## Voting Re-design of Ballots



he background of this case study is building on two cases where the design of the voting ballots made the voting process challenging. The first case was the 2018 Broward County election in Florida<sup>1</sup>, USA where there was a significant undervote in the senate race. Here the reason was that the senate race was placed below the left-most column under the ballot instructions. Another issue is poorly filled out ballots, where voters either do not fill out the ballot correctly or they poorly mark the ballots, making them hard to scan.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup> Caruso, Catherine. "The Problems with Poor Ballot Design." Scientific American, www.scientificamerican.com/article/q-a-with-philip-kortum/

<sup>&</sup>lt;sup>2</sup> Dana Chisnell, Whitney Quesenbery. "Perspective | How a Badly Designed Ballot Might Have Swayed the Election in Florida." The Washington Post. WP Company. https://www.washingtonpost.com/outlook/2018/11/12/how-badly-designed-ballot-might-have-swayed-election-florida?noredirect=on.

In an article by the scientific american, Philip Kortum, a psychology professor at Rice University claims that there are four general classes of major voting issues we see in balloting.

- 1. We got ballot design issues.
- 2. We got instructional issues(telling people how to vote)
- 3. We've got issues related to language on the ballot.
- 4. The way people interact with voting systems in general.

Therefore, voting designs can have a great impact on outcomes of elections and it is therefore extremely important for experts to consider how these four major issues can be solved.

### **1.Define the research scope**

# The hypothesis used for this study - picture superiority effect

In this case study the psychological theory "picture superiority effect" will be used to try to improve issue number 2. The hypothesis states that:

"Sensory semantic theory aims to explain why we are able to better remember pictures over words or numbers. This theory, which was proposed by D.L. Nelson, further asserts that pictures present meaning in a more direct way. Thus, they are more efficiently understood and recalled. Such advantage is termed as picture superiority effect. Moreover, pictures' unique visual attributes make them easier to remember."<sup>3</sup>

By using instructional pictures we can potentially help reduce the difficulties with understanding the instructions.

<sup>&</sup>lt;sup>3</sup> "Sensory Semantic Theory." Sensory Semantic Theory definition | Psychology Glossary. https://www.alleydog.com/glossary/ definition.php?term=Sensory%2BSemantic%2BTheory.

### 2. Ideate and design

### How

Ballot style 58			Seq:058			Ballot style 58		Seq.058	
Official General Election B November 6, 2018 Broward County, Florid	allot Boleta Ofic 6 De a Conda	ial De La El Noviembre id de Browa	Eleccion General 0 e Del 2018 ard, Florida	Ofisyel Ja 6 Konti	leneral Eleksyon Bilten 5 Novanm 2018 te Broward, Florida	Official General Election November 6, 201 Broward County, Flo	n Ballot Boleta Oficial Dr 8 6 De Novi rida Condad de	t La Eleccion General Ofis Imbre Del 2018 Broward, Florida	el Jeneral Eleksyon Bilter 6 Novanm 2018 Conte Broward, Florida
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Use only the marking device provided or a black pen. If you make a mistake, ank for a	O Bruce Wayne		⊃ Jane Doe Ri	RED	Joe Quimby SPRF	Use only the marking device provided or a black pen. If you make a mistake, ank for a	O Bruce Wayne WAYN	⊖ Jane Doe RED	<ul> <li>Joe Quimby</li> </ul>
new ballot. Do not cross out or your vote may not count.	O Lisa Simpson	MPS C	⊃ John Doe Y	YEL	<ul> <li>Adam West QUAH</li> </ul>	new ballot. Do not cross out or your vote may not count.	C Lisa Simpson SMPS	🔾 John Doe 🛛 YEL	Adam West
andidate, I print the ank line	Write-in/Escribir/A lekri	_ <	⊃ Jackie Doe PI	PRP		<ul> <li>To vote for a write-in candidate, fill in the oval</li></ul>	Write-in/Escribir/A lekri	O Jackie Doe PRP	
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Use solo un lapiz de a o una pluma de tinta	O Lara Croft 1	MBR C	Mickey Mouse Ri	RED	<ul> <li>Jakob Nielsen</li> </ul>	seleccion. Use solo un lapiz de punta negra o una pluma de tint	a O Lara Croft TMBR	Mickey Mouse RED	<ul> <li>Jakob Niels</li> </ul>
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r un candidato no esta impreso en n el ovalo 🗨 y	Governor and Lieutenant Govern	or	Commissioner of Agriculture	-	realt Judge, 17th Judicial Circuit, Group 4	<ul> <li>Para Votar por un candidato cuyo nombre no esta impreso es la boleta, llene el ovalo  y</li> </ul>	Governor and Lieutenant Governor	Commissioner of Agriculture	Circuit Judge, 17th Judic
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to. da ki pa	<ul> <li>Jean-Luc Picard</li> <li>Snack</li> </ul>	STRK	-			<ul> <li>Pou vot ou pa valab ariko.</li> <li>Pou vote pou yon kandida ki pa pan non Lanorime sou biltan val</li> </ul>	Jean-Luc Picard STRK	-	
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eri non yon kandida.	Bessie Coleman	SCIE	Fourth District Court of Anneal			rezeve pou ekn non yon kandida	Bessie Coleman     Marie Curie     SCIE	Fourth District Court of Anneal	
	Rachel Carson	1	Tribunal De Apelaciones Del Curato Dis Katriyem Distrikt Lakou Depel	Distrito		Candidate 2	Rachel Carson	Tribunal De Apelaciones Del Curato Distrito Katriyem Distrikt Lakou Depel	
	Write-in/Escribit/A lekri		Shall Judge Judy J. Johnson of the Fourth District Court of Appeal be retained in office?			Wite-ty	Write-in/Escribir/A lekri	Shall Judge Judy J. Johnson of the Fourth District Court of Appeal be retained in office?	
			¿Debera retenense en su cargo al Juez Judy J. Johnson del Tribunal del Cuarto Distrito de Apelaciones?			<ul> <li>Candidate 1</li> </ul>		¿Debera retenerse en su cargo al Juez Judy J. Johnson del Tribunal del Quarto Distrito de Apelaciones?	
			Eske se pou jis Judy J. Johnson nan katriyem distrik lakou dapel rete nan pos li a?			Candidate 2		Eske se pou jis Judy J. Johnson nan katriyem distrik lakou dapel rete nan pos li a?	
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### Use two different ballots, where one ballot gives instructions without a picture and one will use a picture additionally to the instructions

### **Research question**

1. Which ballot will yield the fewest mistakes when voters fill out ballots? (E.g fill out more than one candidate option, requiring a new ballot)

2. What are the opportunities for improvements in the ballot design?

### **Success Metrics**

Low instance of incorrect voting

Easy to fill out

### **Methods**

#### Type 1

#### **Qualitative usability testing**

- Field studies/user interview
- Aiming for around 5 users

Duration: 10-15 min

Location: University of Oslo

Compensation: A coffee

#### Type 2

#### Quantitative usability testing

- Survey: using <u>https://www.qualtrics.com/uk/</u>
- Aiming for 60-70 users
- · Use hot spot feature to simulate voting
- Use a chi-square test to see if there is grounds for rejecting the null hypothesis. Our null hypothesis is: there is no difference between incorrect voting for ballot 1 and 2.

**Duration:** A few days to gather enough answers

Location: Online

Compensation: set by the website

### 3. Test, Evaluate, & Refine

### Process for the two methods Type 1

#### Qualitative usability testing

Pre-study script	Before starting the study: Introduction to participants Not an exam, no right or wrong answers If there are any problems with the prototype, it's the prototypes fault not the participant. If you are recording the session, tell them and ask if they are ok with it.
Introduction	Introduce topic, but do not expose too much
Pre-questions	<ul> <li>Questions before getting into tasks. Do you need to explore more about them.</li> <li>Probe screen questions:</li> <li>Are you familiar with the voting procedure?</li> <li>Do you have any questions before we start?</li> </ul>
Informed consent form	Give consent form to use data, also make sure the participant knows they can withdraw their consent at any point. Also, how the data will be used, where it will be stored and when it will be deleted.
Task/Activity	Ask voters to fill out (Control ballot for group 1, Treatment ballot for group 2)
Post-questions	<ul><li>Follow up questions:</li><li>How did you find the process of voting?</li><li>How did you find the instructions?</li><li>Any further comments?</li></ul>

Group 1 ballot (Control)

#### Group 2 ballot (Treatment)

Ballot style 58		Seq:058			Ballot styl
Official General Election November 6, 2018 Broward County, Flori	Ballot Boleta Oficial 6 De No ida Condad d	De La Eleccion General viembre Del 2018 le Broward, Florida	Ofisye Ko	I Jeneral Eleksyon Bilten 6 Novanm 2018 nte Broward, Florida	Official N Brow
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<ul> <li>provided or a black pen.</li> <li>If you make a mistake, ask for a</li> </ul>	O Bruce Wayne WAY	'N 🔿 Jane Doe	RED	O Joe Quimby SPRF	provided or a b If you make a n
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marcas, es posible que su voto no se cuente. Para Votar por un candidato		Write-in/Escribir/A lekri			marcas, es por no se cuente.
cuyo nombre no esta impreso en la boleta, llene el ovalo  y escriba el nombre del candidato en la linea en blanco provista pera un candidato	Governor and Lieutenant Governor Gobernador y Teniente Gobernador Gouvene Ak Lyetnan Gouvene (Vote for One / Vote por Uno (Vote sou Youn)	Commissioner of Agri Comisinado De Agric Komisyone Agrii (Vote for One / Vote po / Vote pou Your	iculture cultura kilti or Uno 1)	Circuit Judge, 17th Judicial Circuit, Group 46 Juez De Circuito, Circuito 17Mo, Group 46 Jij Itineran nan 17em Sikul, Group 46 (Vote sor One/ Vote por Uno / Vote you Yoan)	cuyo nombre i la boleta, llene escriba el nom en la linea en l
Enfomasyon Sou Bilten Vot: • Pou vote, byen kolore tout andan mal to ki akota raspose ou	Hermione Granger GRY     Ron Weasley	F Cat in the Hat	SUE	Holden Caulfield	Enfomasyon Sou     Pou vote, byer     gral
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<ul> <li>pou ekri sou bilten vot la.</li> <li>Si w fe yon ere, mande yo ba w yon nouvo bilten vo. Si w efase oubyen fe novuo mak, lap posib pou vot ou pa valab ariko.</li> </ul>	Cinderella DSN Prince Charming	Y Justice of the Supren Magistrado en el Tribun Jisti Nan Lakou Si	ne Court al Supremo prem		pou ekri sou b Si w fe yon ere yon nouvo bilt oubyen fe nov pou vot ou pa
<ul> <li>Pou vote pou yon kandida ki pa gen non I enprime sou bilten vot la kolore ti olva la Eni ekri</li> </ul>	Jean-Luc Picard STR     Spock	Cat in the Hat	SUE		<ul> <li>Pou vote pou gen non I enpr la kolore ti ob</li> </ul>
non kandida a sou liy vid la rezeve pou ekri non yon kandida.	Amelia Earhart FLG     Bessie Coleman	T O Arthur T. Read	MRB		non kandida a rezeve pou ek
	O Marie Curie SCII Rachel Carson	E Fourth District Court o Tribunal De Apelaciones Del Katriyem Distrikt Lake	of Appeal Curato Distrito ou Dapel		⊖ Can
	Write-in/Escribir/A lekri	Shall Judge Judy J. Johnson of th District Court of Appeal be retain office?	he Fourth ed in		
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Ballot style 58			Seq:058				
Official General Election E November 6, 2018 Broward County, Florid	allot Bole	ta Oficial De l 6 De Novien Condad de B	De La Eleccion General Ofisyel Jeneral Eleksyon Bilten vviembre Del 2018 6 Novann 2018 de Broward, Florida Konte Broward, Florida				
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new ballot. Do not cross out or your vote may not count.	C Lisa Simpson	SMPS	🔿 John Doe	YEL	<ul> <li>Adam West</li> </ul>	QUA	
fill in the oval    and print the name clearly on the blank line	Write-in/Escribir/A lekri		<ul> <li>Jackie Doe</li> </ul>	PRP			
provided for the write-in candidate.     Instrucciones Para La Boleta:     Para votar, llene completamente el grado instructua su	Representative in Congress Representante En El Congres Reprezentant Nan Kongre (Vote for One / Vote pou / Vote pou Youn)	District 20 iso Distro 20 Distri 20 r Uno	Chief Financial Offi Controlador Estat Chief Ofisyre Finan (Vote for One / Vote po / Vote pou Youn)	cer al 18 r Uno	Circuit Judge, 17th Judicial ( Juez De Circuito, Circuito 1 Jij Itineran nan 17em Sik (Vote for One/ Vote p / Vote you You	Circuit, Gr 7Mo, Gro ui, Group tor Uno n)	
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marcas, es posible que su voto no se cuente	Write-in/Escribir/A lekri		Write-in/Escribir/A lekri				
Para Votar por un candidato							
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Enfomasyon Sou Bilten Vot:	7 vote pou rounj						
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chwazi a. Selman sevi ak yon plim nwa oubyen ak yon kreyon pou ekri sou bilten yot la	Luke Skywalker	REBL	<ul> <li>Arthur T. Read</li> </ul>	MRB	<ul> <li>Count of Monte</li> </ul>	Cristo	
<ul> <li>Si w fe yon ere, mande yo ba w yon nouvo bilten vo. Si w efase oubyen fe novuo mak, I ap posib</li> </ul>	Cinderella Prince Charming	DSNY	Justice of the Supreme Magistrado en el Tribunal Jisti Nan Lakou Sip	Court Supremo rem			
<ul> <li>pou vot ou pa valab ariko.</li> <li>Pou vote pou von kandida ki pa</li> </ul>	O Jean-Luc Picard	STRK					
gen non I enprime sou bilten vot la, kolore ti olva la 🌑 Epi ekri	Spock	onat	<ul> <li>Cat in the Hat</li> </ul>	SUE			
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Candidate 1 Candidate 2	O Marie Curie Rachel Carson	SCIE	Fourth District Court of Tribunal De Apelaciones Del C Katriyem Distrikt Lako	Appeal Curato Distrito J Dapel			
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			¿Debera retenerse en su cargo al J J. Johnson del Tribunal del Cuarto de Apelaciones?	uez Judy Distrito			
Candidate 1     Candidate 2			Eske se pou jis Judy J. Johnson na katriyem distrik lakou dapel rete na	n n pos li			
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### Results

Below are some of the comments given by the participants



### Type 2

#### **Quantitative testing**

Set-up	Using Qualtrics to set up survey using the hotspot feature
Get survey results	Connecting Qualtrics to MTurk: <u>https://</u> www.mturk.com/ https://blog.mturk.com/getting-great-survey- results-from-mturk-and-qualtrics-be1704ff9786
Download data from survey into Excel Sheet	Process data Perform Chi-Square test

### Set up

Ballot style 58			Seq:058
Official General Election B	allot	Boleta Oficial De	La Eleccion General
November 6, 2018		6 De Novier	nbre Del 2018
Broward County, Florid	a	Condad de B	roward, Florida
Ballot Instructions: • To vote, fill in the oval completely next to your choice. Use only the marking device	United Sta Senador De Loo Senatu (Vote for One / Vote p	tes Senator s Estados Unidos ∍ Etazini / Vote por Uno ou Youn)	Attorney Genera Fiscal General Pwokire Jenera (Vote for One / Vote po / Vote pou Youn
<ul> <li>If you make a mistake, ask for a new ballot. Do not cross out or your vote may not count.</li> </ul>	Bruce Wayne	WAYN SMPS	Jane Doe
<ul> <li>To vote for a write-in candidate, fill in the oval             and print the name clearly on the blank line</li> </ul>	Write-in/Escribir,	'A lekri	Jackie Doe
<ul> <li>provided for the write-in candidate.</li> <li>Instrucciones Para La Boleta:</li> <li>Para votar, llene completamente el ovalo   junta a su</li> </ul>	Representative in C Representante En El Reprezantant Nai (Vote for One / Vote po	Congress District 20 Congresso Distro 20 n Kongre Distri 20 / Vote por Uno ou Youn)	Chief Financial O Controlador Est Chief Ofisyre Fin (Vote for One / Vote p / Vote pou You

Using "hot spots", it is possible to simulate the voting process.

The whole survey (the first part of the test has been filled out to show how the hot-spots work)



How did you find the instructions?



Optional: Any additional thoughts?

### The data

1	R	S	т	U	v	W	х	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
1	Part 1_1	Part 1_2	Part 1_3	Part 1_4	Part 1_5	Part 1_6	Part 1_7	Part 1_8	Part 1_9	Part 1_10	Part 1_11	Part 1_12	Part 1_13	Part 1_14	Part 1_15	Part 1_16	Part 1_17	Part 1_18
2	Please c 💌	Please c 🔻	Please c 💌	Please c 🔻	Please c 💌													
3	On	Off	Off	00	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	On	On	Off	Off
5	on	on	UII		on	011	on	011	on	on	011	011			on	011	on	UII
4	On	Off	Off	On	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	On	Off	On	Off
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6	On	Off	Off	On	Off	Off	On	Off	Off	Off	Off	Off	Off	On	Off	On	Off	Off
7	On	Off	Off	On	Off	Off	Off	Off	Off	On	Off	Off	Off	On	Off	On	Off	Off
	0-	04	04	0-	04	04	0	04	04	04	0-	0#	04	0-	04	0-	04	04
0	on	on	on	011	on	on	on	on	on	OII	on	UII		011	on	011	on	on
9	Off	On	Off	On	Off	On	Off	Off	Off	On	Off	Off	Off	On	Off	Off	On	Off
	_									_						_		
10	On	Off	Off	On	Off	Off	Off	Off	Off	On	011	Off	011	On	Off	On	Off	Off
11	On	Off	Off	On	Off	Off	Off	On	Off	Off	Off	Off	Off	On	Off	Off	On	Off
12	On	Off	Off	On	Off	Off	Off	Off	Off	Off	On	Off	Off	Off	On	On	Off	Off
12	Off	00	Off	00	Off	00	Off	0.5	Off	Off	On	Off						
15	on	UII	UII	011	on	on	on	on	on	UII	on	on		011	UII	on	on	UII
14	On	Off	Off	On	Off	Off	On	Off	Off	Off	Off	Off	Off	On	Off	On	Off	Off
4.5				~									o#					
15	Un	Uff	Uff	Un	Off	Off	Off	Off	Off	Un	Uff	Uff	UTT	Un	Uff	Un	Off	Off
16	Off	On	Off	On	Off	Off	Off	Off	Off	On	Off	Off	Off	On	Off	On	Off	Off
17	0-	0#	04	0-	04	04	04	0-	04	04	04	04	04	04	0-	04	0-	04
1/	011	UIT	on	on	on		UIT	UN	UIT	on	on	UII	on	on	on	on	on	UI
10	01	04	04	0.0	04	<b>A</b> #	04	04	04	0.	04	04	04	0.	04	04	0.	04

Formatted the results for each question, using the =COUNTIF function in excel I was able to quickly count how many times a participant crossed off an option.



Then we're able to use the =COUNTIF, to count how many times someone crossed off 2 options, 3 options, 4 options and so on. Correct voting is when a participant only crosses off 1 option for each question.

### **Results from Chi-square test**

**Null hypothesis:** there is no difference between incorrect voting for ballot 1 and 2.

Because the chi-square test came back with a result below 0.05 it can be concluded that there is statistical significance and therefore we can reject the null hypothesis. Therefore, there is a difference between voting when instructions include a picture compared to when there is no picture.

	A	В	С	D	E	F	G	Н	
1	Actual Data:	Voted correctly	Voted incorrectly	Total					
2	Control	23	8	31					
3	Treatment	29	2	31					
4	Total	52	10	124					
5									
6									
7									
8	Expected Values:	Voted correctly	Voted incorrectly	Total					
8 9	Expected Values: Control	Voted correctly 26	Voted incorrectly 5	Total 31					
8 9 10	Expected Values: Control Treatment	Voted correctly 26 26	Voted incorrectly 5 5	Total 31 31					
8 9 10 11	Expected Values: Control Treatment Total	Voted correctly 26 26 52	Voted incorrectly 5 5 10	Total 31 31 124					
8 9 10 11 12	Expected Values: Control Treatment Total	Voted correctly 26 26 52	Voted incorrectly 5 5 10	Total 31 31 124					
8 9 10 11 12 13	Expected Values: Control Treatment Total CHI-Test p-value:	Voted correctly 26 26 52 0,038	Voted incorrectly 5 5 10	Total 31 31 124					
8 9 10 11 12 13 14	Expected Values: Control Treatment Total CHI-Test p-value:	Voted correctly 26 26 52 0,038	Voted incorrectly 5 5 10	Total 31 31 124					
8 9 10 11 12 13 14 15	Expected Values: Control Treatment Total CHI-Test p-value:	Voted correctly 26 26 52 0,038	Voted incorrectly 5 5 10	Total 31 31 124					

16 There is enough statistical evidence to conluce that we can reject the null hypothesis between control and treatment, as the p-value is <0.05

### 4.Produce

Ballot style 58		Sec.058		
		364.000		
Official General Election B November 6, 2018 Broward County, Florid	lallot Boleta Oficia 6 De N la Condad	I De La Eleccion General Ofisye oviembre Del 2018 de Broward, Florida Ki	el Jeneral Eleksyon Bilten 6 Novanm 2018 onte Broward, Flori <b>d</b> a	
Ballot Instructions:	Being voting here	Continue	Continue	
<ul> <li>To vote, fill in the oval </li> <li>completely next to your choice.</li> <li>Use only the marking device provided or a black pen.</li> <li>If you make a mistake, ask for a</li> </ul>	United States Senator Senated De Los Estados Unidos Senate Etazini (Vote for One / Vote por Uno / Vote pou Youn)	Attorney General Fiscal General Pwokire Jeneral (Vote for One / Vote por Uno / Vote pou Youn)	Fourth District Court of Appeal Tribunal De Apelaciones Del Curato Distrito Katriyem Distrikt Lakou Dapel	
<ul> <li>new ballot. Do not cross out or your vote may not count.</li> <li>To vote for a write-in candidate, fill in the oval          <ul> <li>and print the name clearly on the blank line provided for the write-in</li> </ul> </li> </ul>	<ul> <li>Bruce Wayne WAYN</li> <li>Lisa Simpson SMPS</li> <li>Write-in/Escribir/ A lekri</li> </ul>	<ul> <li>Jane Doe RED</li> <li>John Doe YEL</li> <li>Jackie Doe PRP</li> </ul>	Shall Judge Judy J. Johnson of the Fourth District Court of Appeal be retained in office? ¿Debera retenerse en su cargo al Juez Judy J. Johnson del Tribunal del Cuarto Distrito	
candidate.			de Apelaciones?	
Instrucciones Para La Boleta: ● Para votar, llene completamente el ovalo ● junta a su seleccion. Use solo un lapiz de punta negra o una pluma de tinta perca nara marcar la holeta	Representative in Congress District Representante En El Congresso Distri Reprezentant Nan Kongre Distri 2( (Vote for One / Vote por Uno / Vote pou Youn)	20 Chief Financial Officer 20 Controlador Estatal Chief Ofisyre Finans (Vote for One / Vote por Uno / Vote pou Youn)	Eske se pou jis Judy J. Johnson nan katriyem distrik lakou dapel rete nan pos li a? O Yes/SI/Wi	
<ul> <li>Si se equivoca, pida una nueva boleta. Si borra algo o hace marcas, es posible que su voto no se cuente.</li> </ul>	<ul> <li>Lara Croft TMBR</li> <li></li></ul>	Mickey Mouse RED     Bugs Bunny GRY	O No/No/Non	
<ul> <li>Para Votar por un candidato cuvo nombre no esta impreso en</li> </ul>		Write-in/Escribir/ A lekri		
la boleta, llene el ovalo	Governor and Lieutenant Governo Gobernador y Teniente Gobernado Gouvene Ak Lyetnan Gouvene (Vote for One / Vote por Uno / Vote pou Youn)	r Commissioner of Agriculture r Comisinado De Agricultura Komisyone Agrikiti (Vote for One / Vote por Uno / Vote pou Youn)	Mayor of the City Alcalde de la ciudad Majistra nan vil la (Vote for One/ Vote por Uno / Vote you Youn)	
<ul> <li>Pou vote, byen kolore tout andan oval</li></ul>	<ul> <li>Herminoe Granger GRY Ron Weasley</li> </ul>	Cat in the Hat SUE	<ul> <li>Joe Quimby SPRF</li> </ul>	
plim nwa oubyen ak yon kreyon pou ekri sou bilten vot la. • Si w fe yon ere, mande yo ba w	<ul> <li>Lukę Skywalker REBI Leia Organa</li> </ul>	- Arthur T. Read MRB	○ Adam West QUAH	
oubyen fe novuo mak, I ap posib pou vot ou pa valab ariko. • Pou vote pou yon kandida ki pa gen non I enprime sou bilten vot	<ul> <li>Cinderella DSN Prince Charming</li> <li>Jean-Luc Picard STRI</li> </ul>	Y Justice of the Supreme Court Magistrado en el Tribunal Supremo Jisti Nan Lakou Siprem	Circuit Judge, 17th Judicial Circuit, Group 3 Juez De Circuito, Circuito 17Mo, Group 38 Jij Itineran nan 17em Sikui, Group 38 (Vote for One/ Vote por Uno / Vote you Youn)	
la, kolore ti olva la ● Epi ekri non kandida a sou liy vid la rezeve pou ekri non yon kandida.	Spock	Cat in the Hat SUE	<ul> <li>Jakob Nielsen</li> </ul>	
Candidate 1	Rachel Carson	Arthur T Dead MDD	O Don Norman	
Candidate 2	O Write-in/Escribir/ A lekri	C Arthur I. Neau MRB		
Write inv.			Circuit Judge, 17th Judicial Circuit, Group 44 Juez De Circuito, Circuito 17Mo, Group 46 Jij Itineran nan 17em Sikui, Group 46 (Vote for One/ Vote por Uno / Vote you Youn)	
			<ul> <li>Holden Caulfield</li> </ul>	
Candidate 1 Candidate 2			<ul> <li>Count of Monte Cristo</li> </ul>	
Witte info				
1 0F 1	Vote Both Sides of Page / Vote Por Los	Dos Lados de la Pagina / Vote Sou Toude Bo Bilten Paj La	Typ:01 Seq:0058 Spt:01	

Based off the results this a proposed re-design of the voting ballot.

Some features included based of the results:

- **Quantitative:** evidence suggests that we can support the picture superiority effect hypothesis. Therefore it is helpful to include an instructional picture.
- **Qualitative:** messy and no sections. In order to make the process easier for the user there are sections instructing the user where they should start.

Furthermore, in order to make the text more readable I chose a different background colour to get a better contrast.

WCAG 2.0 level AA requires a contrast ratio of at least 4.5:1 for normal text and 3:1 for large text. WCAG 2.1 requires a contrast ratio of at least 3:1 for graphics and user interface components (such as form input borders). WCAG Level AAA requires a contrast ratio of at least 7:1 for normal text and 4.5:1 for large text.

Large text is defined as 14 point (typically 18.66px) and bold or larger, or 18 point (typically 24px) or larger.

#### The old version

#### The new version

United States Senator Senador De Los Estados Unidos Senate Etazini (Vote for One / Vote por Uno / Vote pou Youn)

United States Senator Senador De Los Estados Unidos Senate Etazini (Vote for One / Vote por Uno / Vote pou Youn)

Contrast: 17.72

Background colour: #EFEFEF

Font colour: #050505

Contrast: 18.12

Background colour: #ECF2F

Font colour: #050505

### Further ideas for re-design

- Making different ballots for each language, this would allow more space and also a lager font.
  - However, there is a limited amount of money government can spend on printing ballots and by having all languages on one ballot reduces the printing by 2/3.
- Another option is to have the instructions on a front page before you open the ballot. For example, a Norwegian ballot with instructions on the outside of the ballot:



### Bibliography

- Caruso, Catherine. "The Problems with Poor Ballot Design." *Scientific American*, Scientific American, 7 Nov. 2016, www.scientificamerican.com/article/q-a-with-philip-kortum/.
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- "Sensory Semantic Theory." Sensory Semantic Theory definition | Psychology Glossary. Accessed June 21, 2021. https://www.alleydog.com/glossary/definition.php? term=Sensory%2BSemantic%2BTheory.