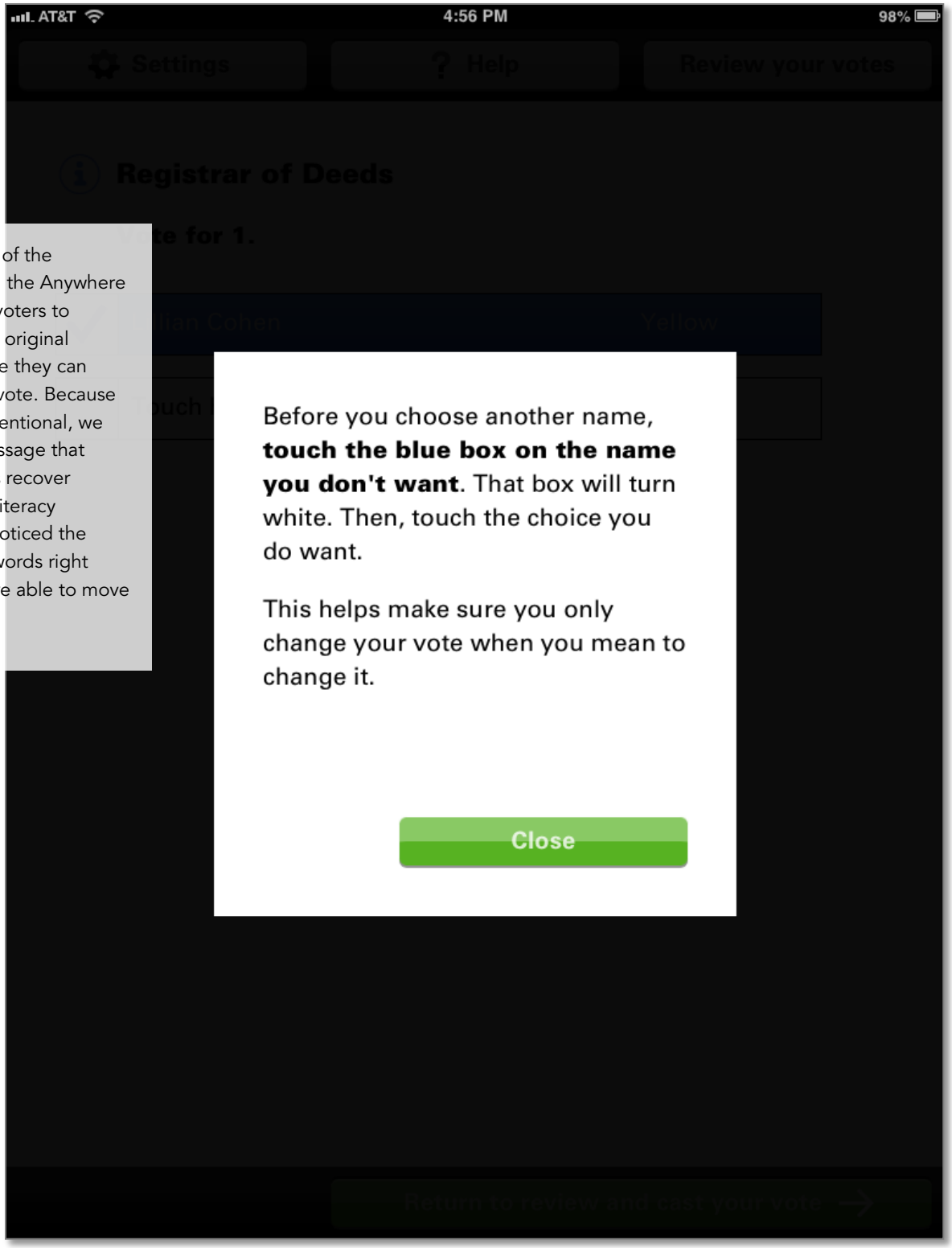
Changing a vote after reaching the Review screen was also confusing to participants. They navigated to the contest, but getting back to Review was challenging. We decided the best flow was to take the voter back to Review directly, so we changed the button label to telegraph that.

Iteration 2

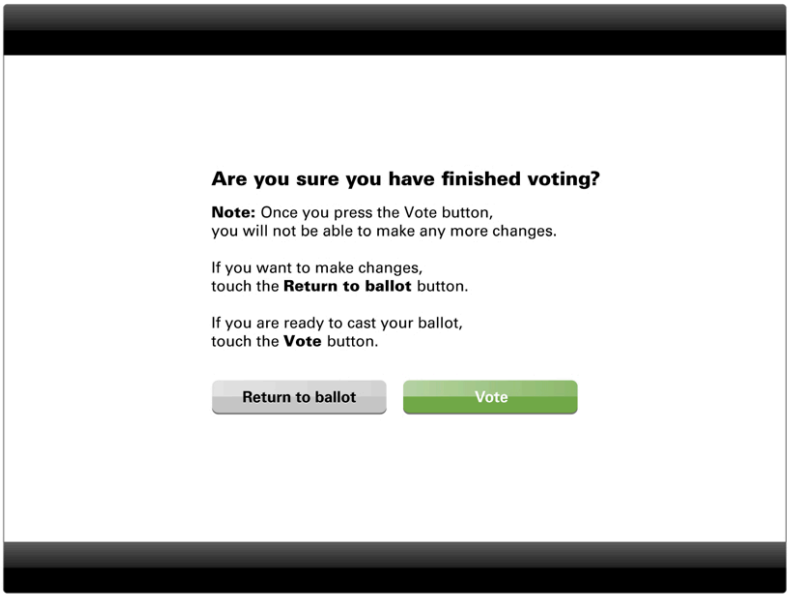


Final

A key feature of the interaction on the Anywhere Ballot forces voters to deselect their original choices before they can change their vote. Because this is unconventional, we needed a message that helped voters recover quickly. Low-literacy participants noticed the emphasized words right away and were able to move on quickly.



Casting the vote

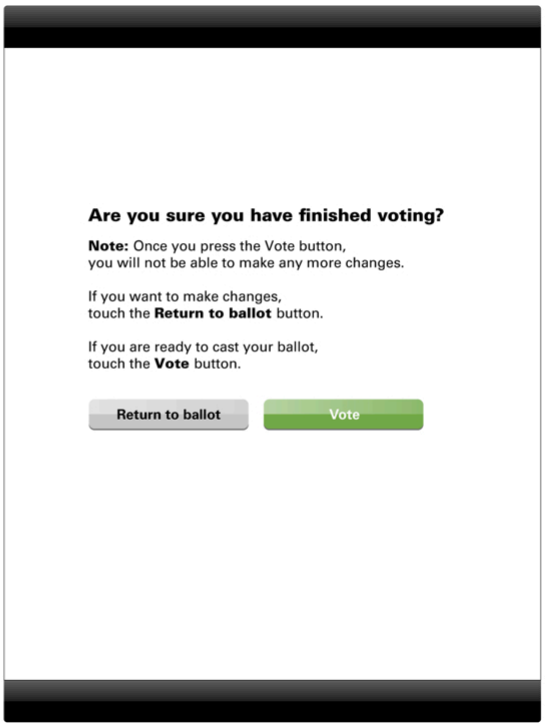


Iteration **1**

Iteration **1**

Turning the ballot from landscape (horizontal) to portrait (vertical) gives better proportion in the space between the line lengths, button sizes, and white space. We're hoping it will scale well to smaller tablets and smartphone screen sizes.

Iteration **2**

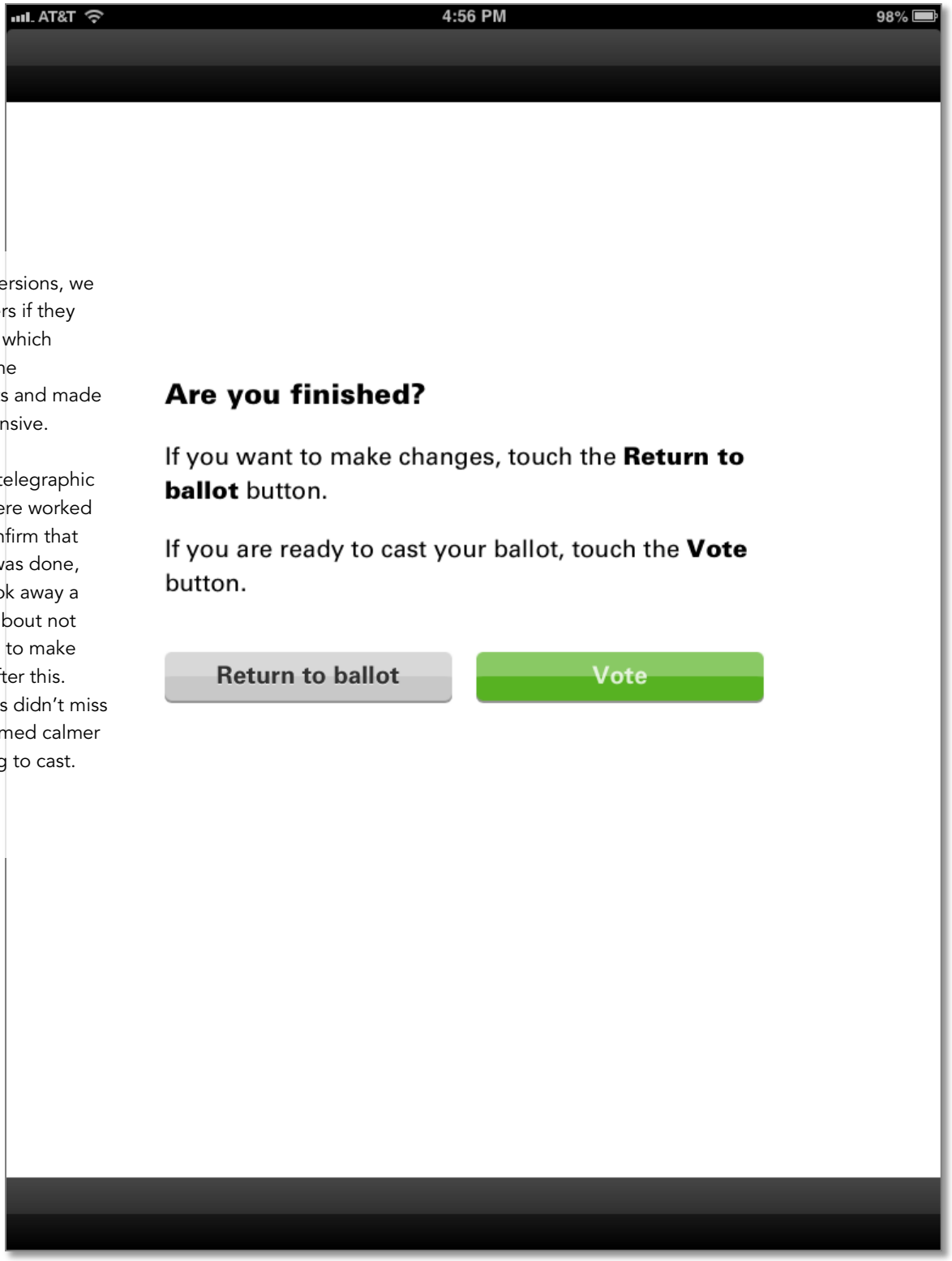


Iteration **2**

Final

In earlier versions, we asked voters if they were sure, which scared some participants and made some defensive.

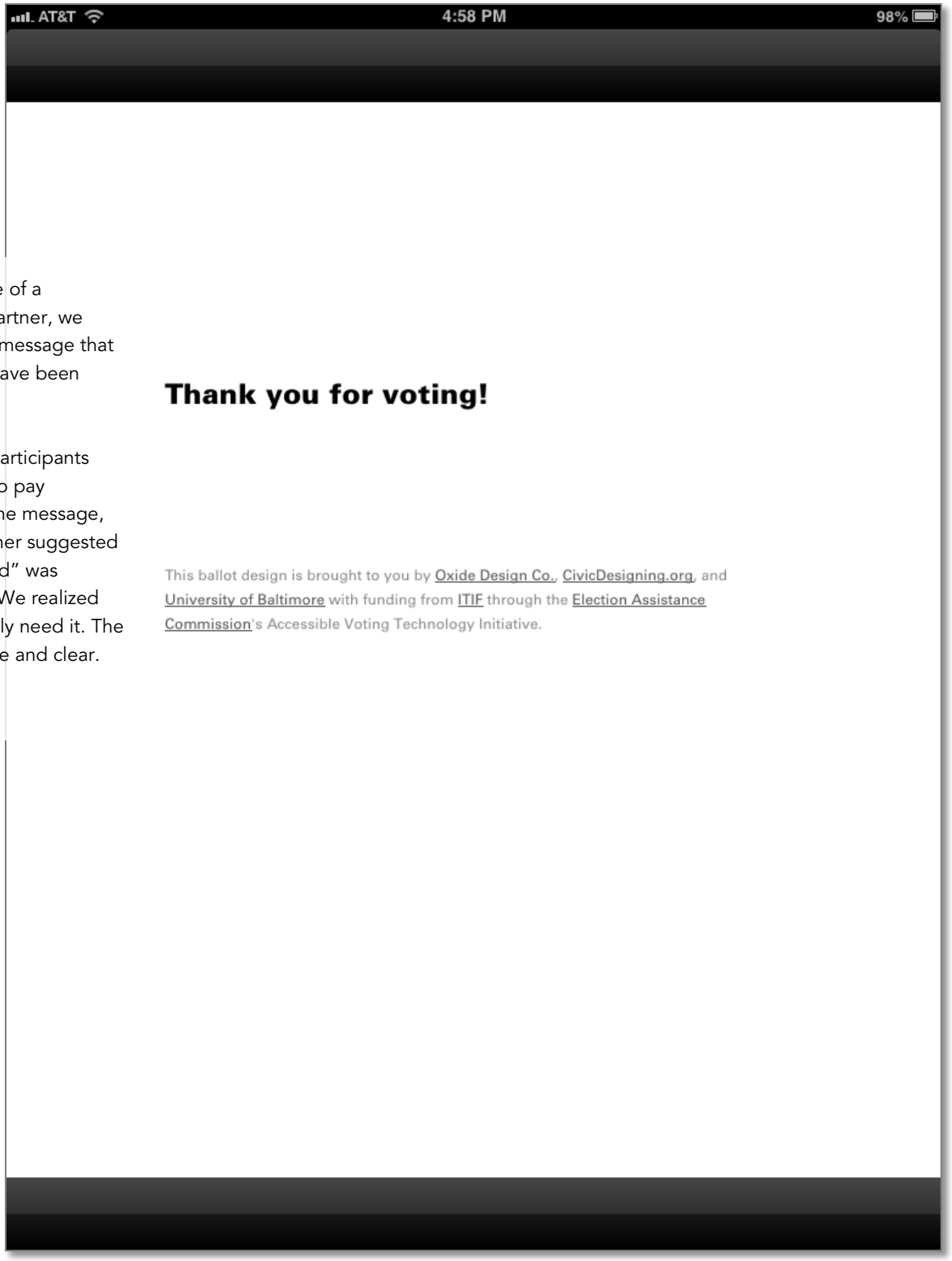
The more telegraphic heading here worked best to confirm that the voter was done, and we took away a sentence about not being able to make changes after this. Participants didn't miss it, and seemed calmer proceeding to cast.



Final

On the advice of a technology partner, we removed the message that "Your votes have been recorded."

Though our participants seemed not to pay attention to the message, our tech partner suggested that "recorded" was problematic. We realized we didn't really need it. The result is simple and clear.



Supplemental content

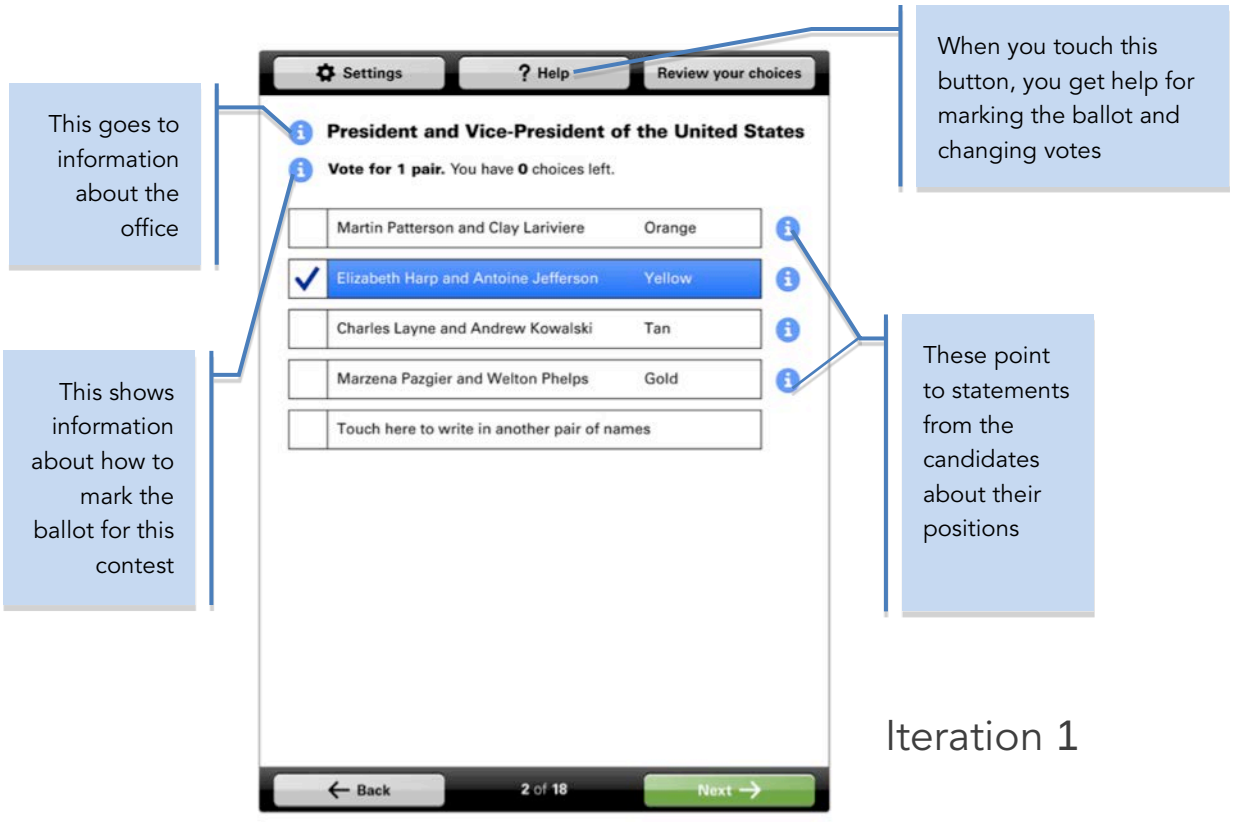
One of the unique features of this ballot design is that we supply content that is not normally directly attached to the ballot itself. The supplemental content falls into two types:

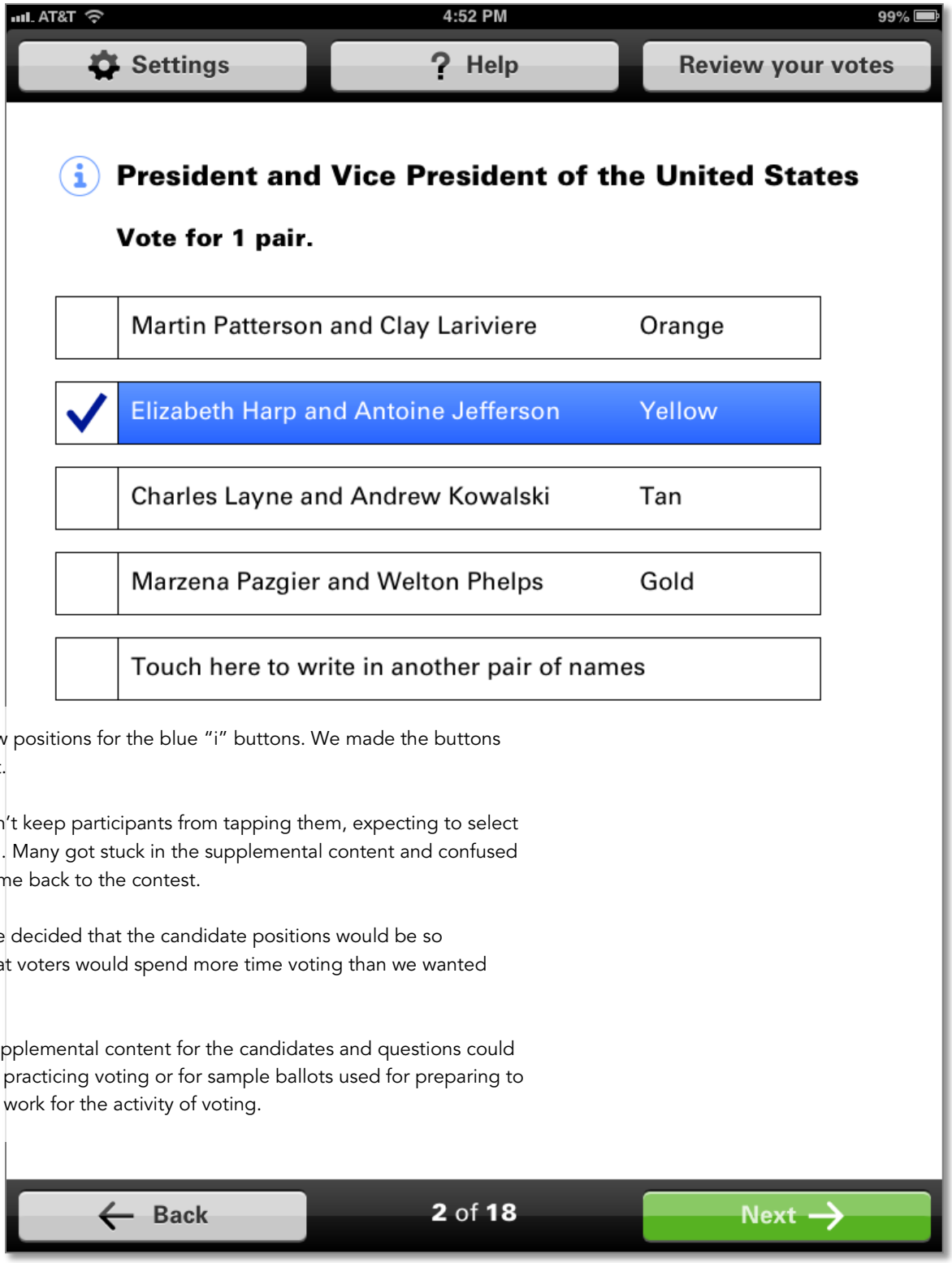
- Help with using the interface
- Information about the choices on the ballot

You can see basic help that comes at the beginning of the ballot or whenever the voter taps the Help button on page 38.

We also moved instructions for writing in and reviewing votes to a separate popup. The popup is a layer on top of the ballot page that appears whenever the voter taps one of the blue "i" symbols. We later removed all of the "i" symbols except the one for the contest name (as shown in the final version on the next page).

For example:





Final

We tried a few positions for the blue "i" buttons. We made the buttons lighter weight.

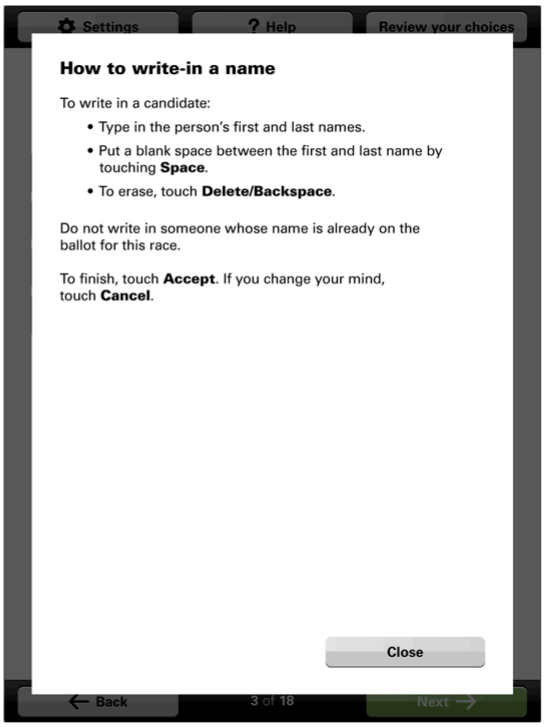
But we couldn't keep participants from tapping them, expecting to select the candidate. Many got stuck in the supplemental content and confused when they came back to the contest.

In the end, we decided that the candidate positions would be so distracting that voters would spend more time voting than we wanted them to.

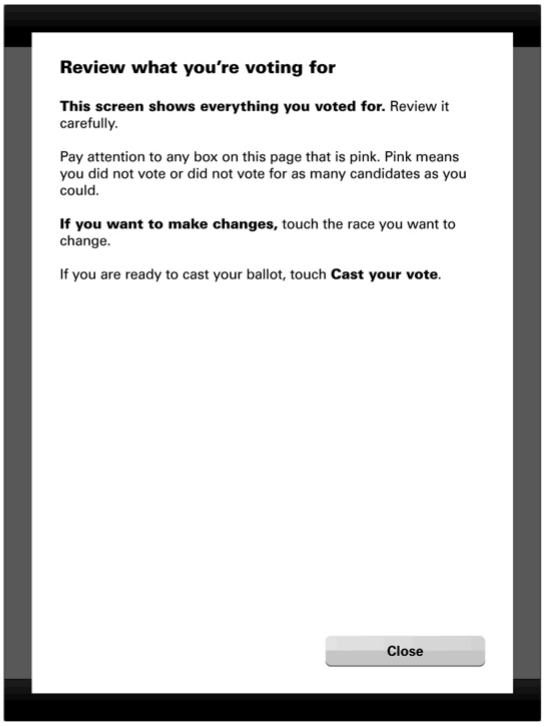
Having the supplemental content for the candidates and questions could be helpful for practicing voting or for sample ballots used for preparing to vote. It didn't work for the activity of voting.

Help with using the interface

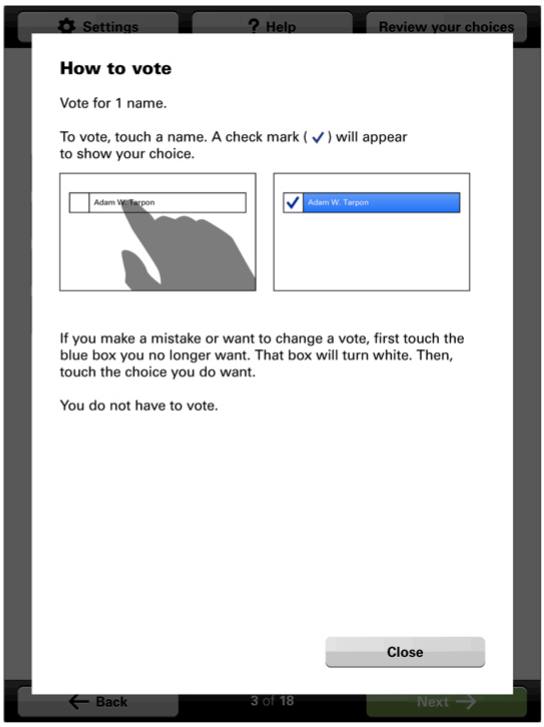
Supplemental content, iteration **1**



Supplemental content, iteration **1**



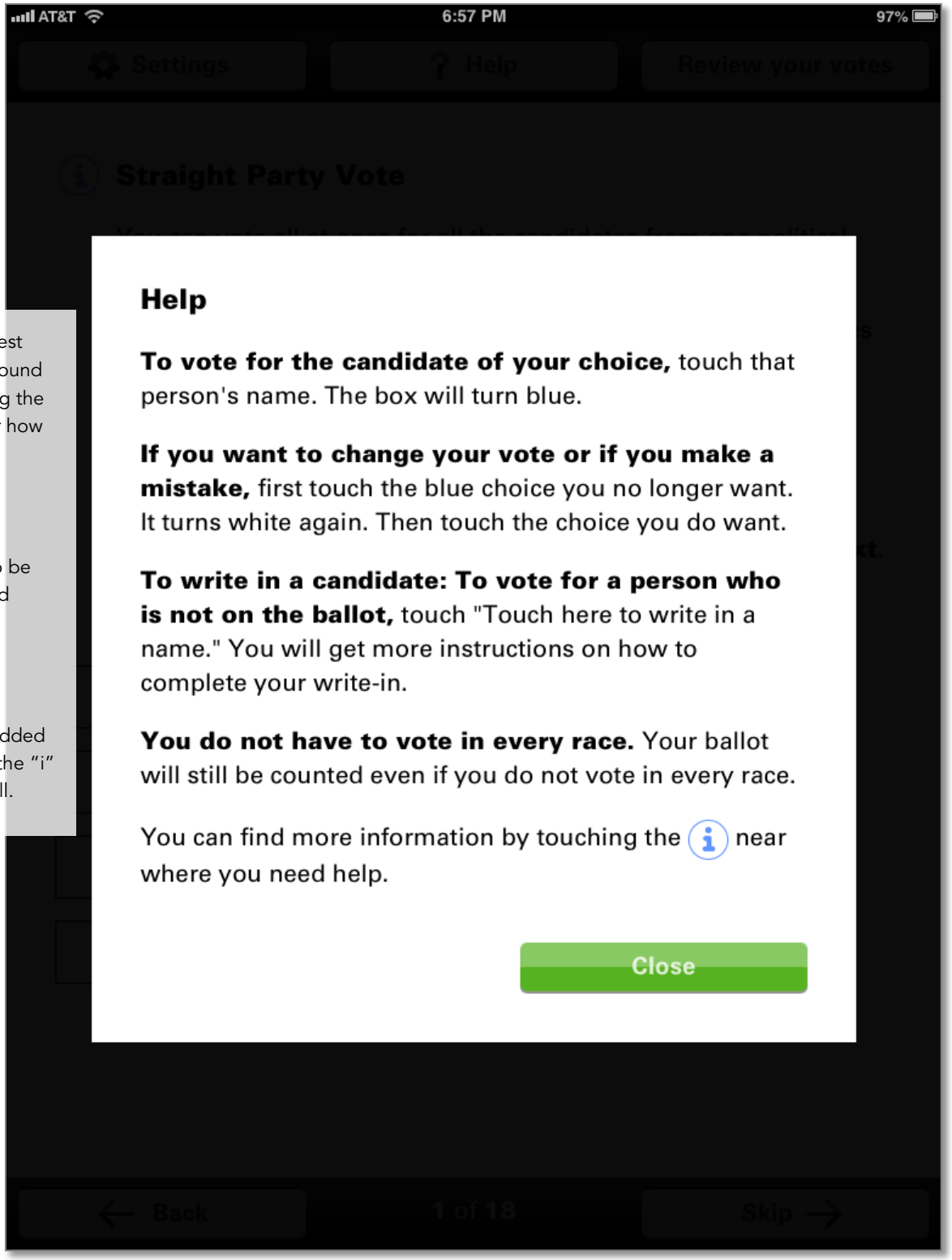
Supplemental content, iteration **2**



Final

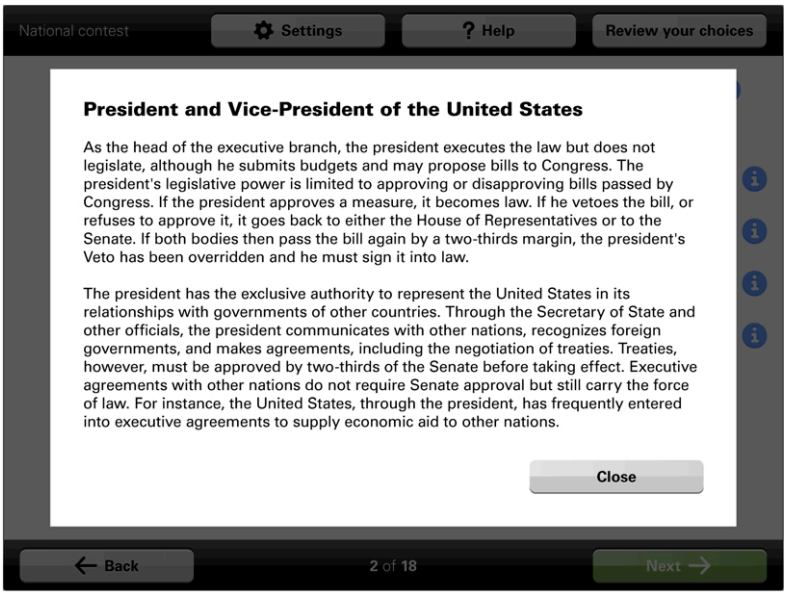
Contrary to best practice, we found that illustrating the instruction for how to vote was seriously problematic. Participants expected it to be interactive and tapped on it repeatedly.

For the help content, we added a prompt for the "i" button, as well.



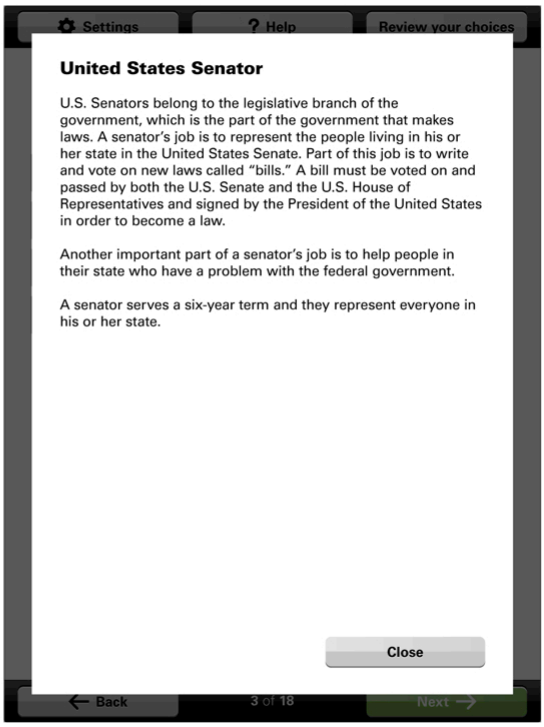
Information about the contest and candidate

This information would typically appear in some other source. For information about offices themselves, we pulled from Wikipedia. Information about candidates was drawn from voter information pamphlets, such as the one that San Francisco publishes and distributes to every registered voter before each election.



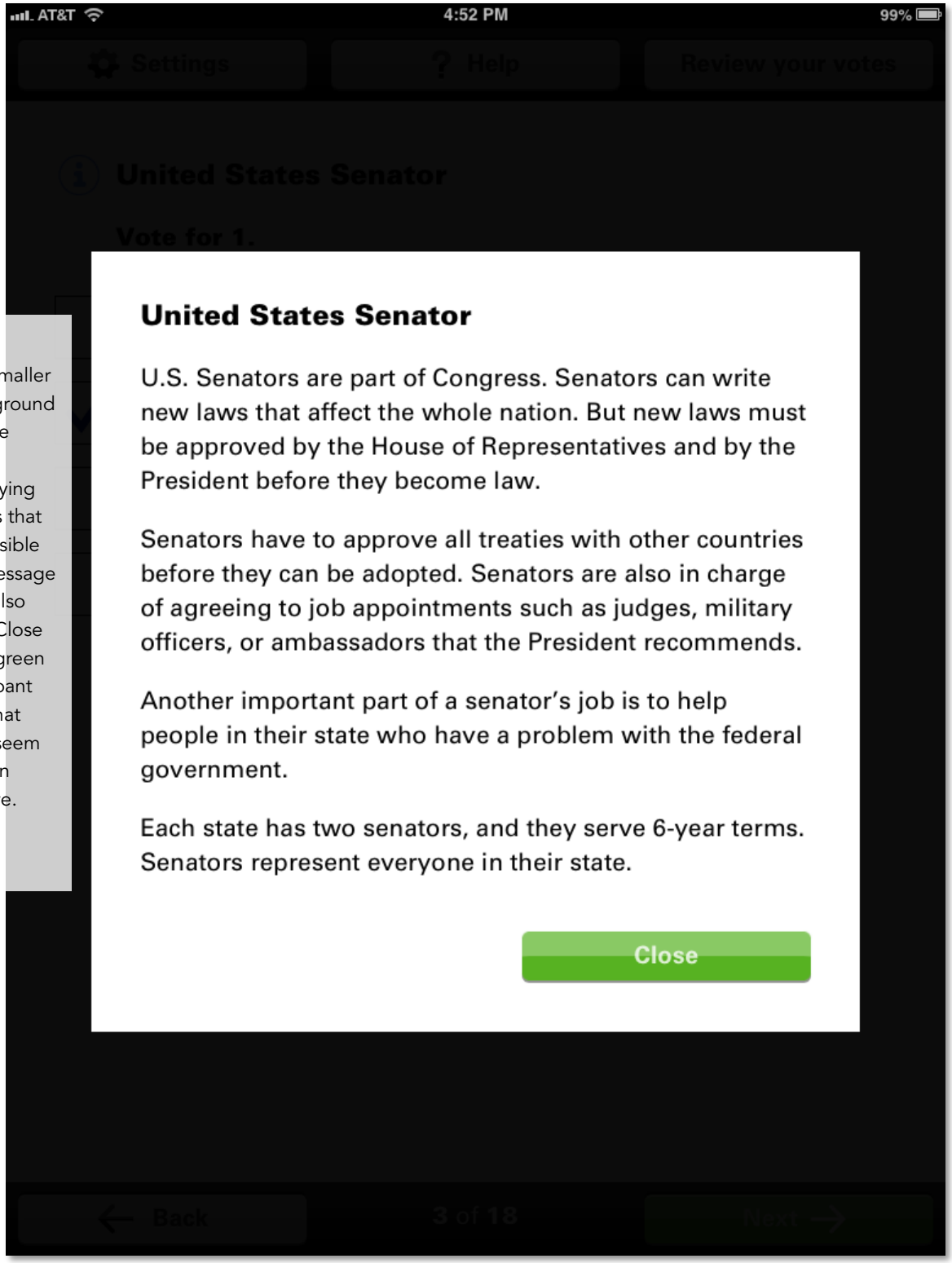
Supplemental content, iteration 1

Supplemental content, iteration **2**



Final

We made the content box smaller and the background darker after we observed participants trying to tap buttons that were barely visible behind the message popups. We also changed the Close button to be green after a participant pointed out that gray made it seem as if the button were not active.



Future work

- Establish the settings for font size, contrast, language, etc. so voters can personalize the interface.
- Refine the summary review instructions and interaction.
- Further improve the features and interaction with a way to pause voting and resume later, and a toggle to make instructions audible on the main interface.
- Build out the ballot into a fully functional, portable, responsive code set.
- Test with people with other disabilities, such as short-term memory loss, traumatic brain injury, aphasia, low vision, and mobility and dexterity issues.
- Test the ballot with screen readers on different devices.
- Pilot the design in a real election with real candidates and questions and a wide range of real voters.

References

See also our annotated bibliography.

[1] United States Election Assistance Commission. (2007). Effective designs for the administration of federal elections. Retrieved from http://www.eac.gov/election_management_resources/designing_polling_place_materials.aspx

[2] Redish, J. G., Chisnell, D. E., Newby, E., Laskowski, S. J., & Lowry, S. (2008). *Report of findings: Use of language in ballot instructions*. NIST IR 7556 Retrieved from http://www.nist.gov/itl/vote/upload/NISTIR-7556.pdf

[3] Rubin, J., and Chisnell, D. E. (2008). *Handbook of usability testing second edition*. Indianapolis: Wiley.

[4] Medlock, M. C., Wixon, D., Terrano, M. Romero, R. L., & Fulton, B. (2002). Using the RITE method to improve products: A definition and a case study. Usability Professionals' Association annual conference, Orlando, Florida.

[5] Snyder, C. (2003). Paper prototyping: The fast and easy way to design and refine user interfaces. New York: Morgan Kaufmann.

[6] The Center for Information & Research on Civic Learning and Engagement. (2010). High school civic education linked to voting participation and political knowledge, no effect on partisanship or candidate selection. Retrieved from http://www.civicyouth.org/high-school-civic-education-linked-to-voting-participation-and-political-knowledge-no-effect-on-partisanship-or-candidate-selection/

[7] Kutner, M., Greenberg, E., Jin, Y., Boyle, B., Hsu, Y., Dunleavy, E., & White, S. (2007). Literacy in everyday life: Results from the 2003 national assessment of adult literacy. National Center for Education Statistics.

[8] United States Election Assistance Commission. (2009). Voluntary Voting Systems Guidelines (v 1.1). Retrieved from http://www.eac.gov/testing_and_certification/voluntary_voting_system_guidelines.aspx

[9] Summers, K., & Summers, M. (2004). Making the web friendlier for lower-literacy users. *Intercom*, 51(6), 19-21.

[10] Summers, K., & Summers, M. (2005). Reading and navigational strategies of web users with lower literacy skills. Proceedings of the American Society for Information Science and Technology, 42(1), NA.

Appendix

The team

Dana E. Chisnell

- Lead researcher
- Co-designer of research methods for the project
- Participant recruiter

Relevant experience

For NIST, with Ginny Redish, researched the use of language in instructions on ballots.

For NIST, developed test method to evaluate poll worker documentation for voting system certification against Voluntary Voting System Guidelines (VVSG).

Consulting expert to NIST to review all of the usability and accessibility test methods for the VVSG. In this review, she advised NIST on the rigor and feasibility of the test methods.

For AARP, groundbreaking research findings on design for older adults with Ginny Redish and Amy Lee for AARP are the basis of several standards included in the WCAG.

General experience

NIST and other clients value Dana as an expert on user research and usability methods and techniques. She's the author with Jeff Rubin of *Handbook of Usability Testing, Second Edition* (Wiley 2008), the seminal book on the topic, and the editor of *Field Guides To Ensuring Voter Intent*.

Drew Davies

- Lead designer
- Lead of code development team

Relevant experience

Serves on the national board of directors of AIGA, the professional association for design, and also serves as the design director for AIGA's Design for Democracy (DFD) program.

Served on the core design and research team that developed the U.S. Election Assistance Commission's Effective Designs for the Administration of Federal Elections.

Redesigned the voter registration form for the State of New York.

Trained top New York State Board of Elections officials on best practices in ballot design.

Worked with the Federal Voting Assistance Program (FVAP) to redesign both the online and print versions of the Federal Post Card Application (FPCA) and Federal Write-in Absentee Ballot (FWAB).

General experience

Drew Davies is the founder and design director of Oxide Design Co., a communications and information design firm established in 2001. Oxide's work has been awarded by every major design competition, including One Show Design, the CLIO Awards, and five different times by Communication Arts Design Annual. Oxide juried and authored *Letterhead + Logo Design 12* (Rockport Publishing 2011), an international collection of exemplary design work. Drew was recently named to Graphic Design: USA's list of People to Watch in 2012.

Kathryn Summers

- Principal investigator
- Co-designer of research methods for the project

Relevant experience

For Pfizer, identified online reading behaviors and navigational strategies for people with lower literacy skills and developed guidelines for online information to be applied across all Pfizer websites.

For AstraZeneca, optimized the patient assistance program form for seniors, native Spanish speakers (in Spanish), and people with lower literacy skills. Result: increased fulfillment of PAP medications and a 36% reduction in program processing costs.

With the National Council on Aging, optimized online information about prescription drug benefits for seniors, resulting in an award for usable design.

For the Office of Disease Prevention and Health Promotion, helped redesign healthfinder.gov to increase usability for "at-risk" users.

For the National Cancer Institute, worked with Whitney Quesenbery on a redesign to balance the information needs of health care practitioners and consumers.

General experience

Kathryn directs graduate programs in interaction design and information architecture at

the University of Baltimore. She teaches user research methods, human/computer interaction, and interaction design, and supervises the University's User Research and Eye Tracking Lab. Since 2001, Kathryn's research and publications have focused on usability for audiences with lower literacy skills, who are older, or whose native language is not English.

We also benefited from the hard work and diligent help from 2 of Kathryn's students, Megan McKeever and Noel Alton.

Rapid Estimate of Adult Literacy in Medicine (REALM)

Adapted from Summers & Summers (adapted from Terry Davis, PhD, Michael Crouch MN, Sandy Long, PhD)

[Assessor reads:] It would be helpful for us to get an idea of what medical words you are familiar with. What I need you to do is look at this list of words beginning here. *[Point to first word]* Say all of the words you know. If you come to a word you don't know, you can sound it out or just skip it and move on.

[If the participant stops, say] Look down this list *[point]* and say the other words you know.

List 1	List 2	List 3
Fat	Fatigue	Allergic
Flu	Pelvic	Menstrual
Pill	Jaundice	Testicle
Dose	Infection	Colitis
Eye	Exercise	Emergency
Stress	Behavior	Medication
Smear	Prescription	Occupation
Nerves	Notify	Sexually
Germs	Gallbladder	Alcoholism
Meals	Calories	Irritation
Disease	Depression	Constipation
Cancer	Miscarriage	Gonorrhea
Caffeine	Pregnancy	Inflammatory
Attack	Arthritis	Diabetes

Kidney	Nutrition	Hepatitis
Hormones	Menopause	Antibiotics
Herpes	Appendix	Diagnosis
Seizure	Abnormal	Potassium
Bowel	Syphilis	Anemia
Asthma	Hemorrhoids	Obesity
Rectal	Nausea	Osteoporosis
Incest	Directed	Impetigo

Scoring Raw Score Grade Equivalent

List 1	0v–18 = 3rd grade
List 2	19–44 = 4th–6th grade
List 3	45–60 = 7th–8th grade
Overall	61–66 = High School

Directions for voting

You usually vote for everyone in the Yellow party. Vote for all the people in that party at one time.

Even though you voted for everyone in the Yellow party, for Registrar of Deeds, you want Albert Sterner. Vote for him.

For State Senator, instead of the Yellow party person, you want the Orange party person. Make sure your vote for State Senator is for the Orange party person.

For City Council, you think that the women running are the best candidates, so vote for them. Your second choice after the Yellow party is the Tan party.

For now, you decide not to vote for Water Commissioners.

For Court of Appeals Judge, vote for Kenneth Mitchell.

You don't have a strong feeling about the state Supreme Court justices, so you decide to allow them to stay in office.

You think Constitutional Amendment K is a good idea.

You think Ballot Measure 101 is a bad idea.

You think Ballot Measure 106 is a good idea.

[After the participant has reached the summary review screen, go to these:]

You decide that you should vote for the Water Commissioners, so do that now.

You realize that you actually wanted Edward Shipett to be your State Assembly person. Change your vote for State Assembly to Edward Shipett.

When you are ready, finish voting as you really would in a real election.

Ballot specifications

The content of the ballot was based on the NIST medium complexity ballot, which we modified slightly. We used the same ballot contests, candidate names, and ballot questions that Redish and Chisnell used in their study for NIST on the language of instructions on ballots [2]. There were 18 pages in the ballot, which included 14 contests, 1 constitutional amendment, and 2 ballot measures. We used colors for party names and realistic but fictional candidate names. Text or the ballot questions came from real questions on ballots found on the Internet.

The names and treatments for buttons and their labels, along with other interaction labels, are placeholders. This specification uses instruction language resulting from research by Redish, et al. for NIST.

What	Instructions
Information applicable to the whole ballot	
Activation or other opening screen	
Election Information	Official ballot for the general election
Official Ballot Statement	City of Baltimore
Type of Election	Baltimore City, MD
Election Administration / Location	November 6, 2012
Election Date	Congressional District 3, Assembly District 6, and Council Districts, 2, 4, 6
Ballot instructions	**How To Vote** **To vote for the candidate of your choice**, touch that person's name. It will turn blue. **To write in a candidate:** To vote for a person who is not on the ballot, touch **Write in a candidate's name**. You will get more instructions on how to complete your write-in. **If you want to change your vote, or if you make a mistake,** first touch the blue choice you no longer want. It turns white again. Then touch the choice you do want.
Information applicable to each separate race	
Race #0 – Straight-Party Vote	**Straight Party Voting** You can vote all at once for all the candidates from one political party. This is called a straight-party ticket. If you want most candidates from one party and some candidates from another party, you can vote straight

What	Instructions
	party here. You can change your vote later for any of the races. In some races, the candidates don't belong to a party. You will need to vote in these races later. To vote straight party, touch the party name, and then touch **Next.** To not vote straight party just touch **Skip.**
[After selecting to vote straight-party]	
Race #1 – President and Vice President	Vote for 1.
Race #2 – US Senate	Vote for 1.
Race #3 – US Representative	Vote for 1.
Race #4 – Governor	Vote for 1.
Race #5 – Lieutenant-Governor	Vote for 1.
Race #6 – Registrar of Deeds	Vote for 1.
[Write-in] *Each race will include an option for writing in a candidate. That line will read:*	Write-in a candidate's name
[Write-in page]	**Write In a Candidate** Use this screen to vote for a candidate who is **not** on the ballot. To finish touch **Accept.** If you change your mind, touch **Cancel.**
Race #7 – State Senator	Vote for 1.
Race #8 – State Assemblyman	Vote for 1.
Race #9 – County Commissioners	Vote for up to 5. You can choose X more.
Race #10 – City Council	Vote for up to 4.
	If you voted a straight-party ticket, you have not voted for this race or any other race from here to the end of the ballot.
Race #11 – Water Commissioners	Vote for up to 2.

What	Instructions
Non-partisan	
Race #12 – Court of Appeals Judge **Non-partisan**	Vote for 1.
Retention Question #1	**State Supreme Court Chief Justice** If you want to keep Esther York as State Supreme Court Chief Justice, vote Yes. If you do not want to keep Esther York as State Supreme Court Chief Justice, vote No. Keep Esther York as Chief Justice of the Supreme Court?
Retention Question #2 Do the same for A and B as for Retention Question 1	**State Supreme Court Associate Justice** If you want to keep Elmer Hull as State Supreme Court Associate Justice, vote Yes. If you do not want to keep Elmer Hull as State Supreme Court Associate Justice, vote No. Keep Elmer Hull as Associate Justice of the Supreme Court?
Referendum #3 **Constitutional Amendment H** Caps on Medical Malpractice Suits	[*not included on this ballot*]
Referendum #4 **Constitutional Amendment K** Allowing Counties To Hold Referenda On Whether to Allow Slot Machines	*[Text of amendment]* Do you want this change to the [name of state] constitution? Yes No
Referendum #5 **Ballot Measure 101** Open Primaries	*[Text of measure]* Do you want this to be a new [name of state] regulation/law? *[Use the appropriate word for the result of the change.]* Yes No
Referendum #6 **Ballot Measure 106** Limits on Private Enforcement of Unfair Business Competition Law	*[Text of measure]* Do you want this to be a new [name of state] regulation regulation/law? *[Use the appropriate word for the result of the change.]* Yes

What	Instructions
	No
Selection summary, review	**Review what you're voting for** **This screen shows everything you voted for**. To continue voting, touch the **Back** button below**.**
Selection summary, review (continued)	[*At any highlighted title where the voter didn't vote, put this instruction.*] You did not vote for anyone. If you want to vote in this race, touch here. [*At any highlighted title where the voter undervoted in a multi-candidate race, put this instruction.*] You voted for [X] people. You can for [Y] more. If you want to vote for more, touch here.
Confirmation screen	[*There is a gray **Return to ballot** button on the left. The Vote button, on the right, lights up green.*] Are you finished? If you want to make changes, touch the **Return to ballot** button. If you are ready to cast your ballot, touch the **Vote** button.
Thank you	Thank you for voting!

Content of the ballot

This section shows the names, parties, and referenda for each section of the sample ballots.

What	Ballot content
Race #0 – Straight-Party Vote Partisan 1 vote allowed 0 write-ins	Orange Yellow Tan Gold
Race #1 – President and Vice President Partisan Vote for 1 pair.	Martin Patterson and Clay Lariviere / Orange Elizabeth Harp and Antoine Jefferson / Yellow Charles Layne and Andrew Kowalski / Tan Marzena Pazgier and Welton Phelps / Gold

What	Ballot content
Race #2 – US Senate Partisan Vote for 1. 1 write-in	Victor Martinez / Orange David Platt / Yellow Heather Portier / Tan
Race #3 – US Representative Partisan Vote for 1. 1 write-in	Glen Tawney / Orange Carroll Forrest / Yellow
Race #4 – Governor Partisan Vote for 1. 1 write-in	Frederick Sharp / Orange Alex Wallace / Yellow Barbara Williams / Tan Althea Sharp / Gold Ann Windbeck / Independent
Race #5 – Lieutenant-Governor Partisan Vote for 1. 1 write-in	Charles Qualey / Orange George Hovis / Yellow Burt Zirkle / Tan
Race #6 – Registrar of Deeds Partisan Vote for 1. 1 write-in	Lillian Cohen /Yellow
Race #7 – State Senator Partisan Vote for 1. 1 write-in	Andrea Solis / Orange Amos Keller / Yellow
Race #8 – State Assemblyman Partisan Vote for 1. 1 write-in	Edward Shiplett / Orange Marty Talarico / Yellow
Race #9 – County Commissioners Partisan	Mary Tawa / Orange Sheila Moskowitz / Orange Damian Rangel / Orange

What	Ballot content
Vote for up to 5. 5 write-ins	Valarie Altman / Yellow Helen Moore / Yellow John White / Yellow Joe Lee / Tan Joe Barry / Tan Martin Schreiner / Tan Eric Savoy / Gold
Race #10 – City Council Partisan Vote for up to 4. 4 write-ins	Reid Davis / Orange Harvey Smith / Orange Randall Eagle / Orange Carole Barker / Yellow Barbara Shry /Yellow Donald Rupp / Yellow Hugh Feister / Tan
Race #11 – Water Commissioners Non-Partisan Vote for up to 2. 2 write-ins	Gregory Seldon Orville White
Race #12 – Court of Appeals Judge Non-Partisan Vote for 1. 1 write-in	Kenneth Mitchell
Retention Question #1	**Supreme Court Chief Judge** Esther York
Retention Question #2	**Supreme Court Associate Justice** Elmer Hull
Referendum #3 **Constitutional Amendment H** Caps on Medical Malpractice Suits	
Referendum #4	Shall there be an amendment to the State constitution

What	Ballot content
Constitutional Amendment K Allowing Counties To Hold Referenda On Whether to Allow Slot Machines	authorizing Madison and Fromwit Counties to hold referenda on whether to authorize slot machines in existing, licensed parimutuel facilities (thoroughbred and harness racing, greyhound racing, and jai alai) that have conducted live racing or games in that county during each of the last two calendar years before effective date of this amendment? The Legislature may tax slot machine revenues, and any such taxes must supplement public education funding statewide. Requires implementing legislation. This amendment alone has no fiscal impact on government. If slot machines are authorized in Madison or Fromwit counties, governmental costs associated with additional gambling will increase by an unknown amount and local sales tax-related revenues will be reduced by $5 million to $8 million annually. If the Legislature also chooses to tax slot machine revenues, state tax revenues from Madison and Fromwit counties combined would range from $200 million to $500 million annually.
Referendum #5 **Ballot Measure 101**	Allows individual or class action "unfair business" lawsuits only if actual loss suffered; only government officials may enforce these laws on public's behalf. Fiscal Impact: Unknown state fiscal impact depending on whether the measure increases or decreases court workload and the extent to which diverted funds are replaced. Unknown potential costs to local governments, depending on the extent to which diverted funds are replaced.
Referendum #6 **Ballot Measure 106**	Requires primary elections where voters may vote for any state or federal candidate regardless of party registration of voter or candidate. The two primary-election candidates receiving most votes for an office, whether they are candidates with no party or members of same or different party, would be listed on general election ballot. Exempts presidential nominations. Fiscal Impact: No significant net fiscal effect on state and local governments.

Anywhere Ballot pattern library

Modeled after libraries for digital designs across the web, through our pattern library, we take apart the Anywhere Ballot to present optimal solutions to common problems or elements in the ballot. This way, various voting systems can follow the patterns and examples to implement the design elements of the Anywhere Ballot that make it so usable and accessible.

Each design element in the library includes a description and example of:

- title
- what it is
- how it works
- who it helps
- an example (visual and, if appropriate, a code snippet)
- when to use the pattern
- why use the pattern

You can find the pattern library for the Anywhere Ballot at http://anywhereballot.com/library.

Annotated Bibliography

Any device, anywhere, any time: A responsive, accessible ballot design

University of Baltimore
Kathryn Summers, University of Baltimore
Megan McKeever, University of Baltimore
Noel Alton, University of Baltimore
Dana Chisnell, CivicDesigning.org
Drew Davies, Oxide Design Co.

Annotated bibliography

Any device, anywhere, anytime: A bibliography on voting, accessibility and mobile

The primary outcome of our ITIF-AVT grant was a ballot interface prototype that can be used on any device, including tablets, smartphones, or desktops. This ballot interface is available at http://anywhereballot.com.

In the tradition of universal design, our ballot interface leverages the robust assistive technologies available for desktops and other devices, while making the ballot instructions and ballot marking interaction usable for both expert users and users who don't read well or who have mild cognitive impairment.

The ballot interface was tested on a tablet, with a range of participants including

- participants with measured low literacy levels
- seniors with high literacy but unfamiliar with tablets
- seniors with low literacy and unfamiliar with tablets
- participants with mild cognitive impairment

We found that the combination of plain language and plain interaction made the ballot interface accessible for most participants – even those unfamiliar with tablets.

This annotated bibliography supported our ballot interface design work, and primarily includes sources about ballot design and about designing for audiences with low literacy skills and mild cognitive impairment. It also includes some sources about barriers to voting, voting trends, and voting technologies, including voting on mobile devices. The bibliography grew and expanded over the course of the project, as we encountered questions and sought to integrate our research findings with the work of prior researchers. The bibliography was also shaped by the needs of our project team, who had varying degrees of familiarity with the voting space and with the range of assistive technologies currently available.

Prior work on ballot design and accessibility

Our goal was to start with best practices in ballot design. Most of the seminal sources in this area will be found below.

General principles of ballot design are well understood. The baseline was set in work commissioned by the Election Assistance Commission (EAC) and researched by AIGA's Design For Democracy, which became *Effective Designs for the Administration of Federal Elections* (http://www.eac.gov/assets/1/workflow_staging/Page/70.PDF). This

set of best practices for ballot design includes design specifications for many types of printed materials used on Election Day, from signs to ballots. It also proposes a basic framework for a digital user interface. NIST created their internal "calibration machine" based on this proposed user interface, which runs on a commercially available touchscreen tablet.

The National Institute of Standards and Technology (NIST) and the EAC have worked since the Help America Vote Act (HAVA) became law in 2002 to establish standards for voting systems. The current version of the standard, Voluntary Voting System Guidelines (VVSG) 2.5, covers usability and accessibility in Chapter 3 – addressing hundreds of accessibility issues mainly for people with low vision or who are blind. The VVSG also addresses accessibility for people with cognitive disabilities through standards on usability and plain language.

Designing for voters with lower literacy skills and cognitive disabilities

We also include many sources about designing web and mobile interfaces for people who don't read well or who are older.

The primary challenges in designing for lower-literacy audiences, readers with cognitive disabilities, and other at-risk audiences such as the elderly are to accommodate their need for sequential processing, to guide interaction effectively, to provide clear feedback, and to help users avoid, discover, and recover from errors. Supporting sequential rather than concurrent demands for cognitive processing improves both understanding and performance. However, understanding and performance also improve when users can see the structure of the information or task they are performing.

In the context of voting, a ballot that showed all the races at once in an overview led to fewer errors in voting choices; a comparison ballot that showed a single race at a time led to reduced undervoting but led to a somewhat higher error rate. Our challenge was to provide the specificity and clarity of a "single race at a time" interaction and also provide an effective "review" experience that allowed users to review and confirm their votes successfully.

Annotated bibliography

[1] Assistive technology for access to computers. (2009). Wisconsin Assistive Technology Initiative.

This article describes the different types of assistive technology needed in classrooms. It also discusses the factors to consider when assigning computer tasks for individuals with cognitive disabilities, such as vision, motor skills, fatigue/strength, attention and computer skills.

Tags: Assistive technology, cognitive impairment

[2] Alvarez, R., Levin, I., & Sinclair, J. (2012). Making voting easier: Convenience voting in the 2008 Presidential election. Political Research Quarterly, 65(2), 248-262.

The authors analyze the choice of voting mode (in-person, early voting, and mail-in) in the 2008 presidential election using a large-sample survey. Convenience voting was defined as those voters who opted to either vote early or mail in their votes. The research found that over the past decade convenience voting has gone from being a novelty to being quite common. It was determined that convenience voting does not have anything to do with partisan voting; the Republican Party does not do better with convenience voting. Elderly voters and those with disabilities are more likely to vote by mail.

Tags: Voting standards, seniors, cognitive impairment

[3] Astrauskas, M. J., John A. Black, J., & Panchanathan, S. (2008). A demonstration of phototacs: A simple image-based phone dialing interface for people with cognitive or visual impairments. Paper presented at the Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility. doi:10.1145/1414471.1414547

New technology and software can be difficult for users with cognitive disabilities to use. This article discusses the relation of a simplified, image-based phone dialer for disabled users that would rely on visual cues and images of contacts rather than names or phone numbers.

Phototacs can be used on any smartphone and consists of two screens. The primary interface, the dialer screen, allows a user to scroll through the images of contacts. The user places a call by tapping the handset icon or the image of the selected person. The configuration screen allows users to add, remove or edit the contacts in the phone book. The user can take a picture or use a picture already stored in their phone.

Tags: Assistive technology, cognitive impairment

[4] Baker, P. M. A., Roy, R. G. B., & Moon, N. W. (2005). Getting out the vote: Assessing technological, social and process barriers to (e)voting for people with disabilities. Paper presented at The Twenty-Seventh Annual APPAM Research Conference.

Results of a voter survey to assess voter satisfaction and issues with the current ballot system. While e-voting tools have improved access, voting systems are not yet completely accessible. Researchers focused on the voting experiences of people with disabilities in a telephone survey of 1,240 following the November 1998 elections and found that voter turnout was 20 percent lower among people with disabilities than among those without who had otherwise similar demographic characteristics. The study also found that the implications of disabilities extended beyond resource

constraints to include social and psychological effects that decrease voter turnout due to decreased social capital and decreased identification with mainstream society.

Tags: Ballot design, cognitive impairment, remote voting

[5] Bederson, B. B., Lee, B., Sherman, R. M., Herrnson, P. S., & Niemi, R. G. (2003). Electronic voting system usability issues. In Human Factors in Computing Systems: Proceedings of CHI 2003, (pp. 145–152). New York: ACM. doi:10.1145/642611.642638

Usability reports on electronic voting machines finding 10% of users dissatisfied or confused with the technology. This article chronicles the challenges of voting and how many voters are afraid to ask for help. There is not training for voters, and the first time most voters see the voting technology, they are already in the booth ready to cast their ballot.

Aside from voter troubles, this article explains the problems with voting machines as well. State or county purchasers are usually more concerned with the cost than the usability of machines, and once the systems are purchased, the public has no access to the machines for evaluations. In addition, election workers who design the ballot tend not to have usability experience and poll workers who deploy the voting system have minimal training or support to cope with problems.

Tags: Barriers to voting

[6] Berkeley, S., & Lindstrom, J. H. (2011). Technology for the struggling reader: Free and easily accessible resources. TEACHING Exceptional Children, 43(4), 48-55.

The article highlights several assistive technologies available for teachers in reading practice and instruction to use with students who are struggling readers, including text-to-speech features and text-modification tools that can be used to summarize information and to reformat screen views in word processors such as Microsoft Word.

Tools available in Microsoft Office include the Readability Statistics tool (generates a grade level score for content) and the AutoSummarize tool (highlights key points in the reading). The web browser Firefox has a "readability" add-on that strips away extraneous page elements for the user. This add-on gives the user the ability to change the way they view the page (newspaper, novel, e-book, etc); the font size (small to extra large); and margin settings.

Tags: Assistive technology, low literacy

[7] Bodine, C., & Scherer, M. J. (2006). Technology for improving cognitive function. A workshop sponsored by the U.S. Interagency Committee on Disability Research (ICDR): Reports from working groups. Disability & Rehabilitation, 28(24), 1567-1571. doi:10.1080/09638280601071151

This paper discusses the results of a two-day conference on Technology to Improve Cognitive Function, sponsored by the Interagency Committee on Disability Research

in 2006. The committee agreed that there is little technology for people with cognitive disabilities, despite the growing need. Since Alzheimer's/Dementia is recognized as a large problem and better defined than cognitive disability in general, it may be the place to start in determining cognitive impairment or decline and appropriate assistive technology.

This article also includes guidelines created by the committee to address cognitive issues and aging, education, and technology.

Tags: Assistive technology, cognitive impairment

[8] Brown, V. (2010). Digital media learning supports individuals with cognitive disabilities. Childhood Education, 87(1), 68.

Students with different cognitive disabilities often have reading difficulties caused by visual discrimination, audio processing problems, attention span difficulties, or short-term memory impairments. The advantage of using websites is the ability to integrate different types of digital media. This integration of media allows interaction with content in ways a static textbook cannot offer, since media may use animation, hypertext, and clickable diagrams.

Tags: Cognitive impairment, universal design

[9] Campbell, B., Tossell, C., Byrne, M., & Kortum, P. (2011). Voting on a smartphone. Proceedings Of The Human Factors And Ergonomics Society Annual Meeting, 55(1), 1100.

Researchers developed a mobile voting system for the iPhone and compared its usability with traditional voting platforms.

Smartphones offer remote participation in elections through the use of pervasive technology, potentially increasing voter participation while allowing voters to use familiar technology. Results showed that the mobile voting system was not as efficient as the other voting methods in total interaction time. However, smartphone owners committed fewer errors on the mobile voting system than on the traditional voting systems.

Tags: Ballot design, voting trends, remote voting

[10] Chaudry, B. M., Connelly, K. H., Siek, K. A., & Welch, J. L. (2012). Mobile interface design for low-literacy populations. In Proceedings of the 2nd ACM SIGHIT International Health Informatics Symposium (pp. 91–100). doi:10.1145/2110363.2110377

This paper presents two different research studies: the first study tested four graphical user interface widgets; the second study tested three cross-page navigation styles. The four tested widgets were interactive icons, check boxes, radio

buttons, and scrollbars. Participants performed best with radio buttons and preferred them to the other widget options.

In the second study, three different navigation paths were tested: linear, hierarchical, and cross-linked modes of navigation. Participants performed better with linear navigation because low-literacy users tend to want to start each new task in the same place and start over whenever they want.

Tags: Low literacy, plain language, plain interaction, remote voting

[11] Chisnell, D., & Redish, J. (2005). Designing web sites for older adults: Expert review of usability for older adults at 50 web sites (Vol. 1). AARP.

This report outlines heuristics for the older users, age 50 and up, compiled from an expert review of 50 websites. Researchers found a wide variance in the population's abilities and skills. The study covered various types of websites from travel and shopping sites to health insurance and financial planning sites.

Tags: Older voters

[12] Chisnell, D. E., Redish, J., & Lee, A. (2006). New heuristics for understanding older adults as web users. Technical Communication, 53(1), 39-59.

Outlines a set of 20 heuristics for evaluating websites for older users and describes a step-by-step methodology of persona-based and task-based heuristic review.

Tags: Older voters

[13] Chisnell, D., Becker, S., Laskowski, S., & Lowry, S. (2009). Style guide for voting system documentation: Why user-centered documentation matters to voting security. In Proceedings of the 2009 conference on Electronic voting technology/workshop on trustworthy elections. USENIX Association.

This document outlines best practices in style, formatting and language guidelines for voting documentation for poll workers and election staff. At the very least, these guidelines form a basis for voting system test laboratories to evaluate documentation.

Tags: Voting statistics, ballot design, plain language

[14] Chisnell, D. (2010). Looking at accessibility as a design problem. Interactions: New Visions Of Human-Computer Interaction, 17(5), 43. doi:10.1145/1836216.1836227

Many voting systems were retrofitted for accessibility rather than designed that way. The standard approach to aiding disability has been to make the disability invisible. But this paper asks, what if design could be used to destigmatize disability?

Tags: Accessibility, cognitive impairment

[15] Coyne, K.P. and Nielsen, J. (2002). Web usability for senior citizens - Design guidelines based on usability studies with people age 65 and older. Nielsen Norman Group, April 2002.

This paper emphasizes overlap between good design practices for a general population and web usability for senior citizens, including limiting graphics and links on a page, and avoiding popup windows, rollover text, new windows, and cascading menus. Other guidelines include avoiding small buttons, tables, and splash pages; choosing text colors for good contrast; limiting required form information; and making a search tool forgiving of spelling errors.

Tags: Older voters, plain interaction

[16] Crow, K. L. (2008). Four types of disabilities: Their impact on online learning. Techtrends: Linking Research & Practice To Improve Learning, 52(1), 51-55. doi:10.1007/s11528-008-0112-6

Looks at visual impairment, hearing impairment, motor impairment, and cognitive impairment and discusses how assistive technology and universal design can make online learning more accessible.

Tags: Cognitive impairment, assistive technology

[17] Dawe, M. (2006). Desperately seeking simplicity: how young adults with cognitive disabilities and their families adopt assistive technologies. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. doi:10.1145/1124772.1124943

Discusses reasons and context behind user abandonment of assistive technology in the home, emphasizing the need for ease of installation, use and upgrade both by the disabled user and a caregiver who may have to maintain, set up, or otherwise use the equipment. Research was collected through interviews with parents and teachers of students with cognitive disabilities. Core research questions included, "What role does technology play today in the lives of families who have a child with cognitive disabilities?"– "How do families find, acquire, and use these technologies?" and "What key factors increase or decrease the adoption of technology?"

Tags: Cognitive impairment, assistive technology

[18] de Joode, E., van Heugten, C., Verhey, F., & van Boxtel, M. (2010). Efficacy and usability of assistive technology for patients with cognitive deficits: A systematic review. Clinical Rehabilitation, 24(8), 701-714. doi:10.1177/0269215510367551

Comprehensive review of 28 papers representing 25 studies and 423 patients. Reviewers concluded the efficacy of assistive technology in general is not yet sufficiently studied in randomized controlled trials, although promising results have been reported. Several studies established that both potential users and clinicians

have optimistic expectations about the usability of assistive technology. Patients who did not use assistive technology were also surveyed about their desire and barriers to use.

Tags: Assistive technology, cognitive impairment

[19] Dill, D., Schneier, B., & Simons, B. (2003). Voting and technology: Who gets to count your vote?. Communications Of The ACM, 46(8), 29-31.

The ideal voting technology would have five attributes: anonymity, scalability, speed, audit, and accuracy. But, in the rush to improve the first four, accuracy is being sacrificed.

Tags: Voting standards

[20] Disabled web use. (2012). Retrieved from http://www.w3.org/WAI/intro/people-use-web/Overview.html

W3C guidelines on how users with disabilities navigate the web, including people with age-related impairments. It also describes tools and approaches that people with different kinds of disabilities use to browse the web and the design barriers they encounter. It includes principles for creating accessible websites, web applications, browsers, and other web tools.

Tags: Cognitive impairment, older voters, universal design

[21] Everett, S. P., Greene, K. K., Byrne, M. D., Wallach, D. S., Derr, K., Sandler, D., & Torous, T. (2008). Electronic voting machines versus traditional methods: Improved preference, similar performance. Paper presented at the CHI '08 Proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems. doi:10.1145/1357054.1357195

This SUS survey of paper and e-voting methods finds similar error rates but much higher SUS scores on e-voting machine between both novice and expert computer users.

In addition to individual ballot preferences, survey responses also revealed that in previous voting experiences in real elections, 12% of participants had been unsure whether their vote was cast correctly or would be counted. A larger 26% had previously worried about figuring out how to use a ballot or voting technology to cast their vote.

Tags: Barriers to voting, voter statistics

[22] Friedman, M. G., & Bryen, D. (2007). Web accessibility design recommendations for people with cognitive disabilities. Technology & Disability, 19(4), 205-212.

Offers 22 design recommendations for people with cognitive impairments. Findings came from a 2003 NIH conference on cognitive disabilities and the web.

Recommendations included using pictures and symbols along with text, simple text, consistent navigation, headings/titles, screen-reader support, large font, uncluttered layout, white space, customization options, numbered lists instead of bullets, large navigation buttons on every page, color contrast, appropriate reading level, no right justification, voice captions, and feedback.

Tags: Universal design, cognitive impairment

[23] Fuglerud, K., & Rossvoll, T. (2012). An evaluation of web-based voting usability and accessibility. Universal Access in The Information Society, 11(4), 359-373.

In a 2011 study of web-based voting in Norway, researchers found that universal design principles were not fully understood or not prioritized for implementation by the solution providers. Researchers designed several e-voting prototypes and asked participants to rank them after use. One prototype was preferred by the majority of participants, including those with impairments, confirming that it is possible to avoid conflicting designs for users with different disabilities.

Tags: Voting standards, accessibility

[24] Gallo, R., Kawakami, H., Dahab, R., Azevedo, R., Lima, S., & Araujo, G. (2010, Dec). T-dre: A hardware trusted computing base for direct recording electronic vote machines. Proceedings of the 26th annual computer security applications conference, Austin, Texas. doi:10.1145/1920261.1920291

Provides overview of considerations needed when developing new e-voting systems. Goals include one voter/one vote, cast-as-intended, counted-as-cast, verifiability, privacy, and coercion resistance.

Tags: Voting trends, ballot design, barriers to voting

[25] Gilbert, J., McMillian, Y., Rouse, K., Williams, P., Rogers, G., McClendon, J., & Mitchell, W., Gupta, P. Mkpong-Ruffin, I., & Cross, E. (2010). Universal access in e-voting for the blind. Universal Access in The Information Society, 9(4), 357-365.

Electronic voting systems have made attempts to include disabled voters but have fallen short. Using recent developments in technology, a secure, user-centered, multimodal electronic voting system has been developed to study a multimodal approach for providing equity in access, privacy and security in electronic voting. The findings suggest that the proposed multimodal approach to voting is easy to use and trustworthy for all populations, including the blind and deaf.

Tags: Assistive technology, voting trends, barriers to voting

[26] Gilbert, J., Ekandem, J., Darnell, S., Alnizami, H., Martin, A., & Johnson, W. (2011). Accessible voting: One machine, one vote for everyone. 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems, Vancouver, BC.

Prime III is an open-source multimodal electronic voting system. It allows users to hear or see candidate names while they cast their vote using their voice or touch. Candidates are randomly assigned to numbers, and the voters speak numbers, allowing for additional privacy. Voters can also sip/puff their vote and all voters receive a printed voting record.

Tags: Assistive technology, voting trends, cognitive impairment

[27] Gillespie, A., Best, C., & O'Neill, B. (2012). Cognitive function and assistive technology for cognition: A systematic review. Journal Of The International Neuropsychological Society, 18(1), 1-19. doi:10.1017/S1355617711001548

The review makes three contributions: (1) It reviews existing Assistive Technology for Cognition (ATC) in terms of cognitive function, thus providing a framework for ATC prescription on the basis of a profile of cognitive deficits; (2) it introduces a new classification of ATC based on cognitive function; and (3) it identifies areas for future ATC research and development.

Tags: Cognitive impairment, assistive technology

[28] Grabinger, S. (2010). A framework for supporting postsecondary learners with psychiatric disabilities in online environments. Electronic Journal Of E-Learning, 8(2), 101-110.

This article talks about cognitive disabilities and online learning. Many times when online tools are constructed they do not take into account people with cognitive disabilities, but the Center of Applied Special Technology has created a framework for online education and tools.

Tags: Cognitive impairment, assistive technology, universal design

[29] Grabinger, R., Aplin, C., & Ponnappa-Brenner, G. (2008). Supporting learners with cognitive impairments in online environments. Techtrends: Linking Research & Practice To Improve Learning, 52(1), 63-69. doi:10.1007/s11528-008-0114-4

Describes the lack of support to make education accessible to students who have suffered from disabilities and discusses the Center for Applied Technology and its educational framework, "Universal Design for Learning," which addresses the need to design curricula for all types of individuals.

Tags: Assistive technology, universal design

[30] Hall, T. E., & Alvarez, R. M. (2012). Defining the barriers to political participation for individuals with disabilities - Working paper. Washington D.C.: The Information Technology and Innovation Foundation - Accessible Voting Technology Initiative.

This working paper, a part of the Accessible Voting Initiative, provides an overview of disabilities in the U.S. as they relate to enabling voting. It includes a discussion of focus group results from disabled users and their voting preferences; discusses registration and voter rate by disability, income, and education; and explains barriers to voting.

Tags: Barriers to voting, voting statistics

[31] Hällgren, M. A. (2011). Technology and everyday functioning in people with intellectual disabilities: A Rasch analysis of the Everyday Technology Use Questionnaire (ETUQ). Journal Of Intellectual Disability Research, 55(6), 610-620. doi:10.1111/j.1365-2788.2011.01419.

The purpose of this study was to explore and evaluate evidence of the validity of ETUQ among adult persons with intellectual disabilities, contributing to the awareness of what technologies are most often used by people with disabilities.

Tags: Cognitive impairment, assistive technology

[32] Huenerfauth, M. P. (2002). Design approaches for developing user-interfaces accessible to illiterate users. Proceedings of the 18th National Conference On Artificial Intelligence. Retrieved from http://www.aaai.org/Papers/Workshops/2002/WS-02-08/WS02-08-005.pdf

This paper presents "User-Interface Recommendations in Support of Universal Literacy Accessibility (URSULA)" to create a set of guidelines for developers to make systems accessible to illiterate users. It examines both technological literacy and written language literacy. Some of the guidelines presented in the article include highlighting important information, adapting for user's geographic location, adapting medical information based on user needs, communicating sequence, facilitating information use (printing, storing, bookmarking, adding notes), detecting and adapting to user literacy level, supporting speech-to-text, and providing "focus tracking" to show users what element of the system the content is referring to.

Tags: Universal design, low literacy, plain language, plain interaction

[33] Hurst, A., & Tobias, J. (2011). Empowering individuals with do-it-yourself assistive technology. Paper presented at The proceedings of the 13th international ACM SIGACCESS Conference on Computers and Accessibility. doi:10.1145/2049536.2049541

Looks at involving disabled users in development and modification of assistive technology to create products that suit their specific needs, and points to a lack of user-centered design in the overall assistive technology marketplace.

Tags: Assistive technology, cognitive impairment

[34] Jantz, C., Anderson, J., & Gould, S. M. (2002). Using computer-based assessments to evaluate interactive multimedia nutrition education among low-income predominantly Hispanic participants. Journal of Nutrition Education and Behavior, 34(5). 254-260.

This research was conducted to measure the effectiveness of interactive multimedia (IMM) with low-income Hispanic persons. Computer evaluations decrease both participant completion time and researcher analysis time. Additionally, participants may feel less intimidated by completing a questionnaire on the touch-screen computer.

Tags: New language learners

[35] Kantner, L. and Rosenbaum, S. (2003). Usable computers for the elderly: Applying coaching experience. IPCC 2003 Proceedings (Annual Conference IEEE Professional Communication Society). doi:10.1109/IPCC.2003.1245476

Explains the computer usage problems found among elderly populations from a 2003 study. Older users had trouble with dexterity, vision, and typing. They were afraid of making mistakes, had trouble using folders, and downloading attachments, and found it difficult to create a search query. When asked, older users suggested simpler pages with fewer buttons, clearer back and forward buttons, fewer popups or moving ads, and search results that display associated groupings.

Tags: Older voters, plain interaction

[36] Kennedy, H., Evans, S., & Thomas, S. (2011). Can the web be made accessible for people with intellectual disabilities? Information Society, 27(1), 29-39. doi:10.1080/01972243.2011.534365

This paper chronicles the Inclusive New Media Design (INMD) project, which brought together 31 designers and developers and 29 people with intellectual disabilities to explore best practices. It highlights simple steps for accessibility among people with mild impairments and discusses barriers that exist for accessibility. The paper defines a difference between cognitive disabilities and intellectual disabilities. It says, "cognitive disability can be acquired at any age, whereas learning disabilities are lifelong; cognitive disability usually refers to a specific condition, whereas intellectual disability is often characterized by a complex of cognitive impairments."

Tags: Cognitive impairment, universal design

[37] Koppell, J. G. S. & Steen, J. A. (2004). The effects of ballot position on election outcomes. The Journal of Politics, 66(1), 267-281. doi:10.1046/j.1468-2508.2004.00151.x

Article looks at the effect of name position on voting from a study of the 1998 Democratic primary in NYC. Each precinct rotated the position of the candidate names, showing that position of name on ballot does influence voting preference – the first name listed is statistically chosen more frequently.

Tags: Ballot design

[38] Kutner, M., Greenberg, E., Jin, Y., Boyle, B., Hsu, Y., Dunleavy, E., & White, S. (2007). Literacy in everyday life: Results from the 2003 national assessment of adult literacy. National Center for Education Statistics.

This document reports on the 2003 National Assessment of Adult Literacy (NAAL), which assesses the literacy rates of 19,000 adults, aged 16 and older. Three types of literacy were measured: prose, document, and quantitative. According to the report, in 2003 some 5% of adults were nonliterate in English. It was also found that 93 million American adults (43%) read at a "below basic" level.

Tags: Low literacy

[39] Laskowski, S. J., & Redish, J. (2006). Making ballot language understandable to voters. Proceedings of the USENIX/Accurate Electronic Voting Technology Workshop 2006 on Electronic Voting Technology Workshop (pp. 1–1). Retrieved from http://static.usenix.org/event/evt06/tech/full_papers/laskowski/laskowski.pdf

The paper discusses "the gap between best practices and typical ballot instructions." It reviews more than 100 paper ballots from all 50 states and the District of Columbia, sample ballots on three Direct Recording Electronic voting machines (DREs), and the online demonstration of voting on the web site of a fourth DRE. Recommended best practices include: "Best Practice 1. Tell people about consequences before they are likely to act. Best Practice 2. Put the context before the action in each instruction. Best Practice 3. Use familiar, common words. Avoid technical or specialized words that users are not likely to understand. Best Practice 4. Put instructions in logical order: First task, first; last task, last."

Tags: Ballot design, voting trends

[40] Lee, B., Chen, Y., & Hewitt, L. (2011). Age differences in constraints encountered by seniors in their use of computers and the internet. Computers in Human Behavior, 27. 1231-1237 doi:10.1016/j.chb.2011.01.003

This article looked at perceived barriers that older adults encounter when using computer-mediated information technology, including intrapersonal, interpersonal, structural, and functional constraints.

Tags: Older voters

[41] López-Guerra, C. (2012). Enfranchising minors and the mentally impaired. Social Theory & Practice, 38(1), 115.

Fairness in voting requires the inclusion of all members of the polity who have what the author calls the *franchise capacity*: the minimum necessary cognitive and moral powers to experience the benefits of having the franchise or the harms of disenfranchisement. The article argues that current age and sanity prerequisites for voting in most places fail to meet the demands of fairness and ought to be revised.

Tags: Cognitive impairment

[42] Making voting more accessible for veterans with disabilities. (2012, 0724). Retrieved from http://www.itif.org/publications/making-voting-more-accessible-veterans-disabilities

More than 40,000 American military personnel have been injured in Iraq and Afghanistan, and many of these Americans are undergoing lengthy recovery and rehabilitation treatments at hospitals far from home. Many barriers exist that may prevent these Americans from registering and voting in elections. Fortunately, improvements in technology and support services can make voting more accessible for these Americans and others who face barriers to participating in the electoral process.

Tags: Barriers to voting

[43] McGrew, G. (2012). Assistive technology for the voting process - working paper. Washington, D.C.: The Information Technology and Innovation Foundation - Accessible Voting Technology Initiative.

Based on the 2010 American Community Survey from the U.S. Census Bureau, there are an estimated 33.4 million people with disabilities in this country who are of voting age. While much progress has been made in voting accessibility over the past 30 years with the help of federal legislation (e.g., Voting Accessibility for the Elderly and Handicapped Act – 1984, Americans with Disabilities Act – 1990, Help America Vote Act – 2002) as well as many state initiatives, many barriers exist that can hinder or prevent people with disabilities from independently participating in the voting process. This report discusses the nature of that process, what functional abilities one needs to carry out tasks associated with the process, and what assistive technology (AT) products are used by people with disabilities that provide them the functional ability to perform these tasks independently. Additionally, this report tries to provide the reader a sense of the context of life with a disability through which the voter must navigate to successfully carry out voting. For some, effective AT products may not be enough to smooth the path to voting success.

Tags: Voting statistics, assistive technology

[44] Niemi, R.G., & Herrnoson, P.S. (2003). Ballot design: How to improve life at the ballot box. Spectrum: The Journal of State Government. 35-39.

Discusses issues with current ballot designs and offers suggestions for future designs to help voters at the voting booth. Principles for a well designed ballot include: simplicity, instructional clarity, consistency, and equity. Flaws will cause problems for new and non-habitual voters; some might vote for wrong candidates, while others might not vote for races they intended to solely because of bad design decisions. More knowledgeable voters (those who vote with regularity) will not be as tripped up by bad design.

Tags: Ballot design, plain interaction, plain language

[45] Nussbaum, M. (2009). The capabilities of people with cognitive disabilities. Metaphilosophy, 40(3/4), 331-351. doi:10.1111/j.1467-9973.2009.01606.x

Argues the law must go further in protecting people with cognitive disabilities by offering them equal access to education. Laws should treat people with cognitive disabilities as equal citizens and should show respect for them as equals. The article states that this means that the law must provide equal entitlement to medical care, housing, and other economic needs. Though, the author states the central theme is not about medical needs, but political needs.

Tags: Cognitive impairment

[46] Olson, K., Nordhaug, H.F. Internet elections: Unsafe in any home?. (2012). Communications of the ACM, 55(8), 36. doi:10.1145/2240236.22040251

Explores online voting systems and countries with internet voting election options, such as Norway, which launched a $40 million project in 2009 to design an electronic voting system for its 2011 elections. The system allowed repeated voting and only counted a voter's last vote. They also used a coding system to prevent tampering, by giving each voter a code on the back of the card mailed to them.

Tags: Voting trends, ballot design, remote voting

[47] Runyan, N. (2007). Improving access to voting: A report on the technology for accessible voting systems. Retrieved March 1, 2007 from http://www.demos.org/publication/improving-access-voting-report-technology-accessible-voting-systems

This document details the need for accessible voting systems for all voters. It states that the technology already exists and is a cheap fix that can be applied to many voting systems. Direct-recording electronic systems should only be used if they incorporate an accessible and truly verifiable paper ballot printer-scanner-verifier that converts them into more reliable ballot-marking devices, or their accessibility is

substantially improved to fully comply with all the new VVSG accessibility requirements.

Tags: Ballot design, cognitive impairment

[48] Redish, J., & Chisnell, D. (2004). Designing Web sites for older adults: A review of recent research. Retrieved June, 9, 2008.

This article reviews web site design for older adult user and outlines common usability and design issues for that population. Researchers discuss various types of web sites, while focusing on interaction and navigation, information architecture, visual design, and information design.

Tags: Older voters, plain interaction

[49] Redish, J., Chisnell, D. E., Newby, E., Laskowski, S. J., & Lowry, S. (2008). Report of Findings: Use of Language in Ballot Instructions. Retrieved from http://www.nist.gov/itl/vote/upload/NISTIR-7556.pdf

This report details the finding of research conducted on plain language in voting instructions; forty-five participants were asked to vote using a plain language version and a standard language version. The report found that participants were able to vote more accurately when using the plain language version ballot. Participants who first used the plain language version were subsequently able to better perform on the standard language version, as well.

Tags: Plain language, ballot design

[50] Redish, J., Chisnell, D. E., Laskowski, S. J., & Lowry, S. (2010). Plain language makes a difference when people vote. *Journal of Usability Studies*, *5*(3), 81-103.

This document discusses plain language guidelines created from an empirical study comparing a ballot with traditional language instructions to a ballot with plain language instructions. Voters were more accurate when using the plain language ballot, and 82% of voters said they preferred the plain language ballot.

Tags: Plain language, ballot design

[51] Selker, T., Goler, J. A., & Wilde, L. F. (2008). Who does better with a big interface? Improving Voting Performance of Reading Disabled Voters. MIT/Caltech.

Discusses the effect of ballot interface on user performance. Finds fault with current methods and suggests a hybrid solution that orients users and guides them through the ballot selection process. Results showed that voters with a diagnosed reading disability were able to perform much better on full-faced voting machines than those who seemed to have similar disabilities but were undiagnosed.

It was suggested that the diagnosis allowed voters to develop methods to compensate for their disability. However, even the best voters made at least two mistakes – an unacceptable error rate in light of the high stakes of voting.

Tags: Ballot design, low literacy

[52] Selker, T. (2007). Technology of access: Allowing people of age to vote for themselves. The McGeorge Law Review, 38, 1113. Retrieved from http://www.americanbar.org/content/dam/aba/migrated/aging/voting/pdfs/selker.authcheckdam.pdf

This article examines how new technology should make voting accessible to all users without relying on help from another person for assistance. It describes that many challenges can be addressed by better interface design: good viewability, redundancy of cues, clear and simple onscreen training materials, and the reduced cognitive complexity of onscreen environments. Simple interfaces with fewer buttons help voters have less to learn and tend to make fewer mistakes.

Tags: Ballot design, universal design, plain interaction

[53] Scherer, M. J. (2005). Assessing the benefits of using assistive technologies and other supports for thinking, remembering and learning. Disability & Rehabilitation, 27(13), 731-739. doi:10.1080/09638280400014816

Planning assistive technologies and other supports for individuals with cognitive disabilities requires a comprehensive and individualized assessment of current goals, past experiences with the use of technologies and other supports, and the person's predisposition to the use of alternative or additional supports. This paper discusses a foundation for the refinement of an existing assessment process to match technologies to individuals with cognitive disabilities.

Tags: Assistive technology, cognitive disability

[54] Shneiderman, B. (2000). Universal usability. Communications of the ACM, 43(5), 84-91.

The article focuses on the need for encouraging research on universal usability of computers to empower every citizen. Universal usability can be defined as having more than 90% of all households as successful users of information and communications services at least once a week. The goals include 1) to cope with the technology variety by supporting the 100-to-1 range of hardware, software, and network access speeds, 2) the accommodation of enormous diversity of users, and 3) bridging the gap between what users know and need to know.

Tags: Universal Design

[55] Shurkin, J. (2011). Call up the vote. *New Scientist*, 211(2831), 28.

Bryan Campbell and his colleagues at Rice University in Houston, Texas, designed an iPhone app for casting votes. They tested 55 people between ages 18 and 69, with and without smartphone experience, on their app and on paper.

On average, users took 90 seconds longer to cast their vote on the smartphone system; however, the app did reduce the number of mistakes made in voting, among people familiar with smartphones. The researchers think they will be able to reduce the time taken by making adjustments to their app.

Tags: Ballot design

[56] Snyder, P. J., Jackson, C. E., Peterson, R. C., Khachaturian, A. S., Kaye, J., Albert, M. S., & Weintraub, S. (2011). Review article: Assessment of cognition in mild cognitive impairment: A comparative study. Alzheimer's & Dementia: The Journal Of The Alzheimer's Association, 7338-355. doi:10.1016/j.jalz.2011.03.009

Provides understanding for what older patients with cognitive disabilities can be expected to do.

Tags: Older voters, cognitive impairment

[57] Smith, B., Laskowski, S., & Lowry, S. (2009). Implications of graphics on usability and accessibility for the voter. E-Voting and Identity, 54–74. doi:10.1007/978-3-642-04135-8_4

This paper explores using graphics on ballots; their implications for usability and accessibility; and their impact voters, specifically those with cognitive disabilities. For the purposes of the paper, graphical elements are photographs, party logos, or informational icons. The paper examines the usability issues for graphics on ballots and provides arguments both for and against their usage. It further explores designing to accommodate cognitive disabilities including reading ability, verbal comprehension, memory and attention, visual comprehension, mathematics comprehension, and problem-solving ability.

Tags: Ballot design, cognitive impairment

[58] Stock, S. E., Davies, D. K., Wehmeyer, M. L., & Lachapelle, Y. (2011). Emerging new practices in technology to support independent community access for people with intellectual and cognitive disabilities. Neurorehabilitation, 28(3), 261-269.

This paper discusses historical and emerging practices related to physical access to community-based information for individuals with cognitive disabilities such as intellectual disability, autism, or traumatic brain injury.

Tags: Cognitive impairment

[59] Summers, K., & Summers, M. (2004). Making the web friendlier for lower-literacy users. *Intercom*, 51(6), 19-21.

[60] Summers, K., & Summers, M. (2005). Reading and navigational strategies of web users with lower literacy skills. Proceedings of the American Society for Information Science and Technology, 42(1), NA.

More than half of adults in the U.S. read below an eighth grade level, yet most web sites are written at a tenth-grade level. The goal of this two-year study, sponsored by Pfizer, was twofold: 1) to understand the differences between the reading and navigational strategies of users with medium to high literacy skills and those with lower literacy skills; 2) to learn how to make web-based medical content usable and accessible for lower-literacy adults, and to develop design principles that could be used to design websites that would meet the needs of both higher and lower literacy users.

Tags: Low literacy

[61] Summers, K., Langford, J., Wu, J., Abela, C. and Souza, R. (2006). Designing web-based forms for users with lower literacy skills. Proceedings of the American Society for Information Science and Technology, 43: 1–12. doi:10.1002/meet.14504301174

Previous research (Summers & Summers, 2003) has identified patterns of behavior and effective practices related to how lower literacy users interact with health-related internet sites. But, earlier research has not addressed how users react to interactive medical forms on health sites. The goal of this study was to learn how low-literacy users react to web-based medical forms and develop design principles for creating these forms.

Tags: Low literacy

[62] Takagi, H., Saito, S., Fukuda, K., & Asakawa, C. (2007). Analysis of navigability of web applications for improving blind usability. ACM Transactions Computer-Human Interaction, 14(3), 13. doi:10.1145/1279700.1279703

This research proposes new, landmark based navigation structure to assist blind users with orienting and navigating a site. It discusses difficulty non-visual users have with current site structure despite using their assistive tools. One difference is that sighted users navigate hypertext navigation by selecting hyperlinks. For blind users, navigation means hypertext navigation and scanning navigation, which corresponds to eye-movements for the sighted. One of the goals for this study was to discover the various scanning methods, and measure their frequencies. Findings included the need to increase the number of useful landmarks, improve HTML specification, and improve voice browsers to support users to learn appropriate navigation methods for each page they access.

Tags: Universal design

[63] Underhill, W. (2012). Elections in the digital world. State Legislatures, 38(2), 20.

Through the Voting Information Project – collaboration between the Pew Center on the States and Google – election officials, advocacy groups, candidates, and others can use free tools to provide voters with personalized information on voting day. Thirty-four states have provided data to the voting project. The project team then created a code that programmers can use to build local apps.

Tags: Voting trends

[64] United States Election Assistance Commission. (2007). Effective Designs for the Administration of Federal Elections. Retrieved from http://www.eac.gov/election_management_resources/designing_polling_place_materials.aspx

This document outlines the guidelines created by the U.S. Election Assistance Commission for the design of ballots and polling place materials. The report includes legislative guidelines and design principles; similarly, the report outlines the whole ballot design process, which can be complex and difficult to navigate.

Tags: ballot design, universal design

[65] United States Election Assistance Commission. (2009). Voluntary Voting Systems Guidelines (v 1.1). Retrieved from http://www.eac.gov/testing_and_certification/voluntary_voting_system_guidelines.aspx

This document outlines the set of specifications and requirements created by the U.S. Election Assistance Commission to be used when testing voting systems for basic functionality, accessibility, and security capabilities. This current version updates the prior documents to be in line with the most recent advancements in election technology and practices. States may choose to follow these requirements.

Tags: ballot design, universal design

[66] Ward, A., Baker, P. M. A., & Moon, N. W. (2009). Ensuring the enfranchisement of people with disabilities. Journal of Disability Policy Studies, 20(2), 79-92.

This article asserts that how people with disabilities vote is just as important as the physical barriers they face when casting their votes. For this reason, attention has begun to turn to the sorts of problems people with disabilities encounter in their interactions with poll workers and other local election officials. New voting technologies have only augmented the arguments around voting for people with disabilities. In the end, the article's discussion is more on voting policies than voting practices.

Tags: Cognitive disabilities, voting trends

[67] Wattenberg, T. (2004). Beyond standards: Reaching usability goals through user participation. SIGACCESS Accessibility and Computing (79), 10-20.

The passing of the Americans with Disabilities Act (ADA) was meant to increase inclusion of those with disabilities in the mainstream; however, unemployment rates have remained pretty much the same since the ADA's passing. This paper argues for inclusion of users in assistive technology development as a way of developing more useful assistive tools and reducing drop-off amongst disabled users.

Tags: Cognitive impairment, assistive technology

[68] Wise, P. H. (2012). Emerging technologies and their impact on disability. Future Of Children, 22(1), 169-191.

New technologies can mean great things for able-bodied people; however, for those with learning disabilities, new technologies often push them further out of the mainstream. For example, telephones increased the ease of oral communication, but this further limited the deaf community's ability to communicate with each other and those outside their community. Adaptive systems had to be created to overcome this barrier. The paper focuses on mostly therapeutic technology and not adapting technology to those with disabilities.

Tags: Assistive technology

[69] Yao, D., Qiu, Y., Huang, H., Du, Z., & Ma, J. (2011). A survey of technology accessibility problems faced by older users in china. Universal Access in the Information Society, 10(4). 373-390. doi:10.1007/s10209-011-0222-3

Older generations need the internet to have more parent-child interaction, make friends, learn about society, and gain knowledge. Problems with current design include: flashing screens, loud colors, unreadable fonts, text walls, and small images. All these things are obstacles for the older adult. Most designers are not currently addressing these design problems. This paper enumerates feedback from older adult users on design choices that need to be reconsidered when designing for the older adults.

Tags: Older voters, plain interaction, universal design