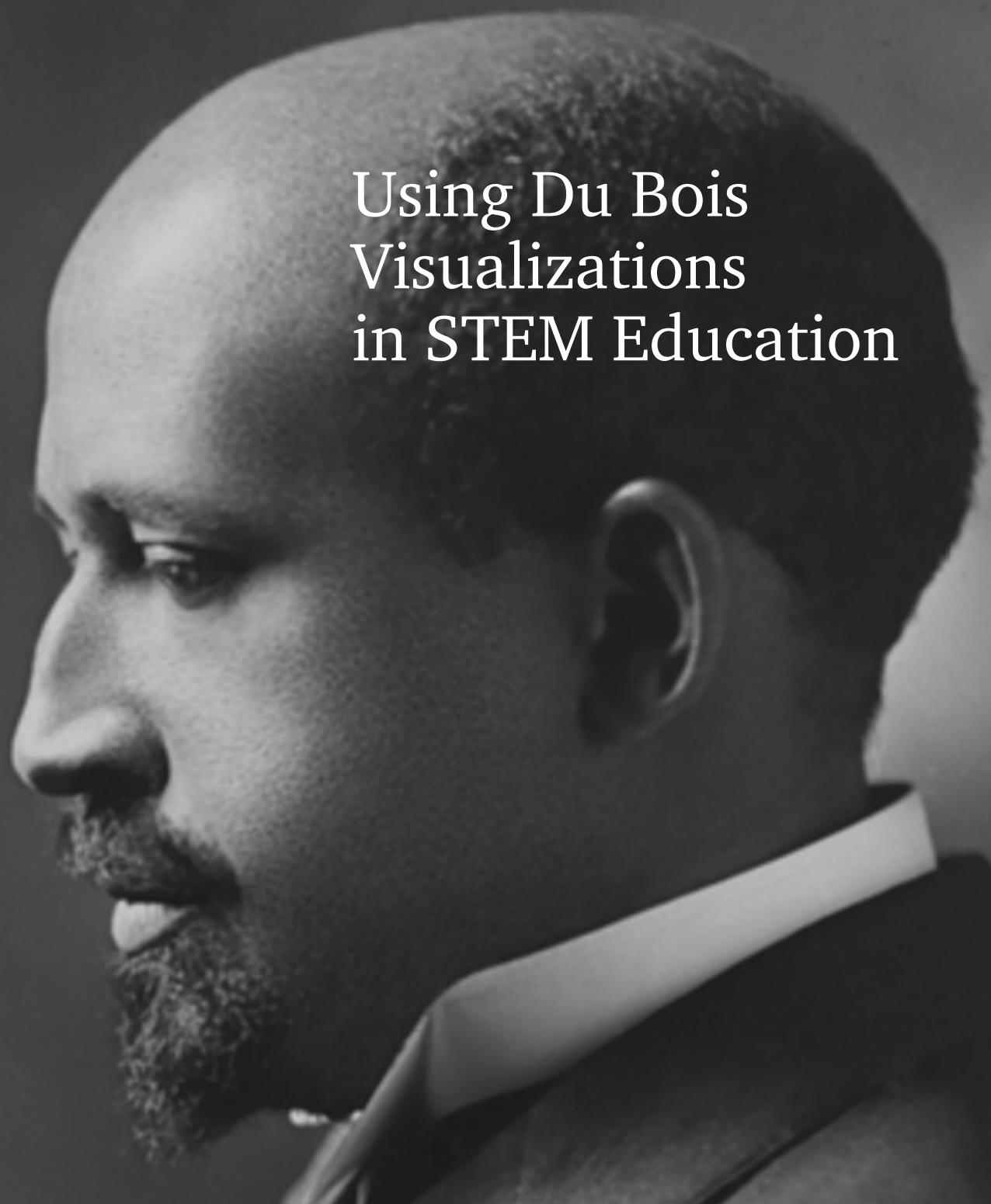




Du Bois SERVE Project

# Using Du Bois Visualizations in STEM Education





# Introduction

The overall aim of the module is to introduce the visuals created by W.E.B. Du Bois for the 1900 Paris Exposition, and explore the role of visual communication in STEM education. The visuals are studied, by deconstruction and re-creation, while placing them in their historical context.

The sections, which may be used collectively or independently are: Context, Explore, and Implement.



# Context



Du Bois Visualizations in  
a Historical Context

# Explore



an analog exercise to analyze  
and re-create Du Bois visuals  
using hand-drawn methods.

# Implement



Implement the Du Bois  
visual style with digital  
tools



# Context





# Context

The Context section provides background on the conception, motivation and messaging of the visuals. Also discussed is the venue where the visuals were first shown, the Exhibition of the American Negro, within the 1900 Paris Exposition.

To better understand the times when the visuals were created, influential events leading to the Exposition are discussed.



# Context: Background



TJ Calloway



Du Bois in Paris



Atlanta U. Students

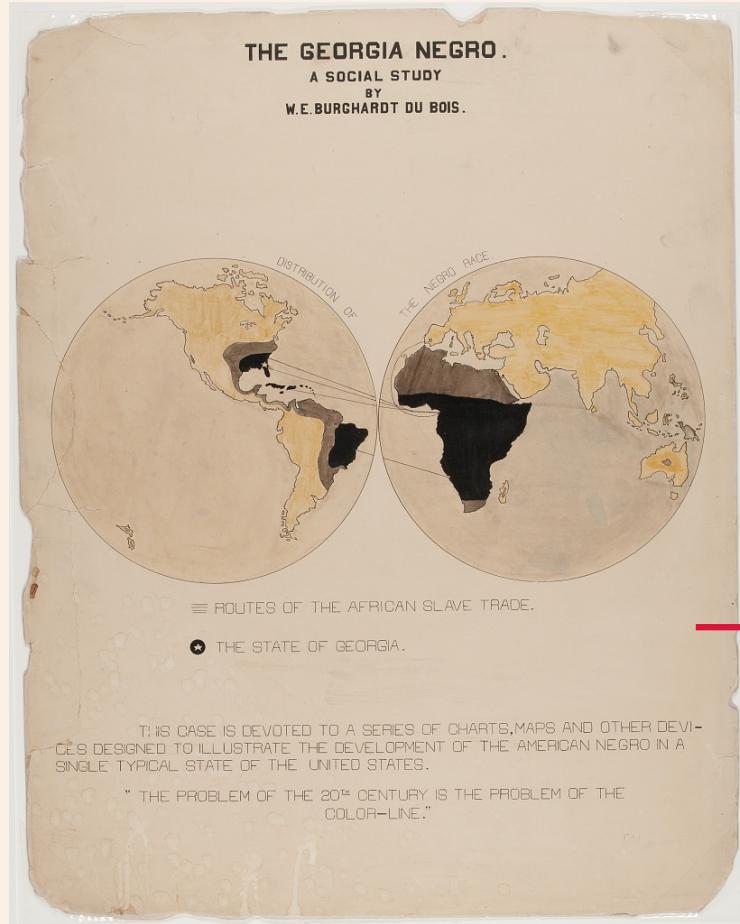
The motivation for creating the visuals designed and created by Du Bois and his collaborators was to tell, on a world stage, the state and progress of Black Americans 35 years after emancipation from slavery.

Thomas J Calloway, organized the “Exhibition of the American Negro” to be shown during the 1900 Paris Exposition, and commissioned Du Bois, his Fisk University classmate, to create a set charts, graphs, photographs and other artifacts for the world stage.

Du Bois, along with collaborators at Atlanta University spent four months creating the materials the exhibit.



# Context: The Visuals

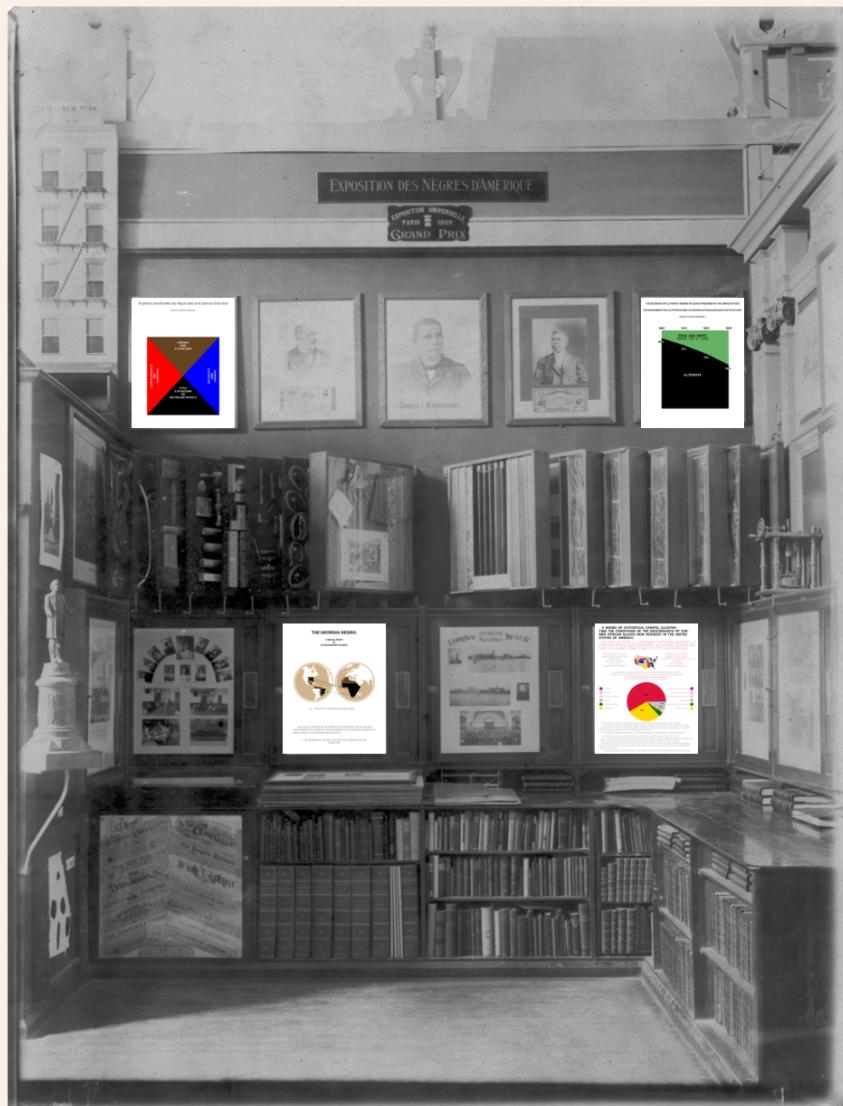


The visuals were hand-drawn using pen, ink and paint on 22x28 in. poster board

The venue shows the visuals as posters to be viewed and other materials may be "flipped through".



# Context: The Questions for Discussion



Why do you think Du Bois created a series of graphs and data visualizations of Black life for the exposition?"

Why visualizations instead of a written report?"

What effect did the venue have on the design of the visuals?

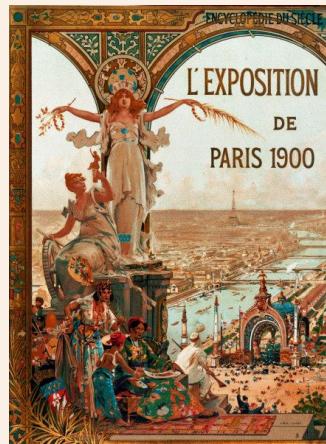
# Context: The 1900 Paris Exposition



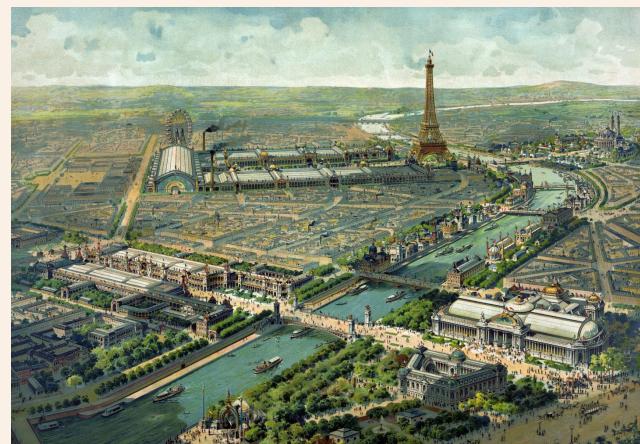
The Exposition Universelle of 1900 was the venue for Du Bois to tell the story of Black Americans on an international stage.

Fifty-six nations participated in the expo, designed to celebrate the achievements of the 19th century, while looking forward to the developments in the 20th.

The Du Bois visuals were part of the “Exhibition of the American Negro”, seen by over 50 million people. The exhibition also included an African-American bibliography containing 1,400 titles along with 500 photographs.



Exhibition Poster



1900 Paris



Exhibition of American Negroes



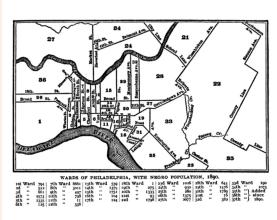
# Context: Five years before Paris



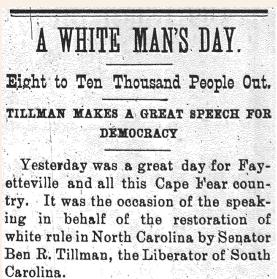
During the summer of 1895, in a Brooklyn park, there was a cotton plantation complete with five hundred Black workers reenacting slavery.



In 1896 the landmark Plessy v. Ferguson Supreme Court decision was handed down, legitimizing racial segregation, leading to generations of Jim Crow laws.



Du Bois created the Philadelphia Negro in 1897 which sought to ascertain something of the geographical distribution of his race, their organizations, and their relation to their million white fellow-citizens.



In 1898 the duly elected people in Wilmington, NC was violently overthrown. The coup occurred after the state's Southern Democrats conspired and led a mob of 2,000 white men to overthrow the legitimately elected local Fusionist government.



During the 1880s and 1890s, instances of lethal mob violence increased steadily, peaking in 1899 when twenty-seven Georgians fell victim to lynch mobs. Included in this number was the horrific lynching of Sam Hose.



# Context: References

Paris Exposition of 1900 (Exposition Universelle)

[https://en.wikipedia.org/wiki/Exposition\\_Universelle\\_\(1900\)](https://en.wikipedia.org/wiki/Exposition_Universelle_(1900))

Black America, 1895

<https://publicdomainreview.org/essay/black-america-1895>

Plessy v. Ferguson

<https://www.britannica.com/event/Plessy-v-Ferguson-1896>

The Philadelphia Negro

[https://www.google.com/books/edition/\\_/sqwJAAAAIAAJ](https://www.google.com/books/edition/_/sqwJAAAAIAAJ)

Wilmington Insurrection of 1898

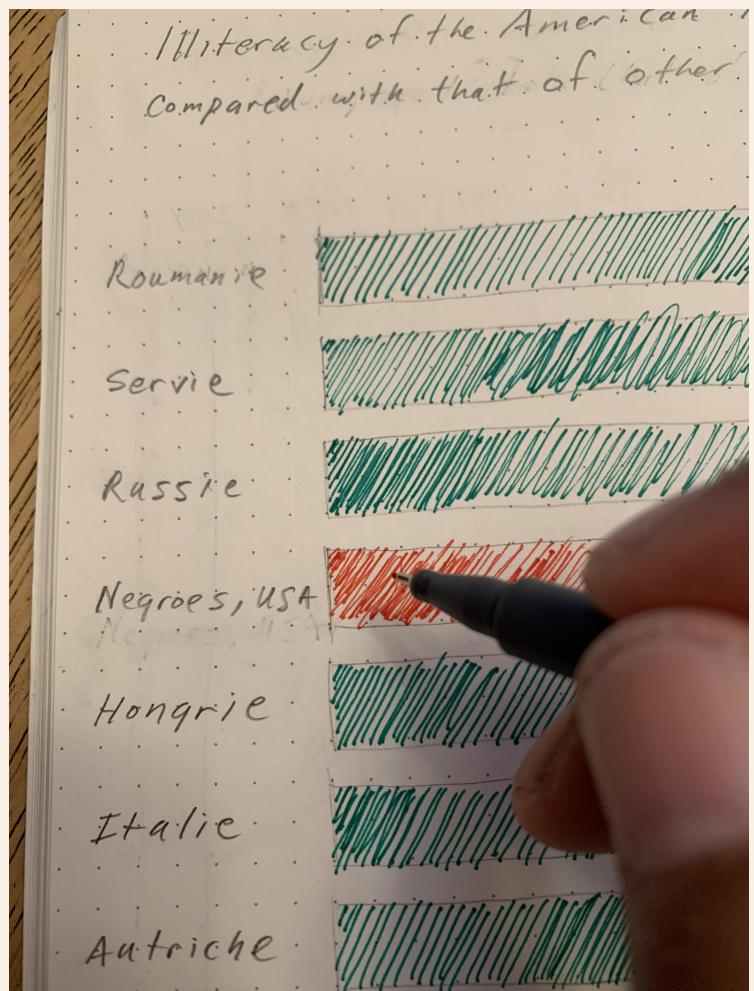
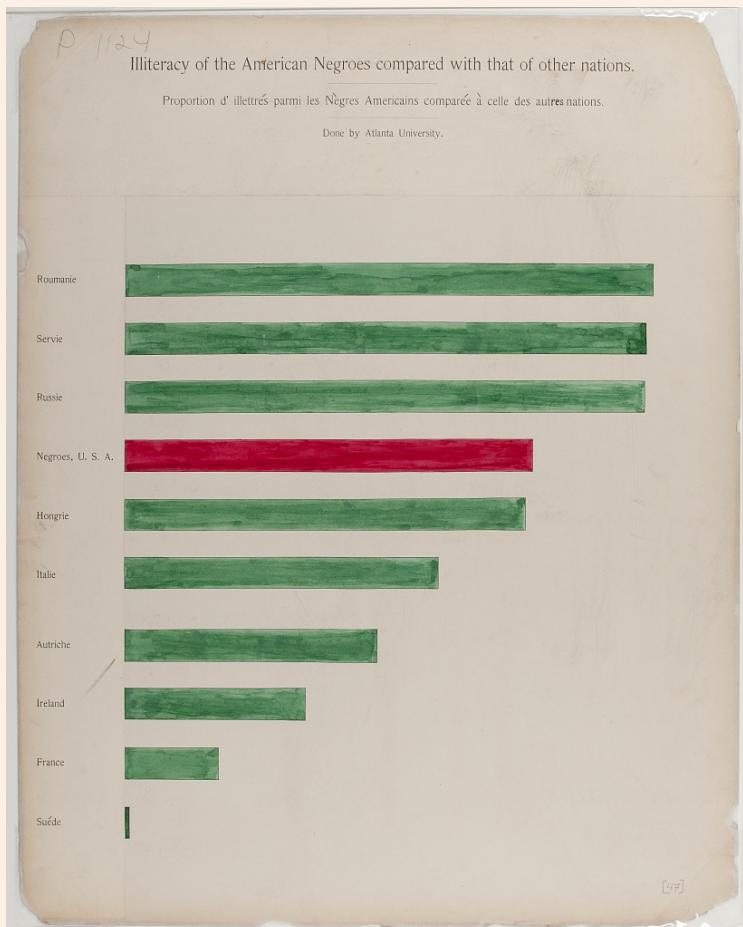
[https://en.wikipedia.org/wiki/Wilmington\\_insurrection\\_of\\_1898](https://en.wikipedia.org/wiki/Wilmington_insurrection_of_1898)

The Lynching of Sam Hose

[https://en.wikipedia.org/wiki/Lynching\\_of\\_Sam\\_Hose](https://en.wikipedia.org/wiki/Lynching_of_Sam_Hose)



# Explore





# Explore

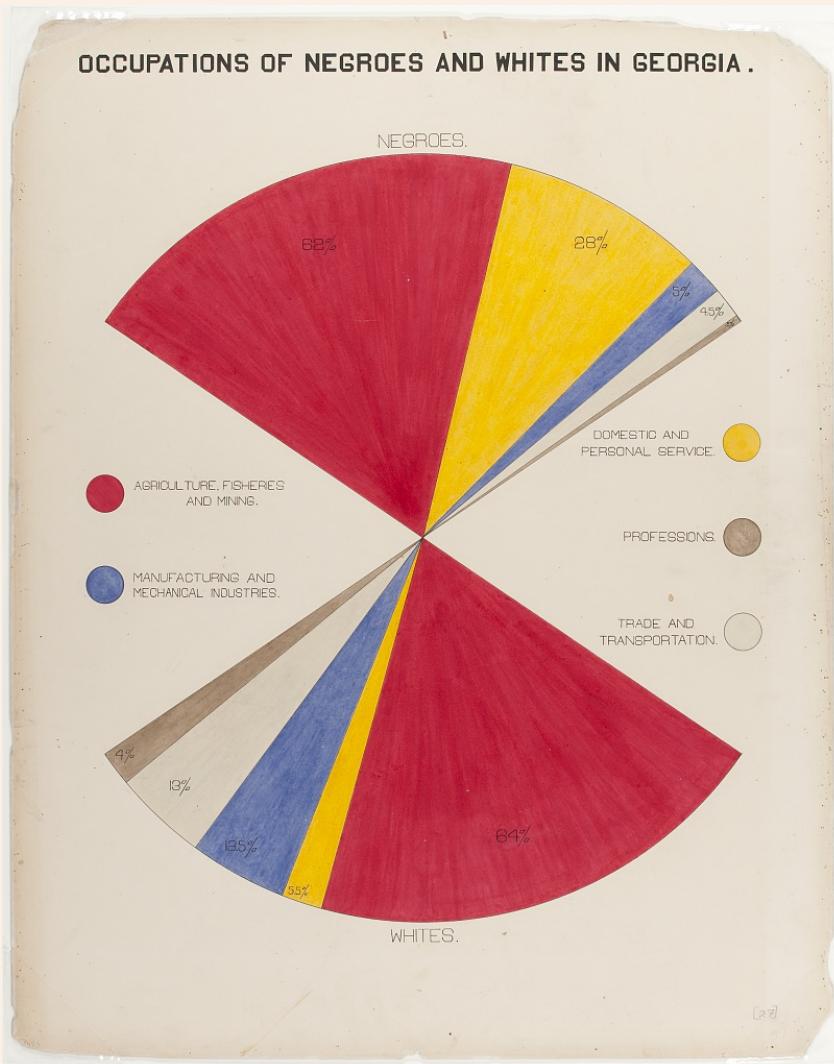
This section is a hands-on session that will take a sample Du Bois visualization, (Plate 27 in this example) and reconstructs and analyzes various aspects of the visual.

The exercise aims to recreate the sample visual using hand-drawn methods (pens, paper, markers, etc.), to immerse the students in the act of creation, while thinking about the context and messaging. Rapid iteration and peer review may be used to gauge effectiveness of the visual.

Next, drawing with modern data may be introduced.



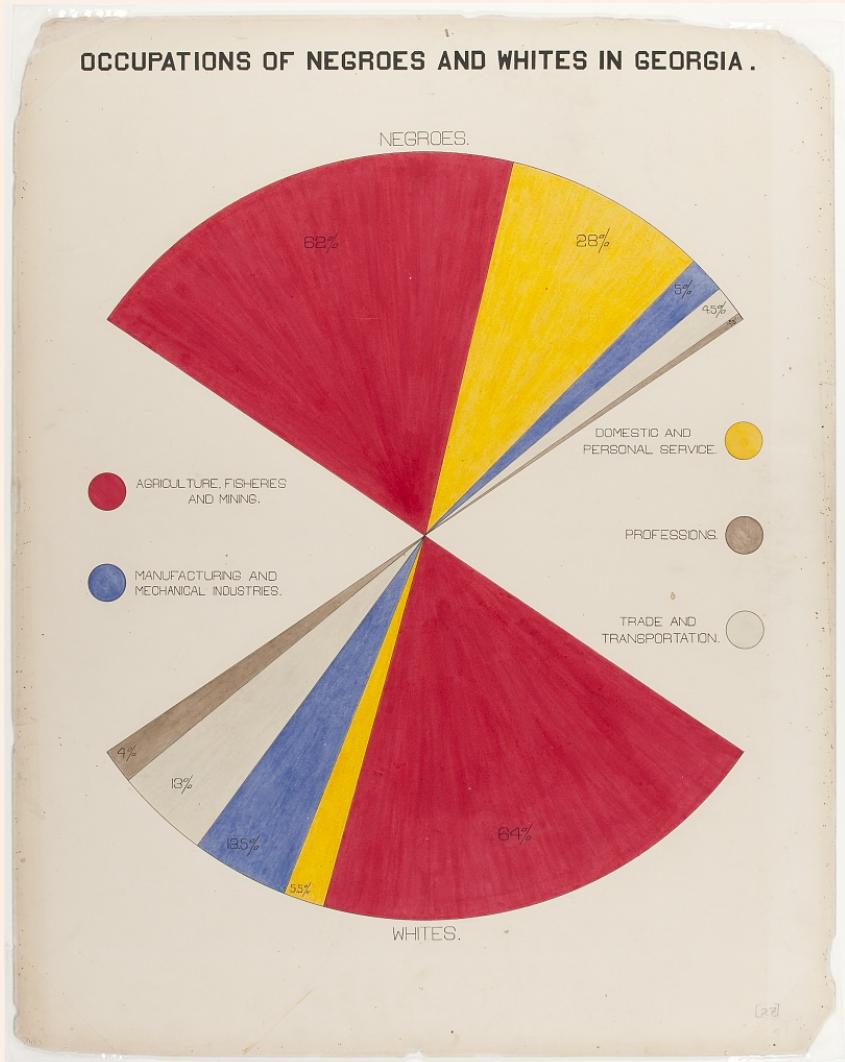
# Explore Example 1



Occupations of Negroes and Whites in Georgia



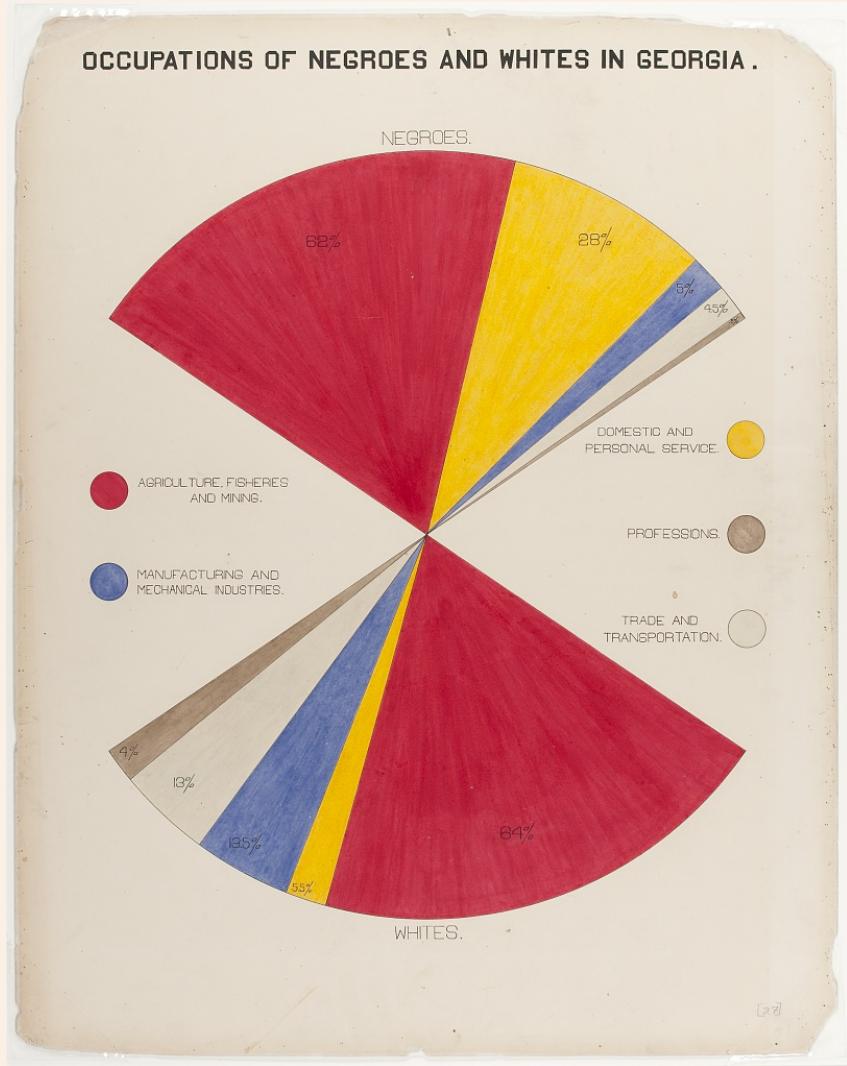
# Explore: Outline



- Message and Audience
- Aesthetics/design
- Analytical methods
- Chart Types



# Explore: Message



The message of the visual is tied to the overall message from Du Bois at the Paris Exposition:

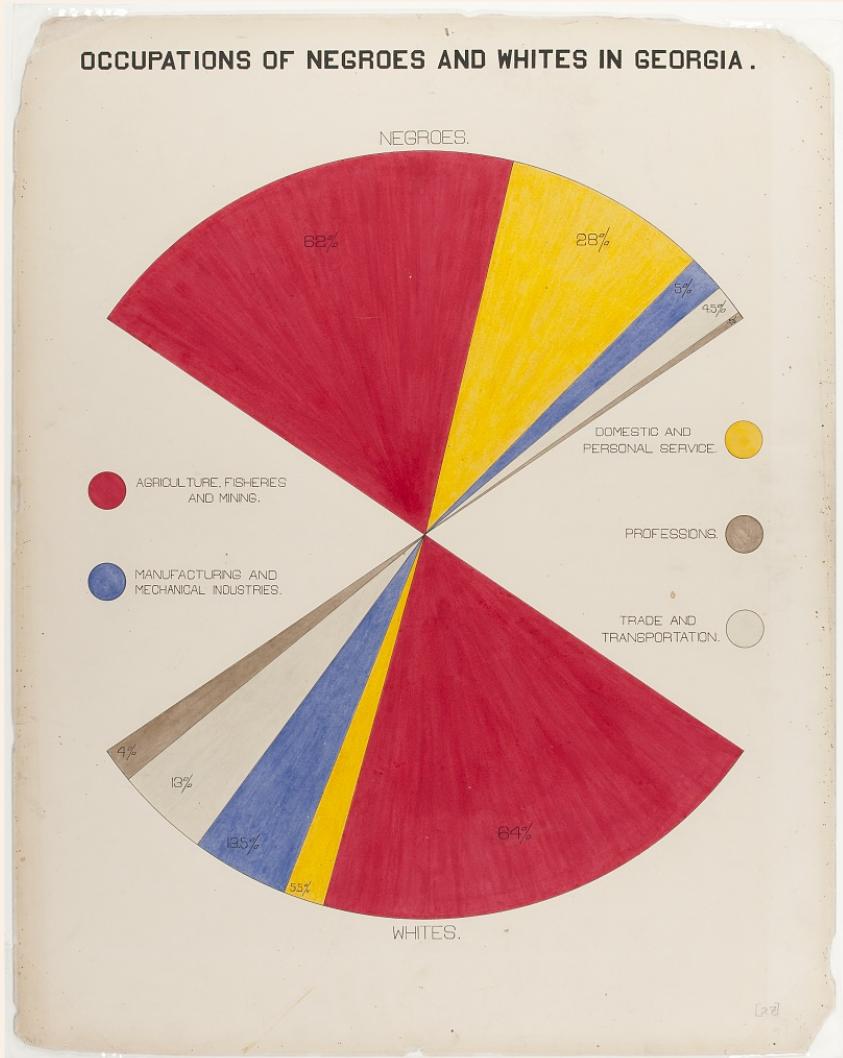
Describe the status and progress of Black Americans since emancipation.

The visual compares the occupations of Black and white populations of Georgia, showing parity for some occupations, while highlighting differences for others.

Activity: Discuss the message that the visual is attempting to convey



# Explore: Aesthetics and Design



The “Fan-Chart” visual uses proportionally sized wedges to encode the data. The populations are arranged, in sections, top (Black), and bottom (white) such that the wedges may be easily compared.

Also note the legends arranged on the left and right, placed in the gaps between the wedges.

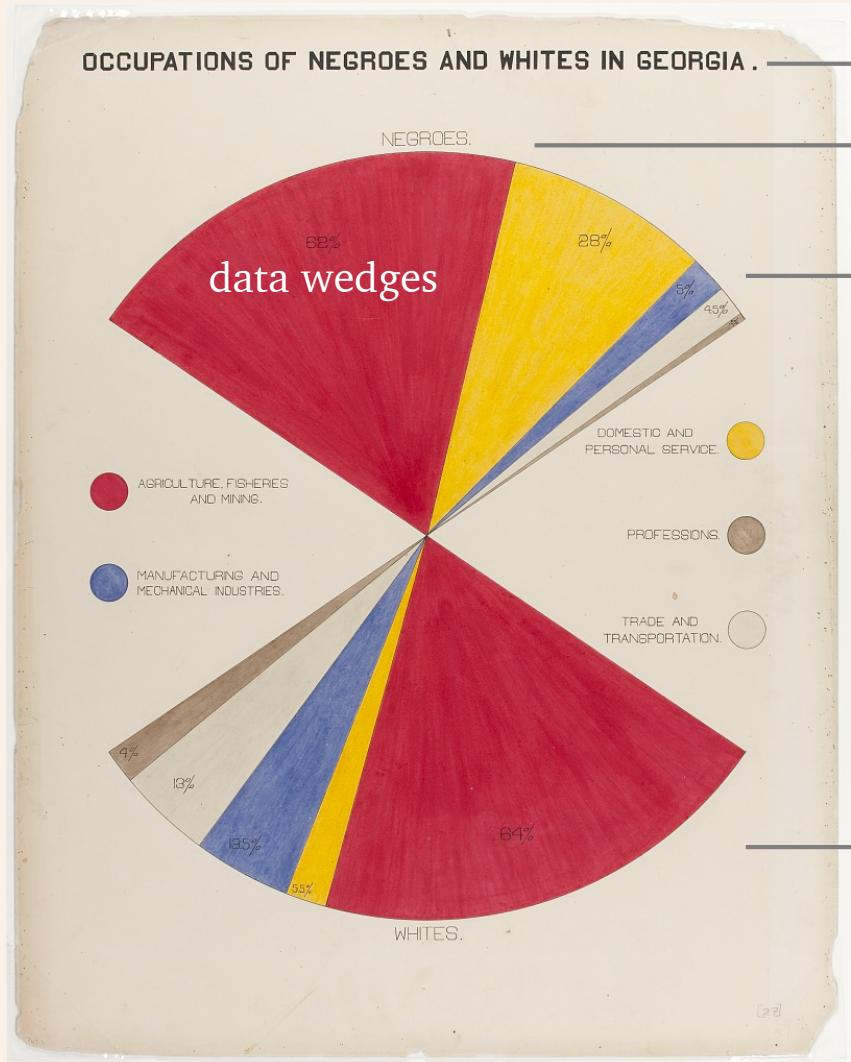
The visual uses the typical Du Bois color palette.





# Explore: Aesthetics and Design

22x28 inch portrait mode



Title

Labels

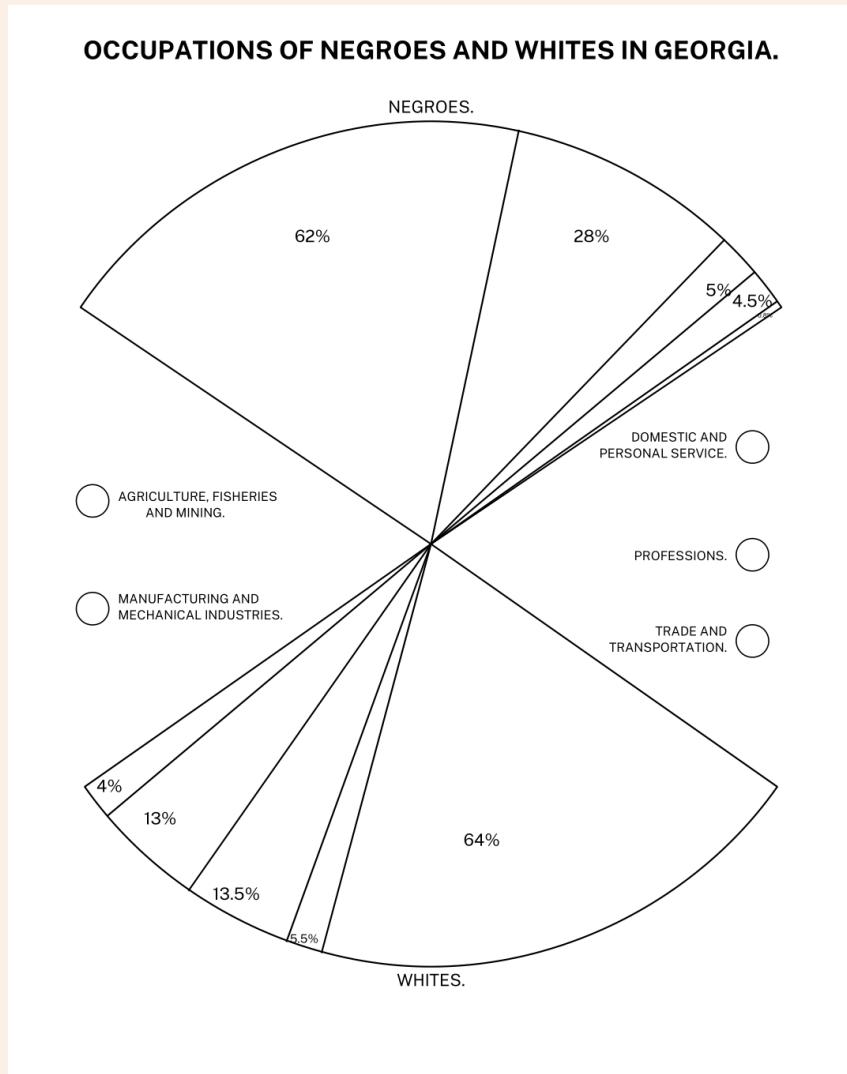
Black Georgians

Legend

White Georgians



# Explore: Recreate



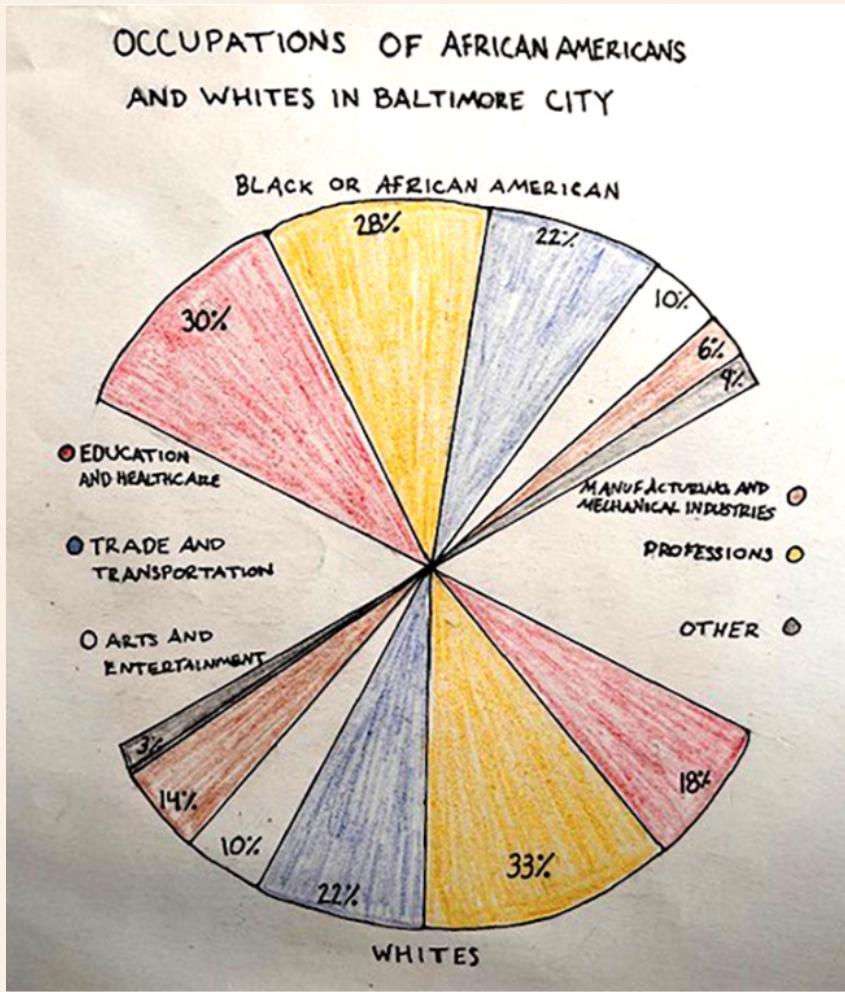
Re-create the visual using pens, paper and other analog materials like markers, colored pencils, rulers, and protractors.

Strive for rapid iteration, and do not focus on precision, but rather exploring the various components of the chart, and how they are conveying the message and information. Students may work together or individually.

At the end of the session, the re-creations may be shared and critiqued as a group.



# Explore: Modernize

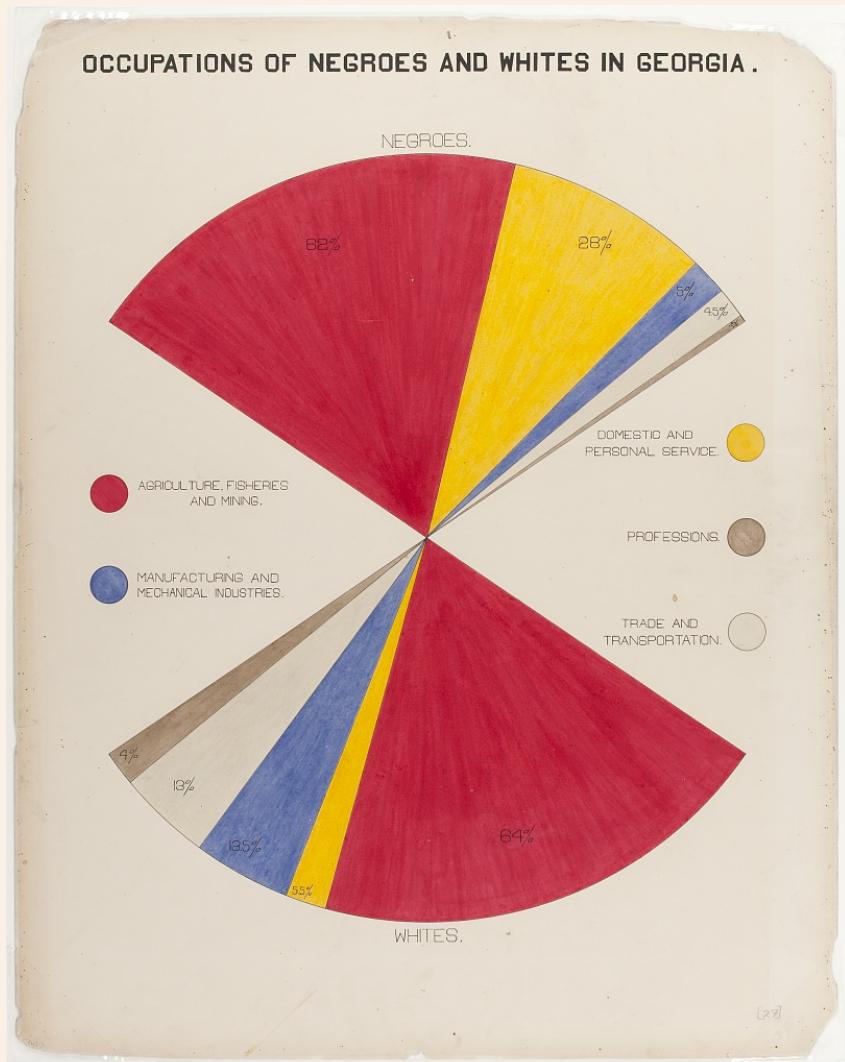


In this section, students may apply modern data to the Du Bois Style. This involves data gathering, selection of appropriate chart type, and defining the elements to apply the Du Bois style to (for example color palette, labeling methods)

This example shows modern data on the occupations of African-Americans and Whites in the city of Baltimore.



# Explore: Analytical Methods



This section address the effectiveness and analytical methods used in the visual.

- Is the “fan chart” an effective?
- Can the viewer make comparisons?
- What conclusions are drawn?
- What additional questions are raised?

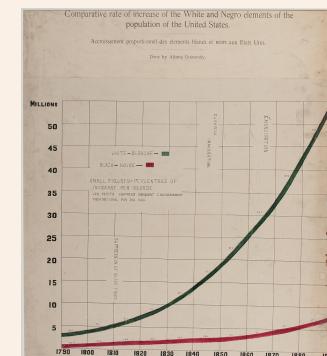
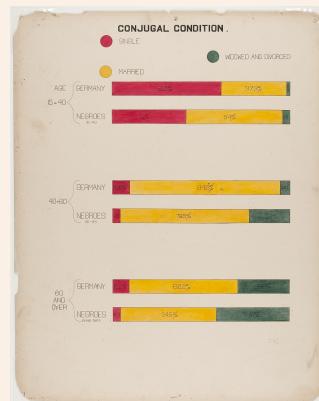
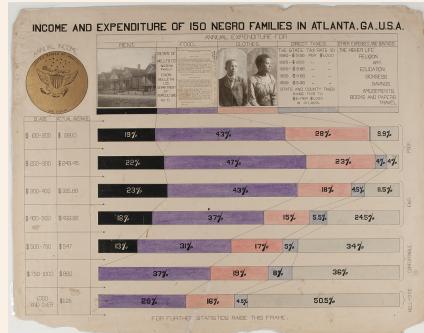


# Explore: Chart Types

In the section, consider the selection of chart type, and its role in conveying the appropriate message.

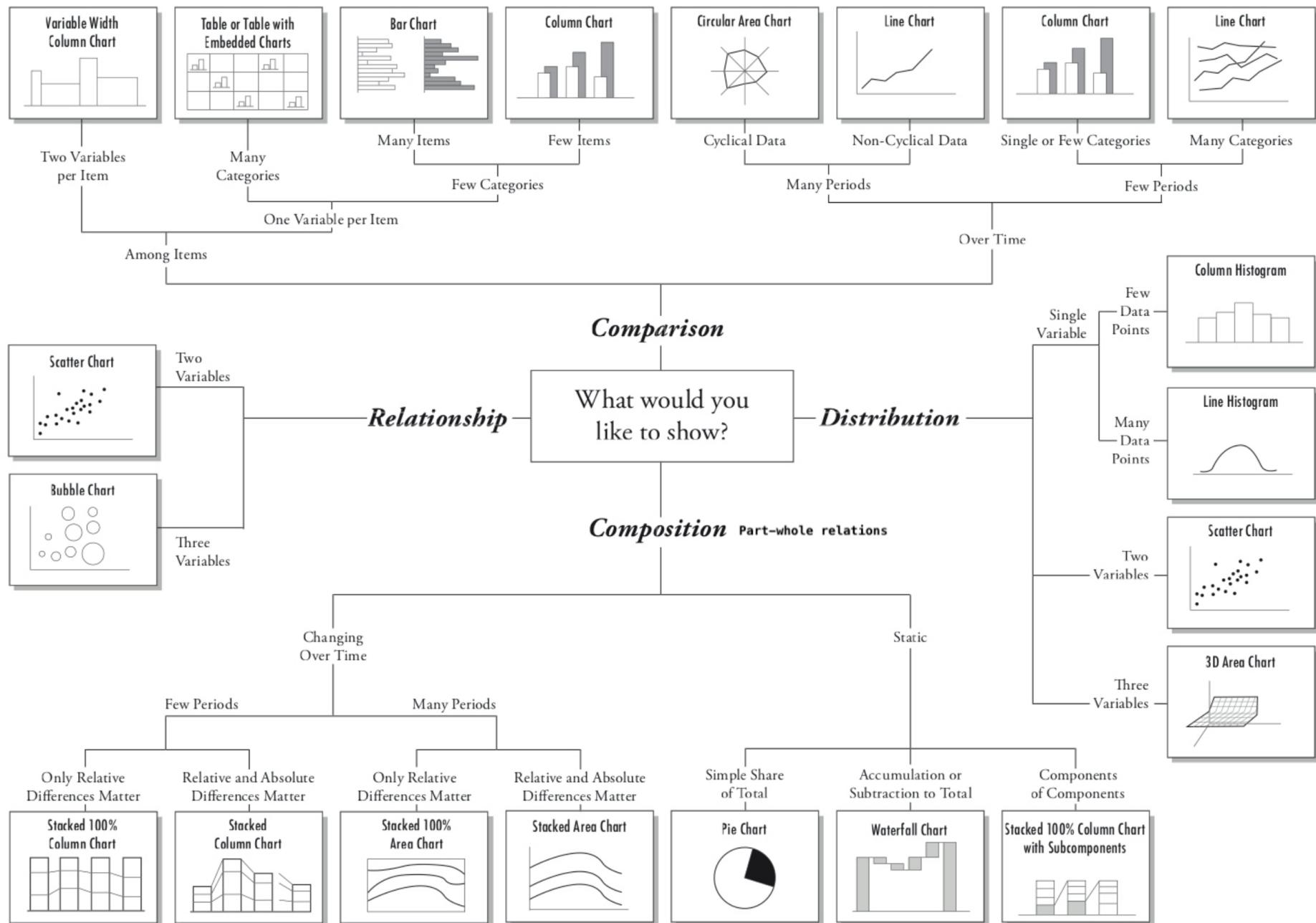
For example, here are four other types of charts in the Du Bois collection, covering economics, population, and social status.

The types include the fanciful Du Bois spiral, stacked bars with integrated photographs, conventional bar graphs, and line graphs.



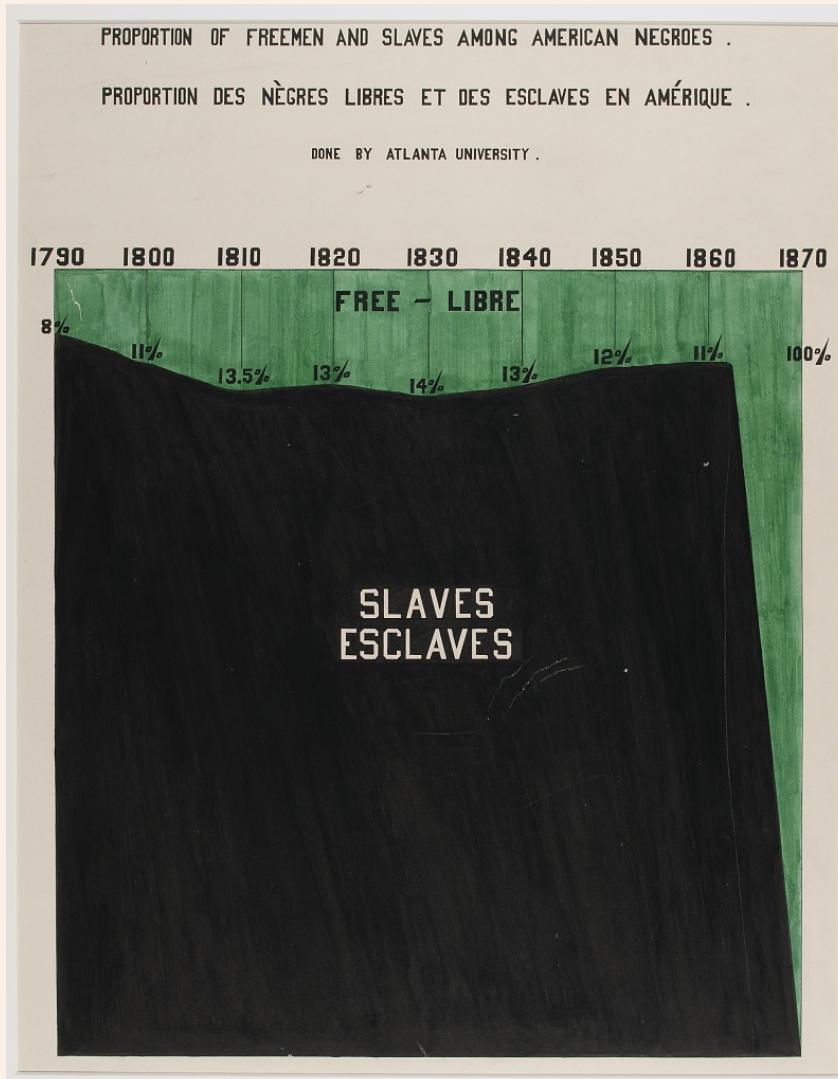


# Chart Suggestions—A Thought-Starter





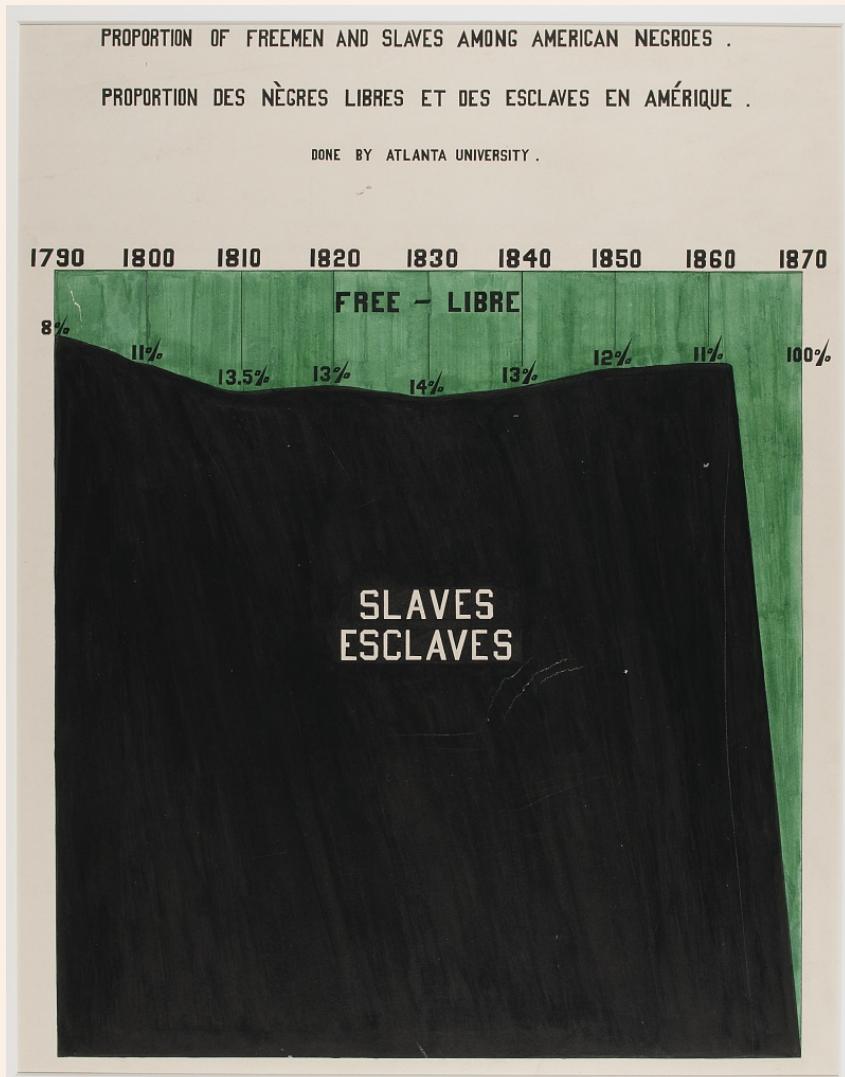
# Explore Example 2



Proportion of Freemen and Slaves Among American Negroes



# Explore: Message



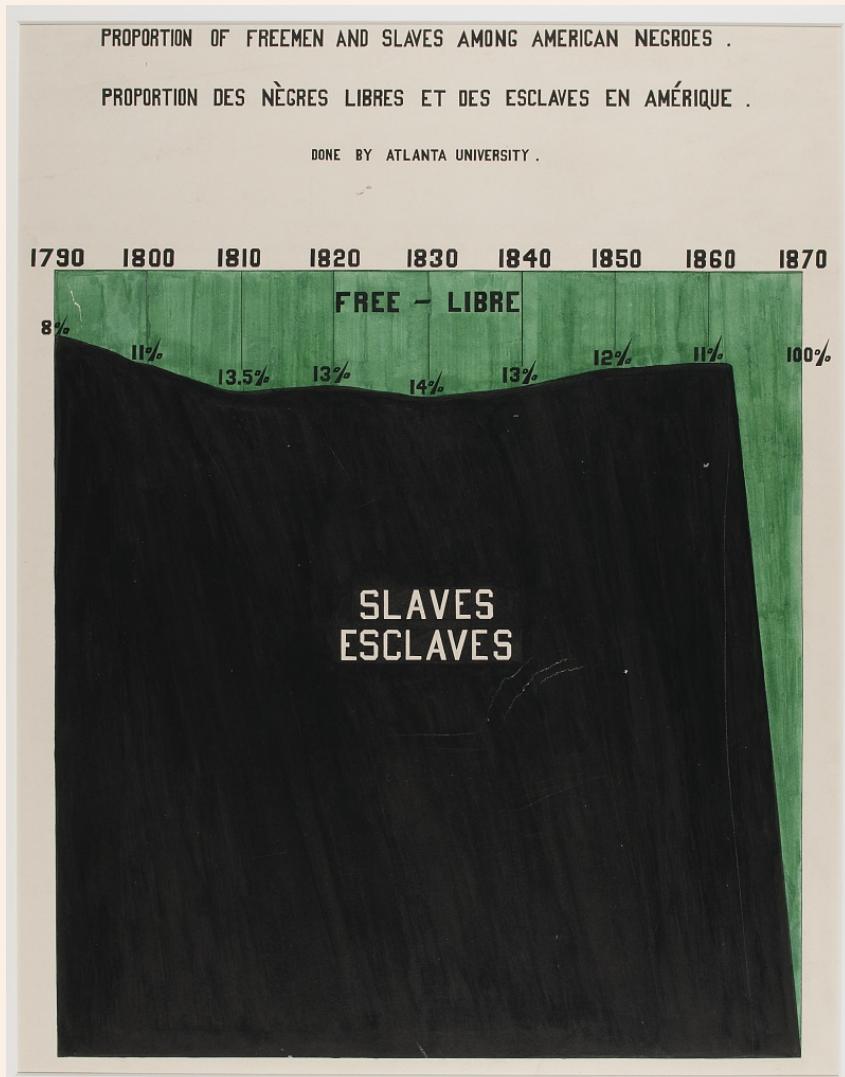
The message of the visual is tied to the overall message from Du Bois at the Paris Exposition:

Describe the status and progress of Black Americans since emancipation, and provide an alternative narrative to racist views of the time.

The visual compares free and slave populations from 1790 to 1870, using an area chart with two primary colors representing freedom and slavery.



# Explore: Considerations



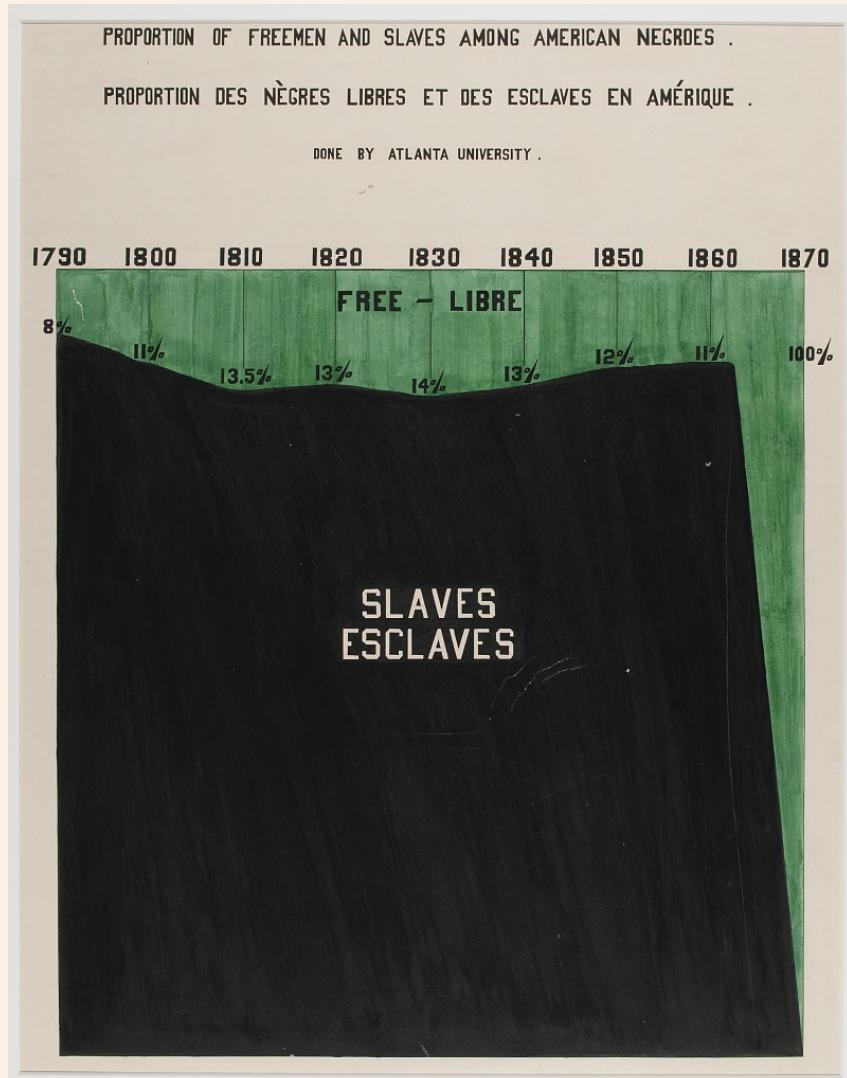
What analytic methods would you use to make this chart?

What chart type is best? Aesthetics: consider dimensions, color selection, titles, data labels, legend, notes etc.

What tools do think are needed to make this chart?



# Explore: Aesthetics and Design



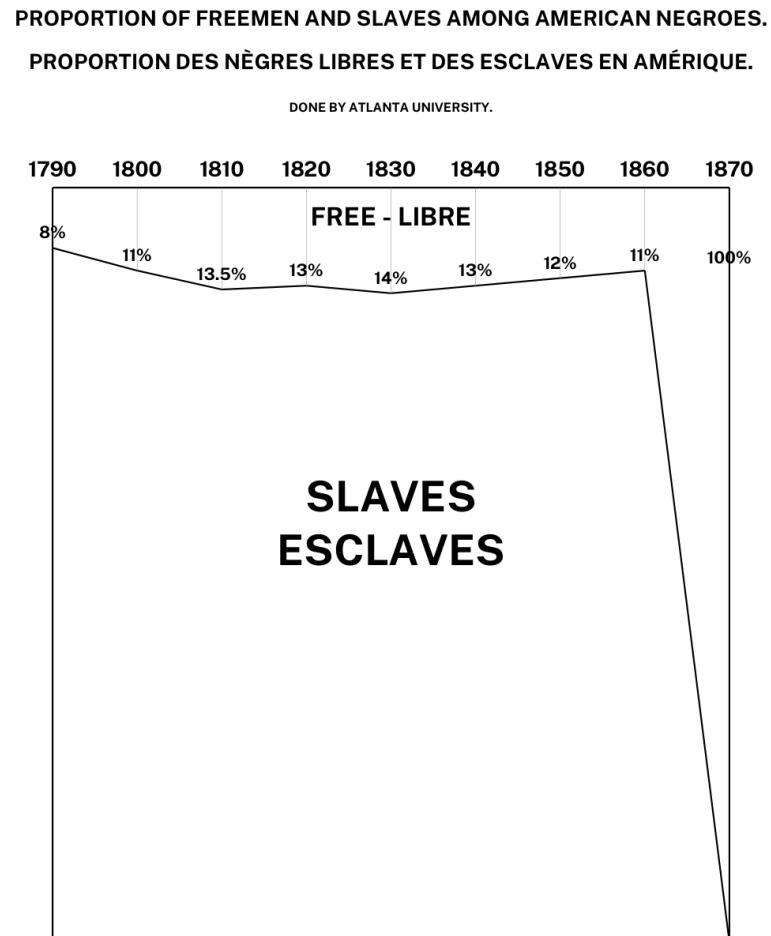
This visual makes uses a bold color contrast (black for slavery, green for freedom) to show the proportion of enslaved and free people.

The area is dominated by black, with contrasting large text, yet the eye is drawn to the sudden jolt of green freedom in 1865. Note that increasing data goes down instead of up.

The titles are bilingual (a nod to the venue), and the X-axis is labeled at the top, contrary to today's convention. Instead of a labeled Y-axis, each individual data point is labeled.



# Explore: Re-create



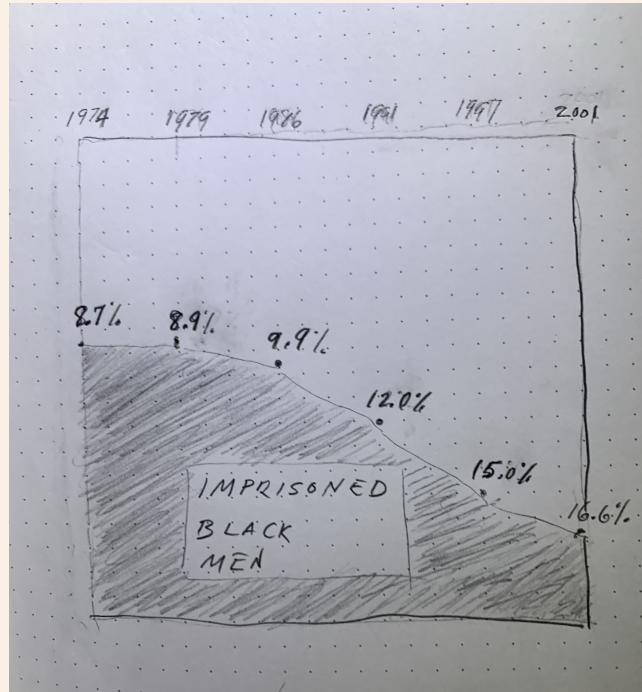
Re-create the visual using pens, paper and other analog materials like markers, colored pencils, rulers, and protractors.

Strive for rapid iteration, and do not focus on precision, but rather exploring the various components of the chart, and how they are conveying the message and information. Students may work together or individually.

At the end of the session, the re-creations may be shared and critiqued as a group.



# Explore: Modernize



**Table 5. Percent of adult population ever incarcerated in a State or Federal prison, by gender, race, and Hispanic origin, 1974-2001**

Gender	Percent of adult population ever incarcerated in a State or Federal prison					
	1974	1979	1986	1991	1997	2001
Male	2.3%	2.4%	2.8%	3.4%	4.3%	4.9%
Female	0.2	0.2	0.2	0.3	0.4	0.5
Race/Hispanic origin						
White*	0.8%	0.8%	0.9%	1.1%	1.3%	1.4%
Male	1.4	1.5	1.7	1.9	2.3	2.6
Female	0.1	0.1	0.1	0.2	0.2	0.3
Black*	4.5%	4.6%	5.2%	6.2%	7.9%	8.9%
Male	8.7	8.9	9.9	12.0	15.0	16.6
Female	0.6	0.7	0.8	0.9	1.3	1.7
Hispanic	1.3%	1.4%	2.0%	2.7%	3.8%	4.3%
Male	2.3	2.6	3.6	4.9	6.7	7.7
Female	0.2	0.2	0.3	0.4	0.6	0.7

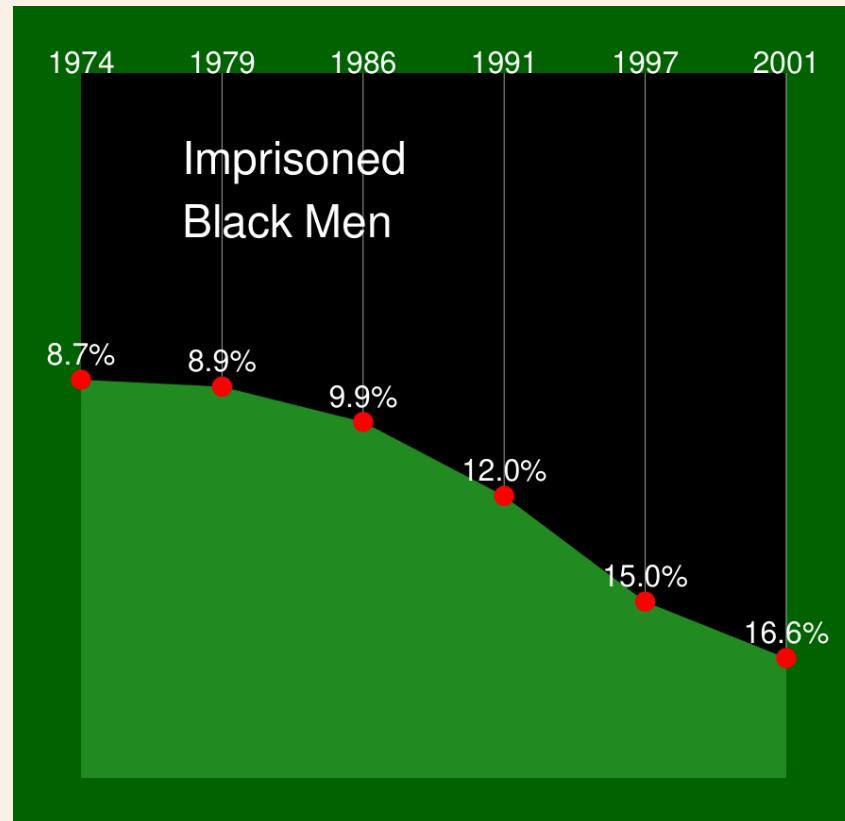
Note: Percents were based on intercensal resident population estimates from the U.S. Census Bureau. See *Methodology* for data sources.

\*Excludes persons of Hispanic origin.

In this section, apply modern data to the Du Bois Style. This involves data gathering, selection of appropriate chart type, and defining the elements to apply the Du Bois style (for example color palette, labeling methods) This example shows incarceration rates between 1974-2001.



# Explore: Modernize

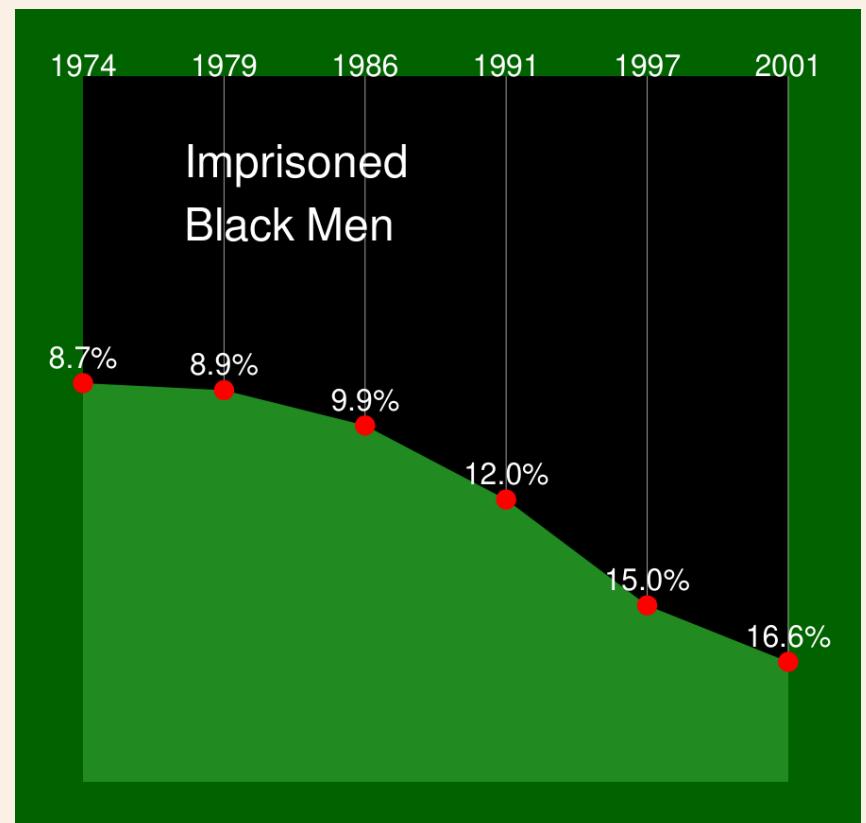
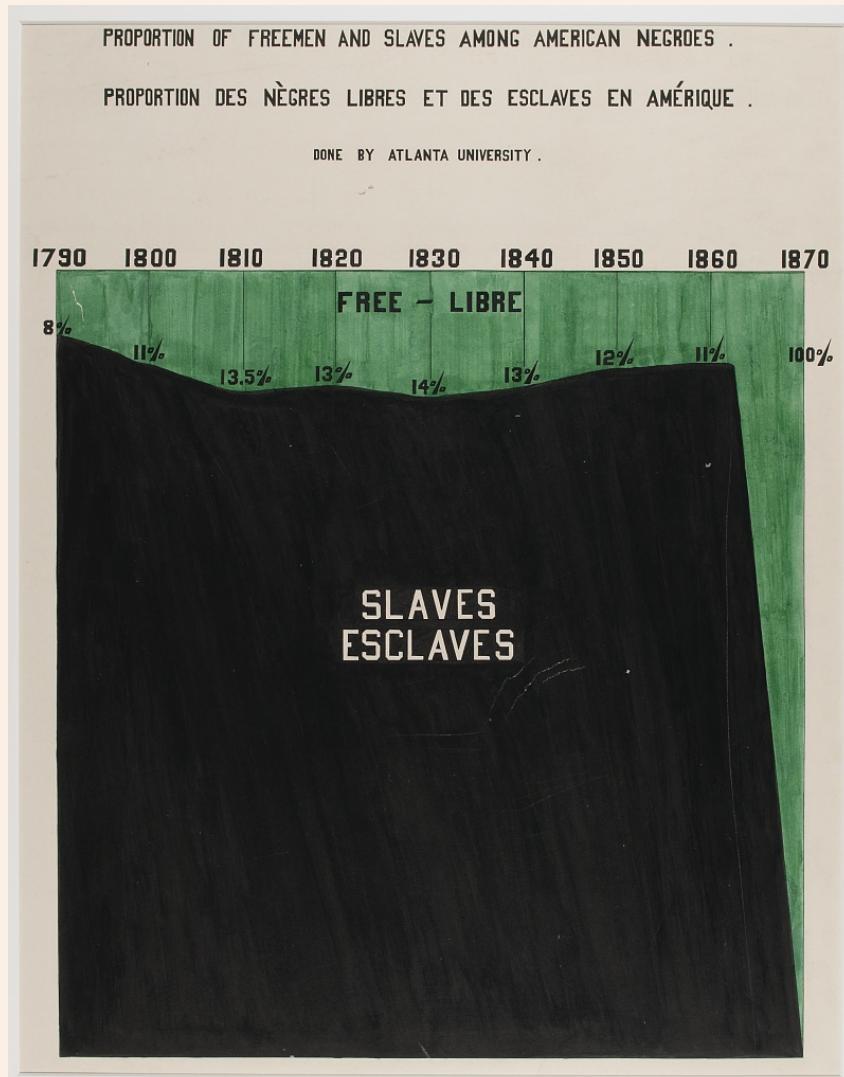


This example updates the hand-drawn version to a digital format, using a color scheme similar to the original, and adding red as a highlight color (note the Pan-African black-red-green theme)

Also note the vertical lines are reminiscent of the bars of a prison cell.



# Explore: Modernize

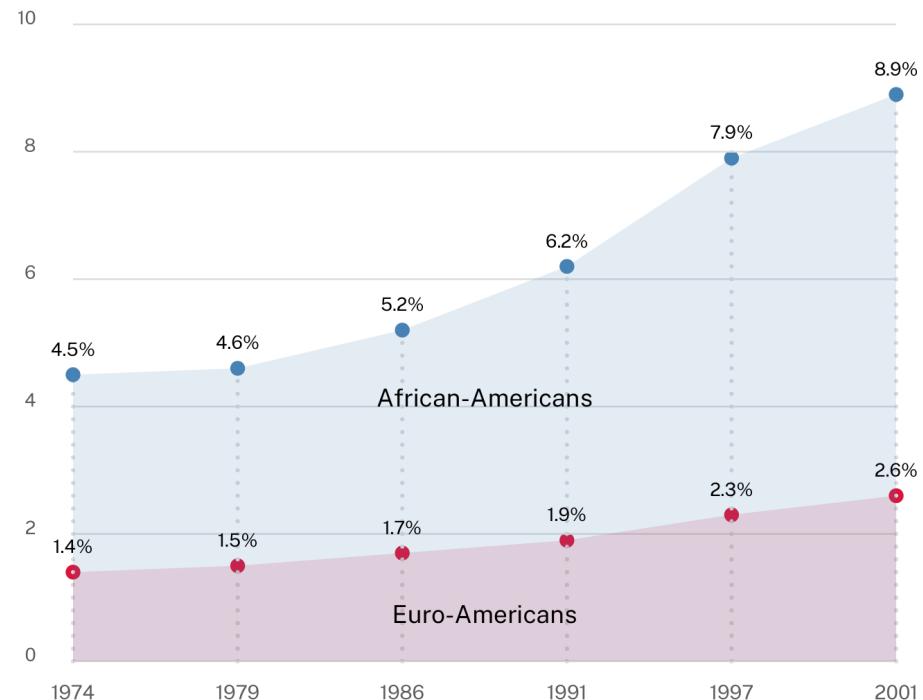


Original and Modern versions compared



# Explore: Modernize

Incarceration Rate: Euro and African American Males, 1974-2001

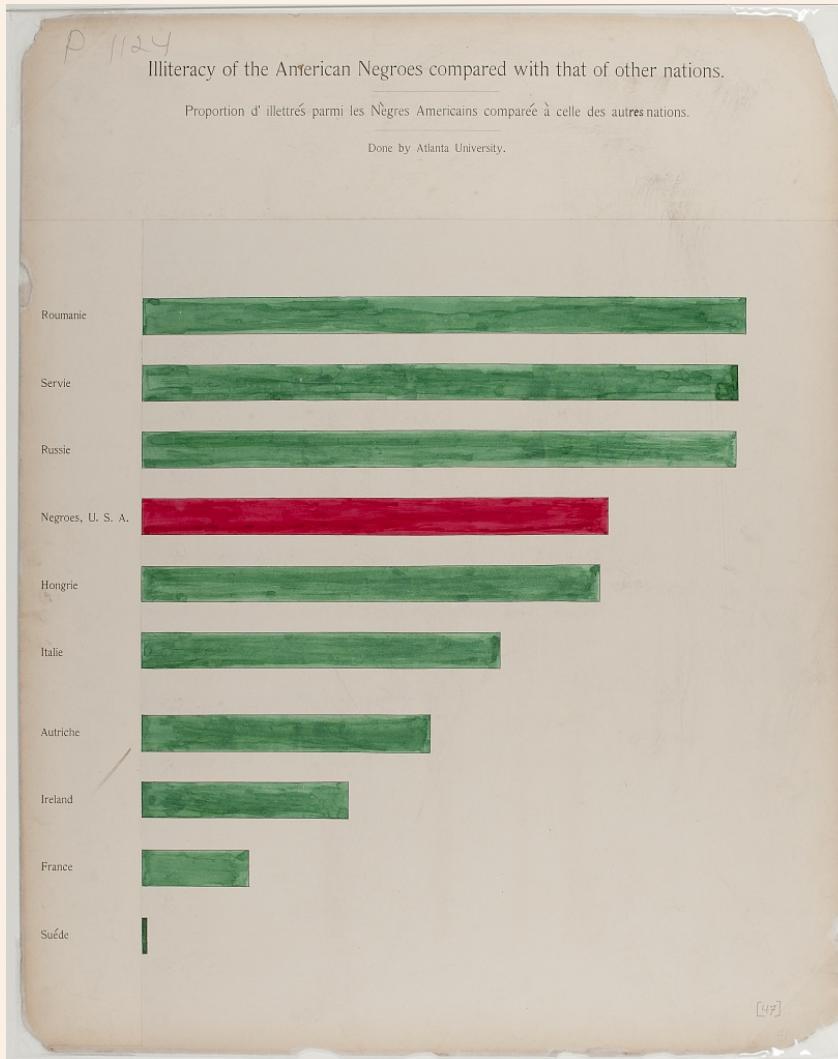


This example compares incarceration rates between European and African American males, using overlapping area charts with common scales and contrasting colors.

This example returns to the usual conventions: (x-axis labeled on the bottom, data increasing moves up and to the right)



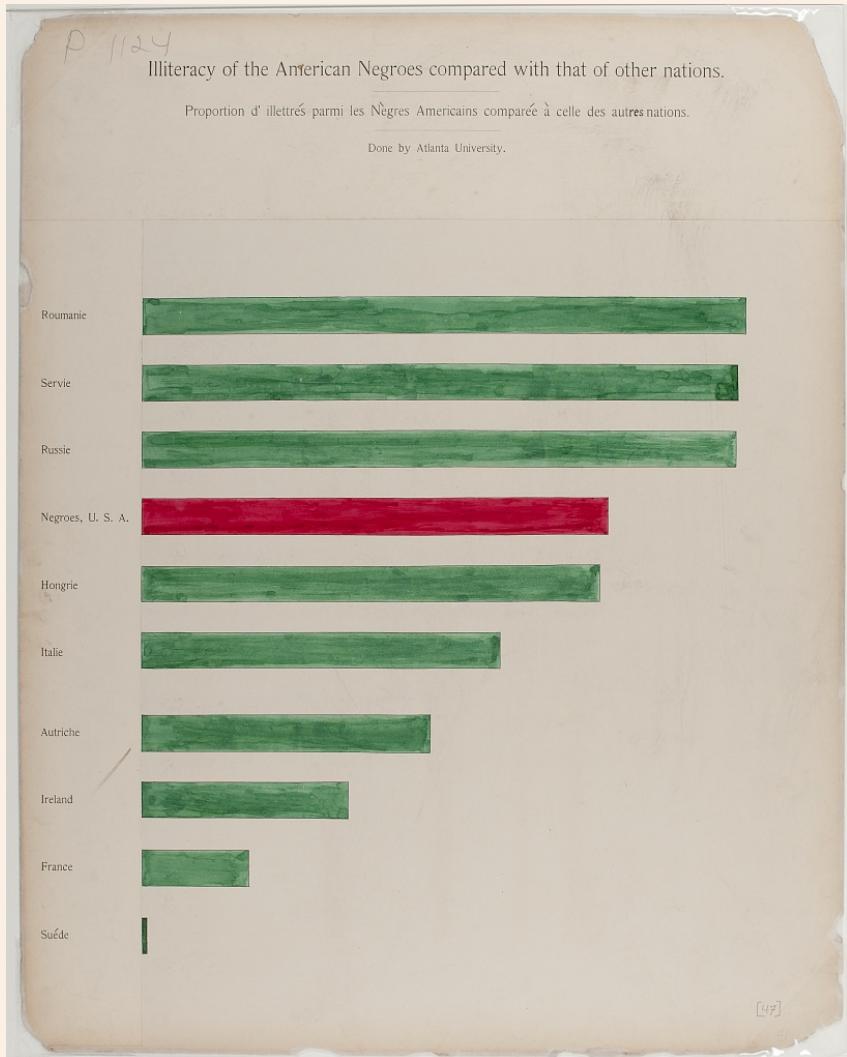
# Explore Example 3



Illiteracy of American Negroes compared with that of other nations



# Explore: Message



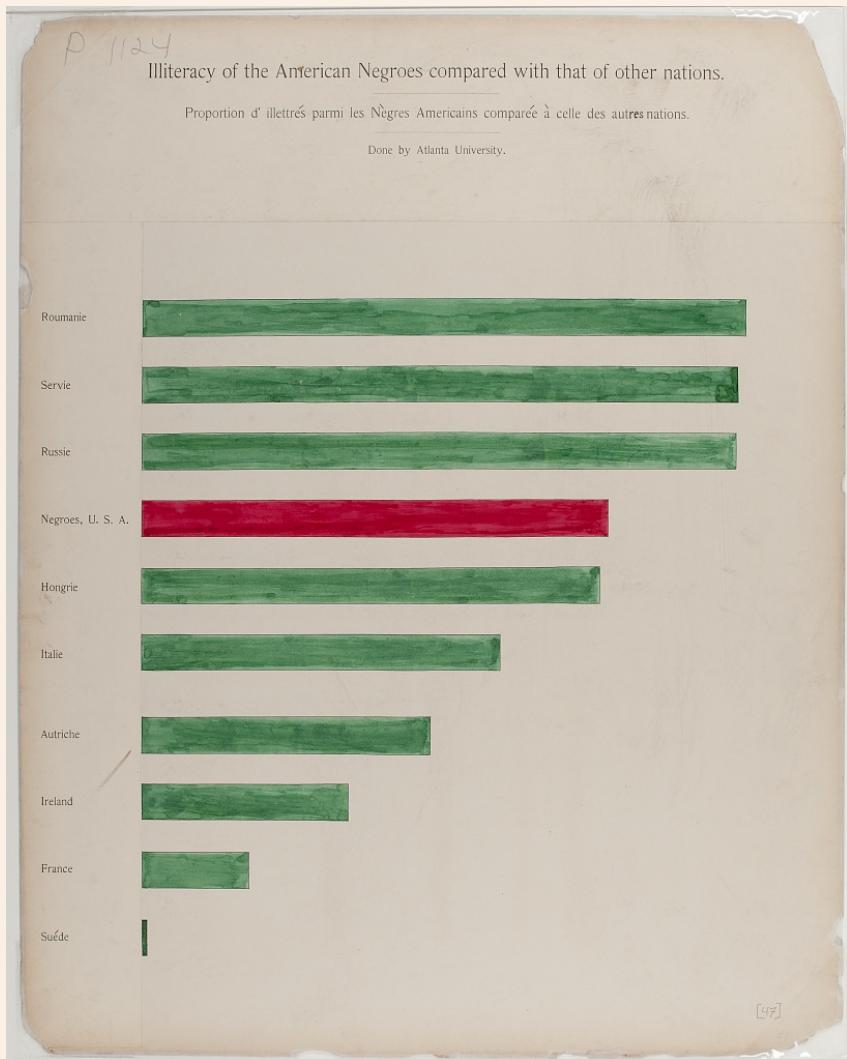
The message of the visual is tied to the overall message from Du Bois at the Paris Exposition:

Describe the status and progress of Black Americans since emancipation, and provide an alternative narrative to racist views of the time.

Comparing the state of Black Americans with the larger world, the visual shows Black Americans illiteracy in red, in the middle of a sea of green, higher than countries like France, but better than others like Russia.



# Explore: Aesthetics and Design



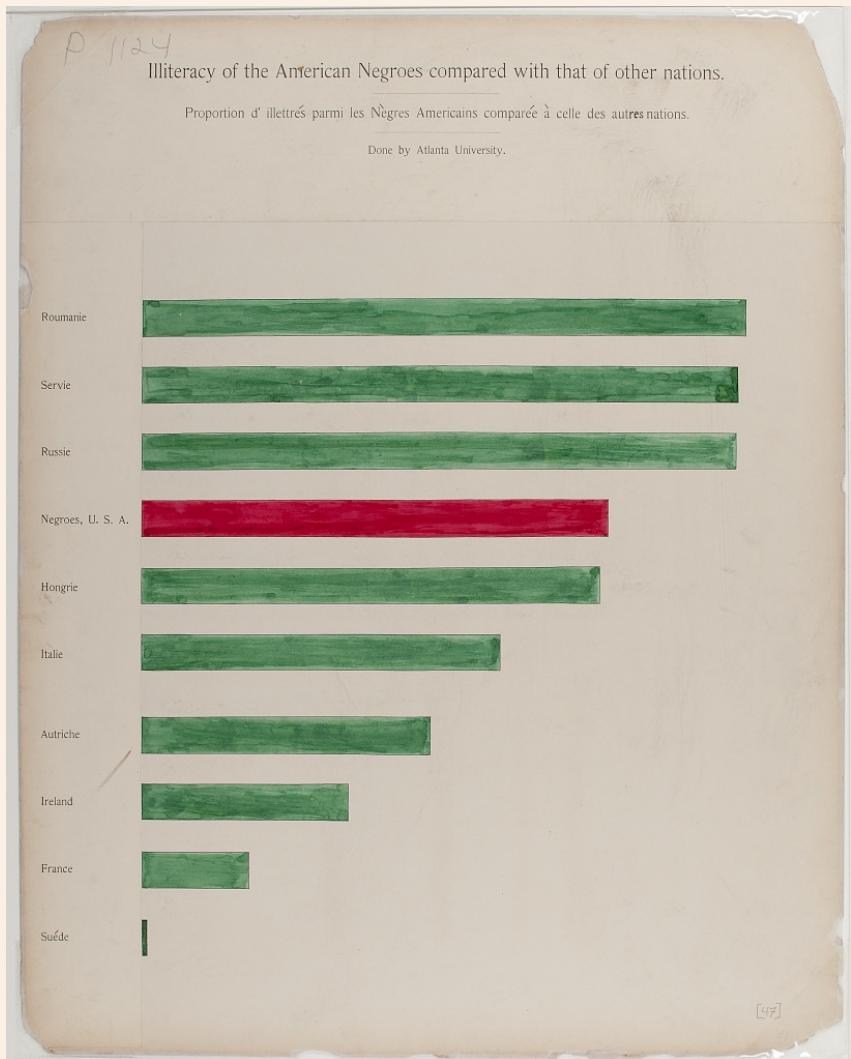
This visual, a conventional bar graph, uses spot color to highlight the data for Black Americans compared to other countries, showing the illiteracy rate to be at the midpoint compared to other nations.

The chart portion is a large percentage of the canvas, simply showing the message.

Note the bilingual labels and titles (a nod to the venue)



# Explore: Considerations



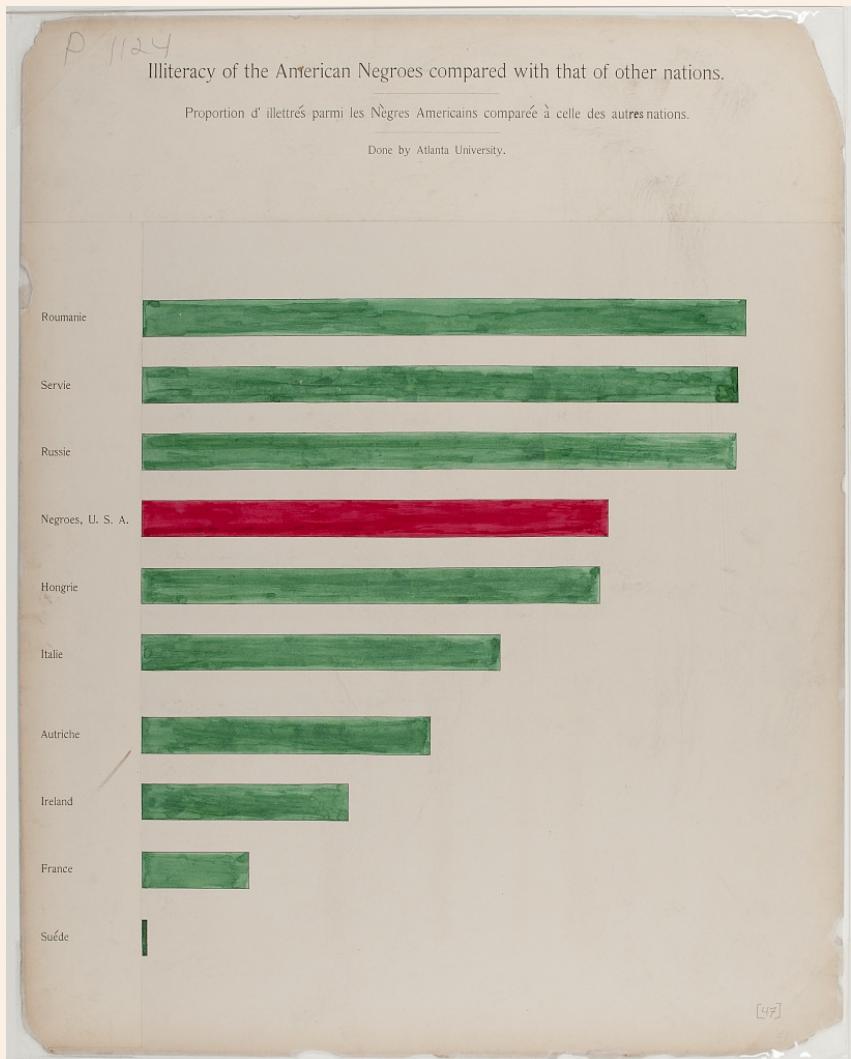
What analytic methods would you use to make this chart?

What chart type is best? Aesthetics: consider dimensions, color selection, titles, data labels, legend, notes etc.

What tools do you think are needed to make this chart?



# Explore: Aesthetics and Design



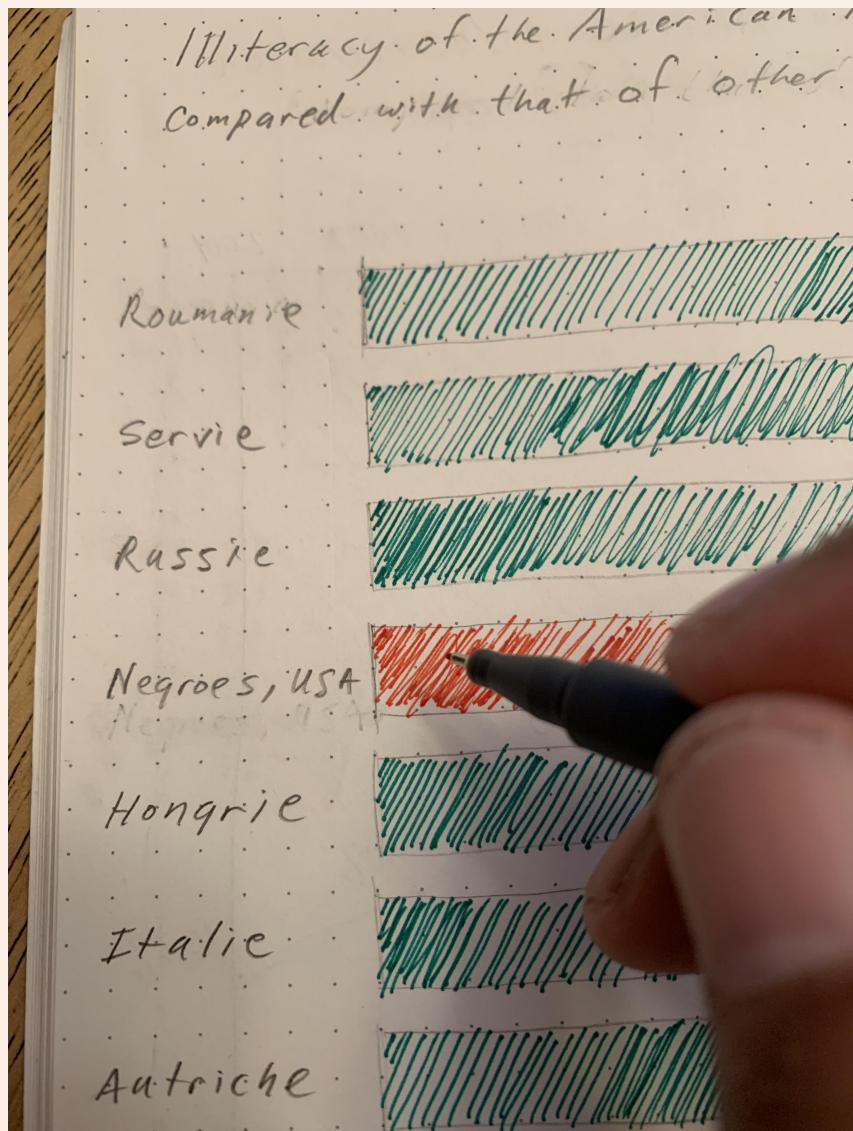
What analytic methods would you use to make this chart?

What chart type is best? Aesthetics: consider dimensions, color selection, titles, data labels, legend, notes etc.

What tools do think are needed to make this chart?



# Explore: Re-Create



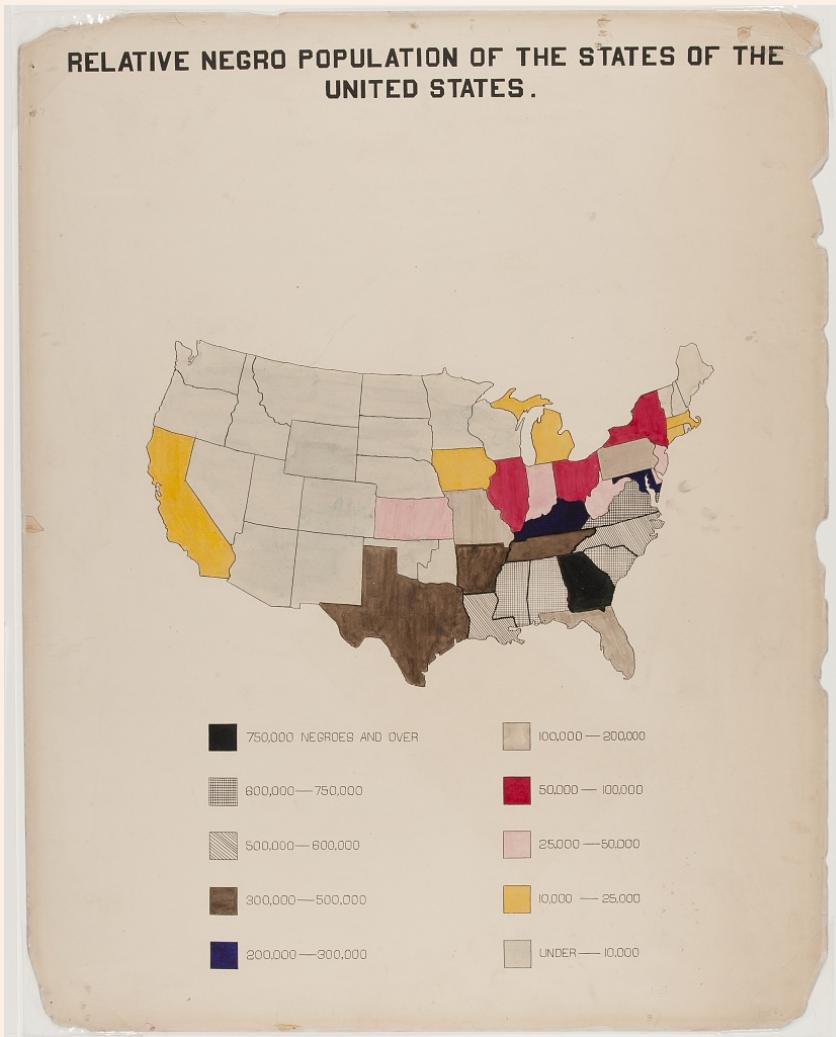
Re-create the visual using pens, paper and other analog materials like markers, colored pencils, rulers, and protractors.

Strive for rapid iteration, and do not focus on precision, but rather exploring the various components of the chart, and how they are conveying the message and information. Students may work together or individually.

At the end of the session, the re-creations may be shared and critiqued as a group.



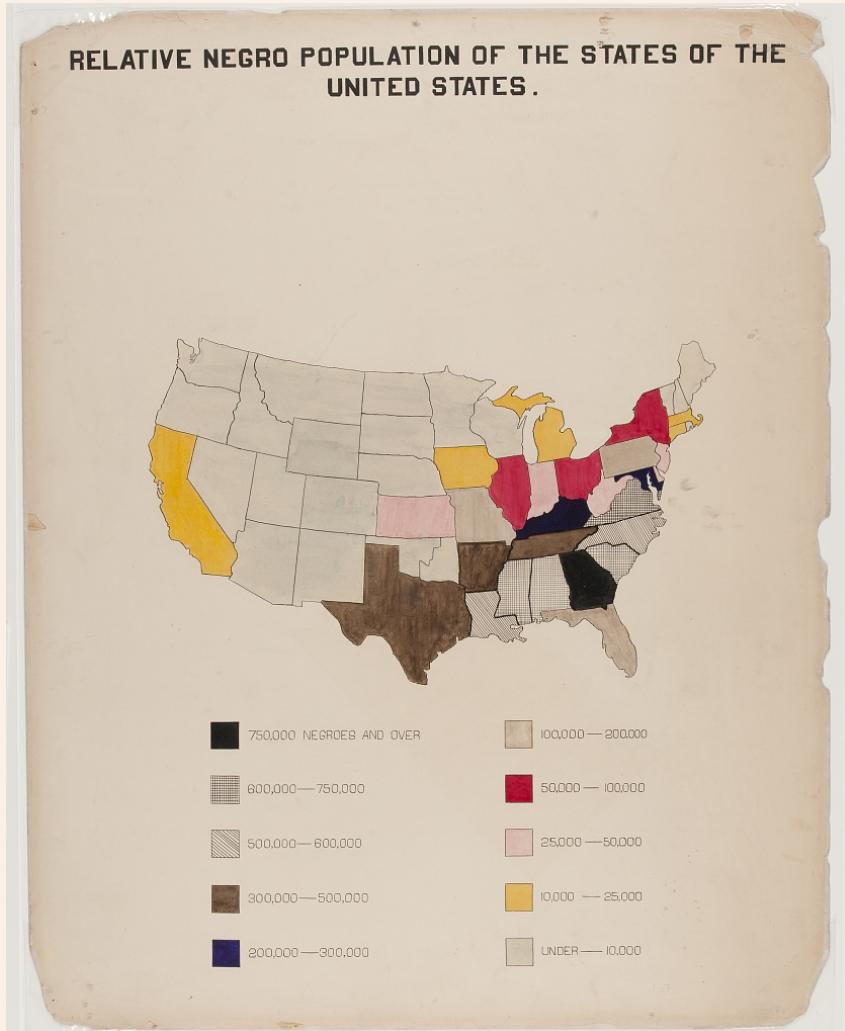
# Explore Example 4



Relative Negro Population of the States of the United States



# Explore: Message



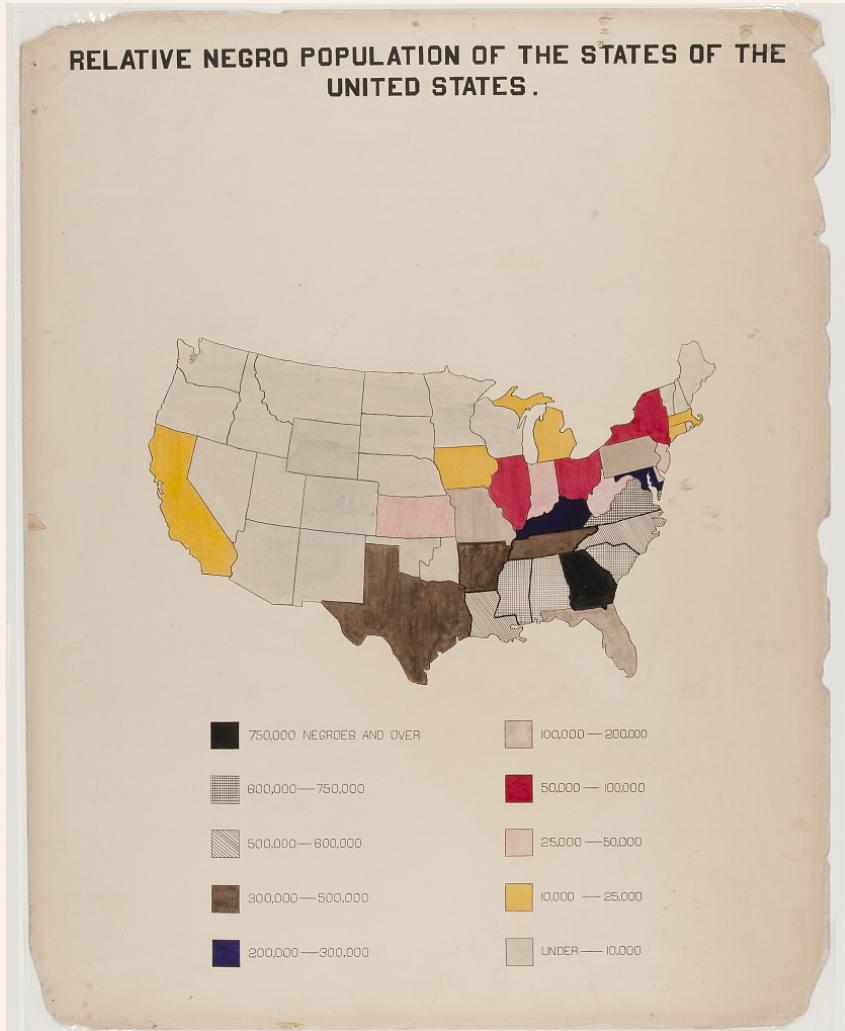
The message of the visual is tied to the overall message from Du Bois at the Paris Exposition:

Describe the status and progress of Black Americans since emancipation, showing the world their place in the US.

The visual shows the population of Black Americans across the United States, with larger populations concentrated in the South, while still showing the distribution throughout the states



# Explore: Aesthetics and Design



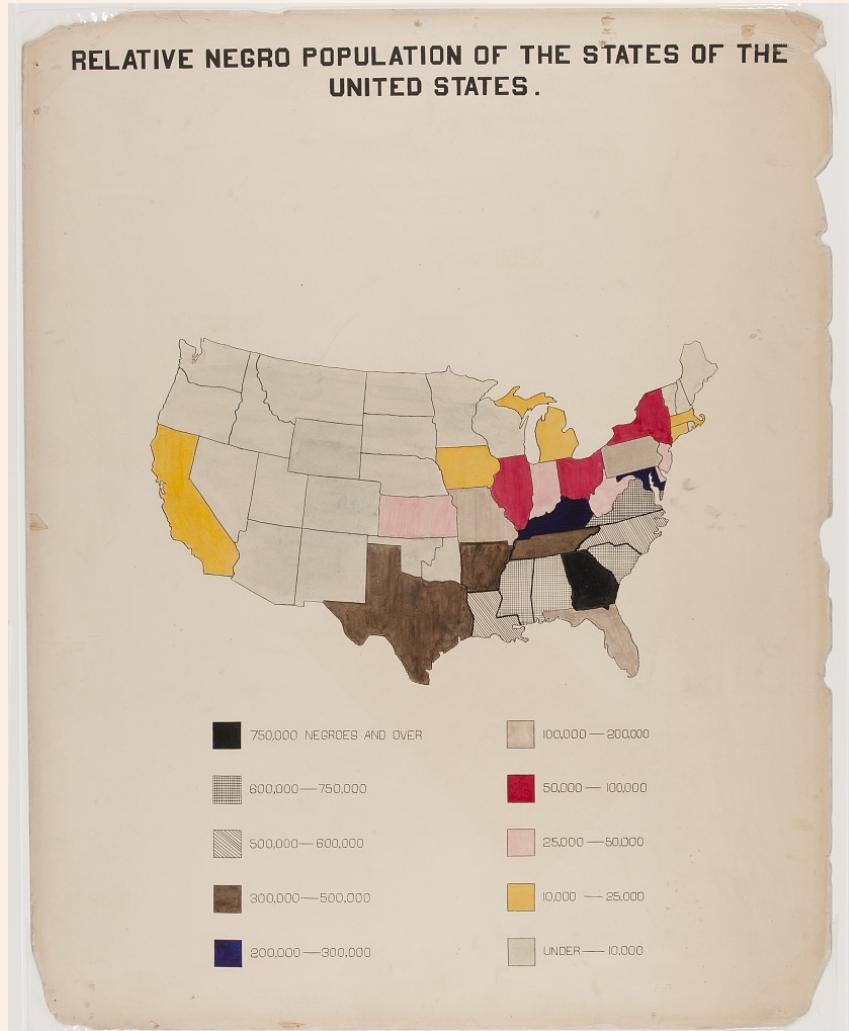
This visual has three sections: title, choropleth map, and legend, uses a combination of color (black, brown, tan, red, pink, gold) and cross-hatching to encode ten categories of population data.

The solid and cross-hatched black is used to represent the higher populations based in the South, red and pink encode the mid-level populations, gold used for lower populations. A neutral color is used to states with a very small Black population.

Note the use of ample white space to allow the eye to focus on the map.



# Explore: Aesthetics and Design



Title

Choropleth Map

Legend



# Explore: Re-Create

RELATIVE NEGRO POPULATION OF THE STATES OF THE UNITED STATES.



- |   |  |
|---|--|
| <input type="checkbox"/> 750,000 NEGROES AND OVER | <input type="checkbox"/> 100,000 - 200,000 |
| <input type="checkbox"/> 600,000 - 750,000        | <input type="checkbox"/> 50,000 - 100,000  |
| <input type="checkbox"/> 500,000 - 600,000        | <input type="checkbox"/> 25,000 - 50,000   |
| <input type="checkbox"/> 300,000 - 500,000        | <input type="checkbox"/> 10,000 - 25,000   |
| <input type="checkbox"/> 200,000 - 300,000        | <input type="checkbox"/> UNDER - 10,000    |

Re-create the visual using pens, paper and other analog materials like markers, colored pencils, rulers, and protractors.

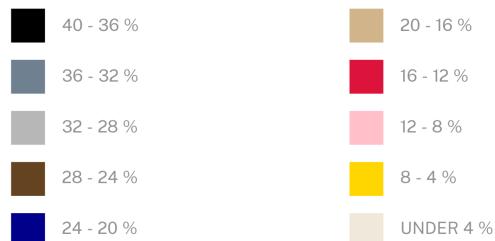
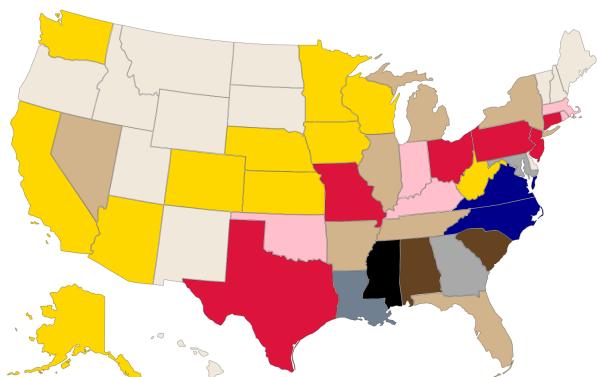
Strive for rapid iteration, and do not focus on precision, but rather exploring the various components of the chart, and how they are conveying the message and information. Students may work together or individually.

At the end of the session, the re-creations may be shared and critiqued as a group.



# Explore: Modernize

PERCENT BLACK POPULATION OF THE UNITED STATES. (2021)

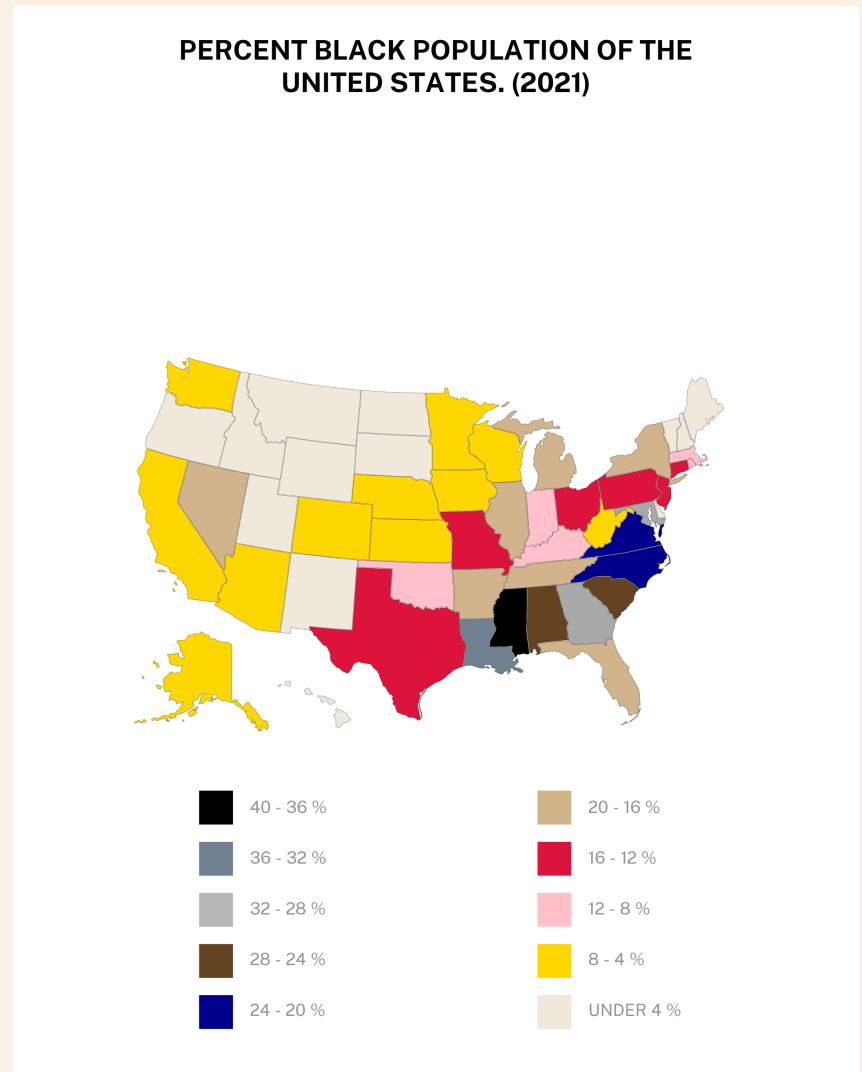
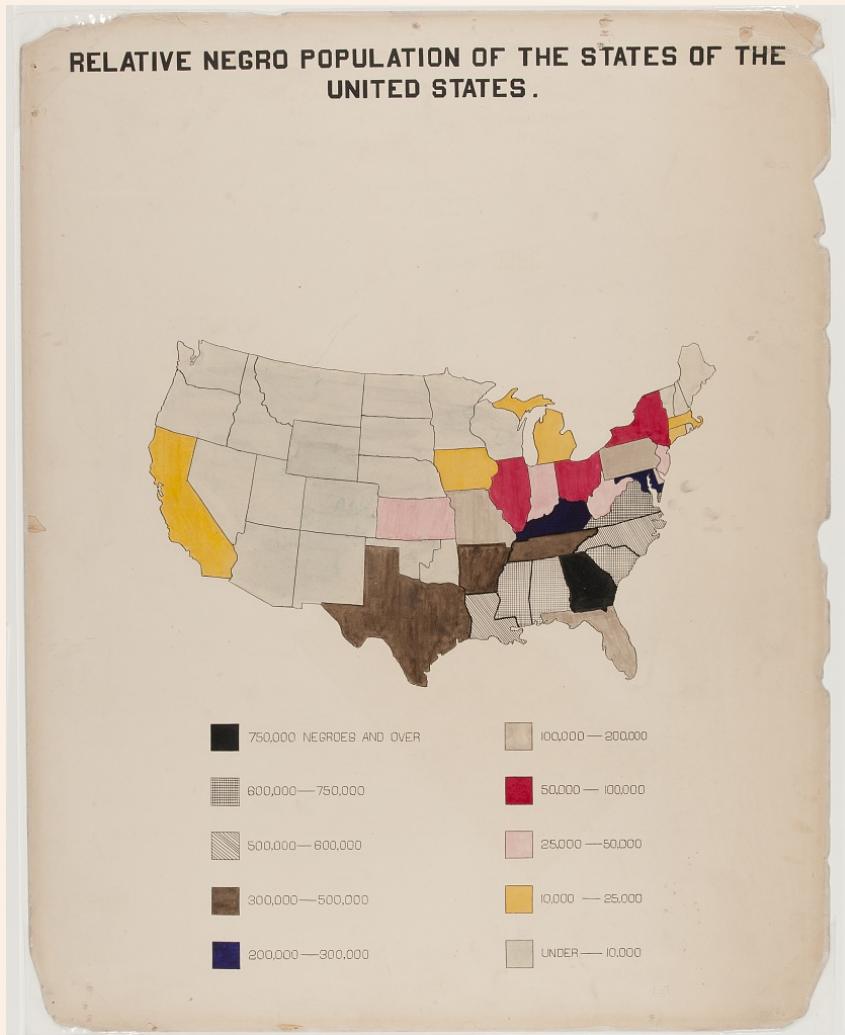


This example uses modern data to update the population of Black Americans to 2021.

It mimics the layout and color scheme of the original, but uses uses percentages instead of numbers, retaining the ten categories.



# Explore: Modernize



Original and Modern Data Versions Compared



# Explore: References

## Du Bois Visualizations for Consideration in STEM Education

<https://github.com/ajstarks/dubois-data-portraits/tree/master/dubois-stem>

## Du Bois Visualization Style Guide

<https://github.com/ajstarks/dubois-data-portraits/blob/master/dubois-style.pdf>

## Recreating the Du Bois Data Portraits

<https://speakerdeck.com/ajstarks/recreating-the-dubois-data-portraits>

## Du Bois Visualizations Catalog (originals)

<https://speakerdeck.com/ajstarks/du-bois-visualizations-originals>

## African American Photographs Assembled for 1900 Paris Exposition

[https://www.loc.gov/collections/african-american-photographs-1900-paris-exposition/?st=grid&sb=date\\_desc](https://www.loc.gov/collections/african-american-photographs-1900-paris-exposition/?st=grid&sb=date_desc)

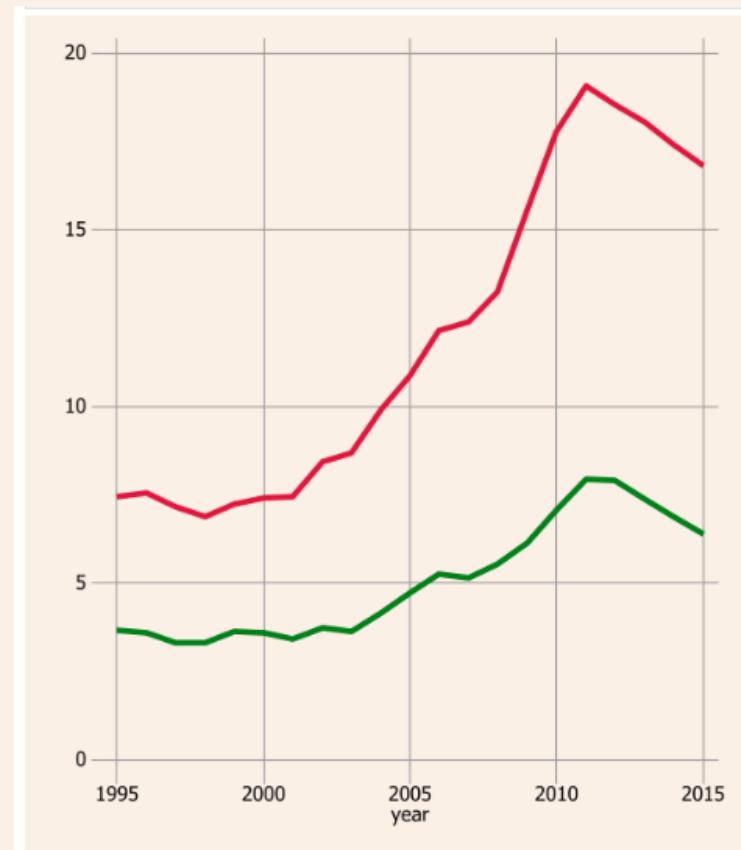
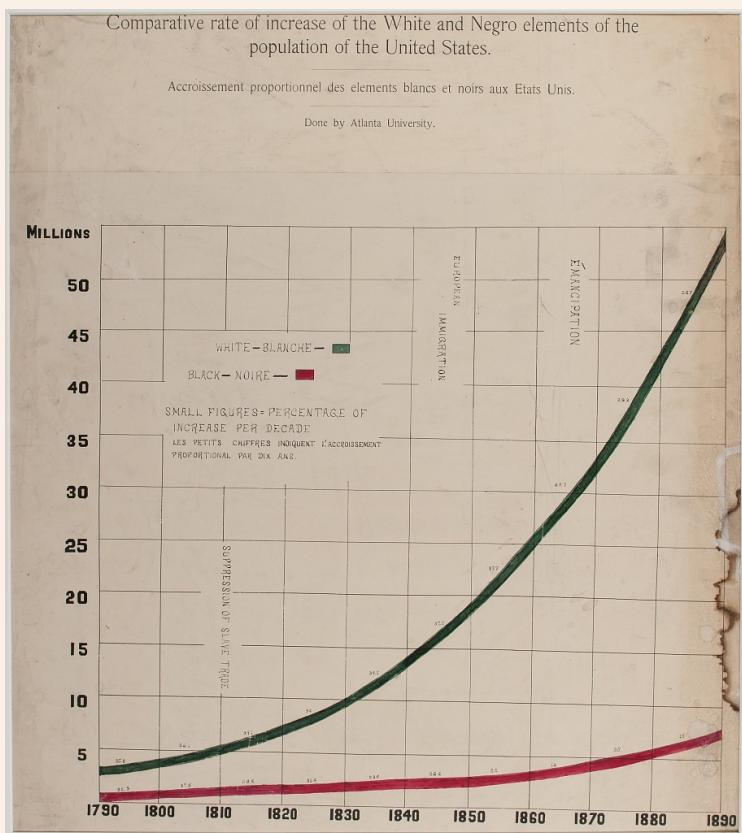
## W.E.B. Du Bois Data Portraits, Visualizing Black America

<https://papress.com/products/w-e-b-du-boiss-data-portraits-visualizing-black-america>

## Black Lives 1900, W.E.B. Du Bois at the Paris Exposition

<https://www.theredstoneshop.com/products/black-lives-1900>

# Implement





# Implementation

The Implementation section builds on the Context and Explore sections and guides the students through building a Du Bois-style visualization using digital tools.

The example shown here uses R and Jupyter notebook, which provides an interactive environment to explore the visual, starting from a basic graph, to applying the Du Bois style.

Note that participants of the Du Bois Challenge, an annual online exercise that re-creates a curated set of Du Bois visuals, provides examples of digital re-creations using tools such as R, python/matplotlib, and Tableau.



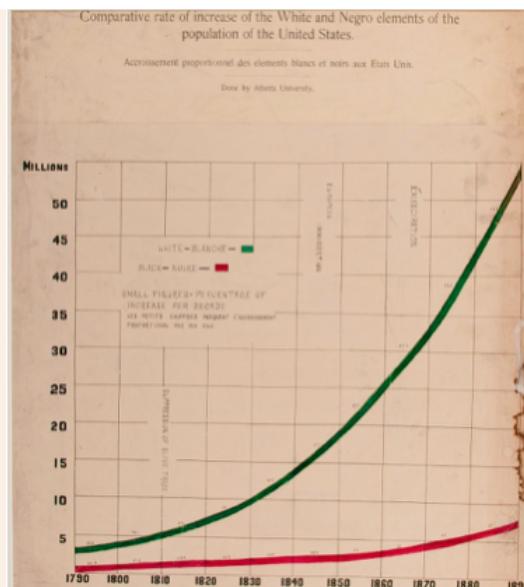
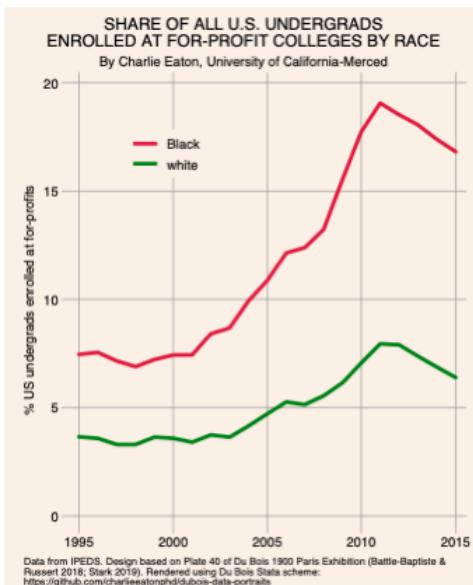
# Implementation: Introduction

duboisforprofitenrollments.ipynb

File Edit View Run Kernel Tabs Settings Help

Code ▾

No Kernel



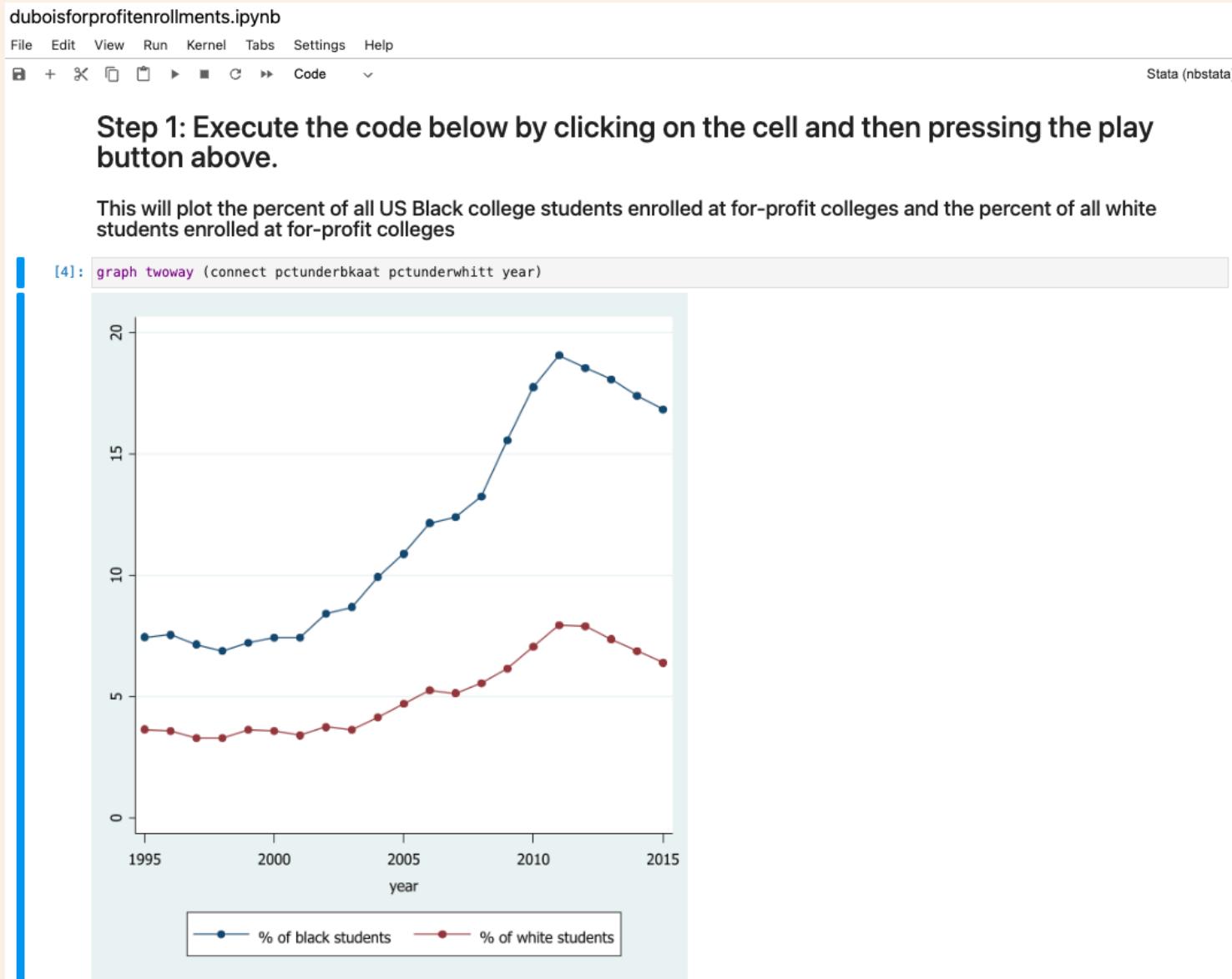
In this exercise, you will learn how to graph for-profit college enrollments by race since 1995 (left).

You'll learn how to plot the for-profit college data using similar design elements as Du Bois' Plate 40's plot of the U.S. population by race from 1790 to 1890.

You'll also learn how to modify the graph according to your own creative ideas for what might capture your audience's attention while still accurately representing the data.



# Implementation: Basic Chart





# Implementation: Hinting

duboisforprofitenrollments.ipynb

File Edit View Run Kernel Tabs Settings Help

Stata (nbstata)

In the cell below, add a "du bois scheme" specification to change the color pallete and background color. If you need a hint, press ... below.

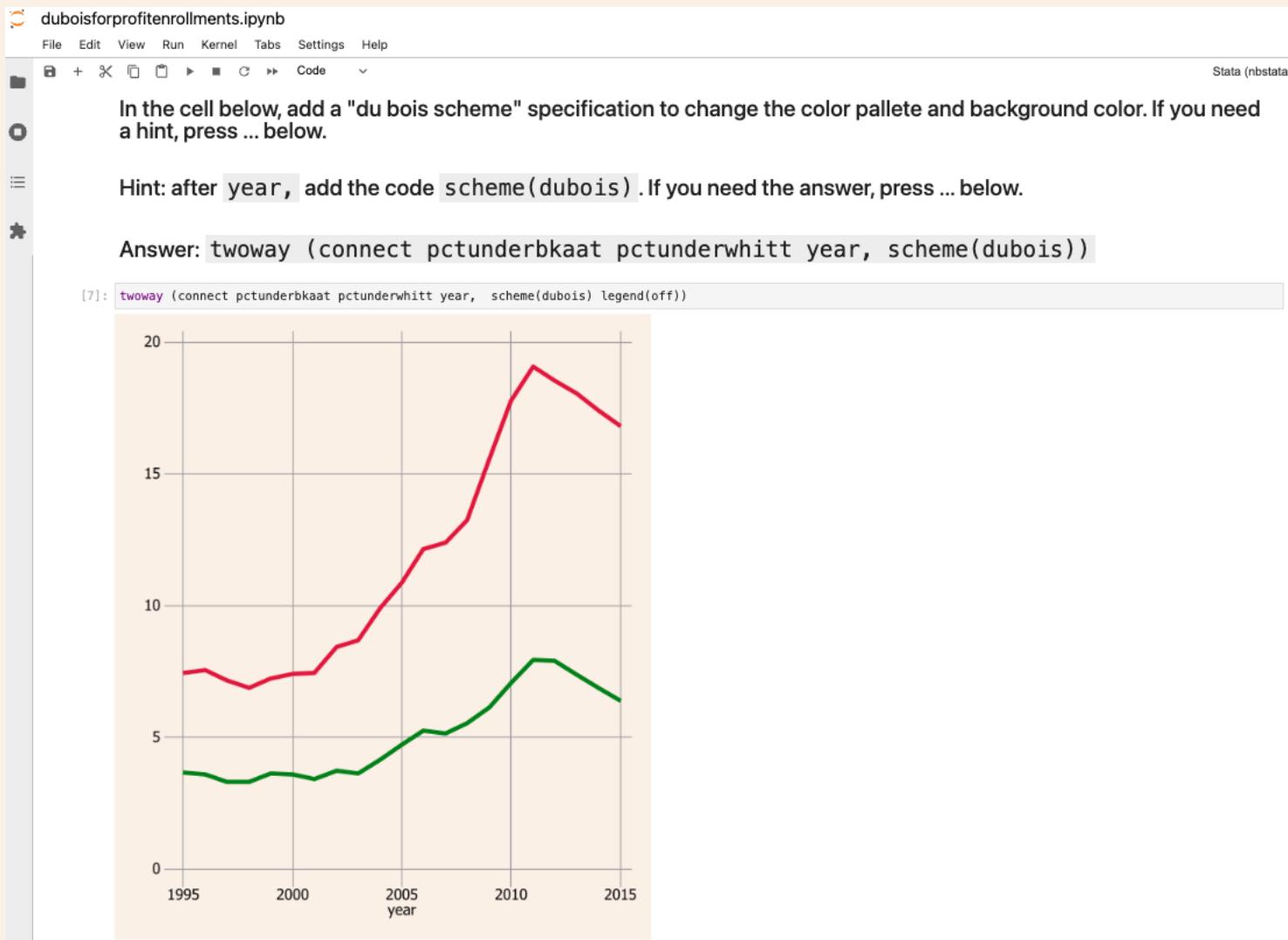
Hint: after `year,` add the code `scheme(dubois)`. If you need the answer, press ... below.

...

```
[6]: twoway (connect pctunderbaat pctunderwhitt year, legend(off)) scheme(dubois)
scheme(dubois) is not a twoway plot type
r(198);
```



# Implementation: Applying style





# Implement: References

Github Repository for the #DuBoisChallenge2024

<https://github.com/ajstarks/dubois-data-portraits/blob/master/challenge/2024/README.md>

Du Bois Challenge 2024 Recap

<https://speakerdeck.com/ajstarks/du-bois-challenge-2024-recap>

2024 Du Bois Challenge using R Programming.

<https://medium.com/illumination/2024-du-bois-challenge-using-r-programming-02af8afa5626>

Developing Du Bois's Data Portraits with Python and Matplotlib

<https://www.edriessen.com/2024/02/07/developing-du-boiss-data-portraits-with-python-and-matplotlib/>

Three Tricks I Learned In The Du Bois Data Visualization Challenge

<https://nightingaledvs.com/recreating-historical-dataviz-three-tricks-i-learned-in-the-du-bois-data-visualization-challenge/>

Molly Kuhs Du Bois Challenge repo

<https://github.com/makuhs/DuboisChallenge>

#DuBoisChallenge2024 using Python and Matplotlib

<https://github.com/edriessen/dubois24-python-matplotlib>

#DuBoisChallenge2024 using R

<https://github.com/sndaba/2024DuBoisChallengeInRstats/tree/main>

#DuBoisChallenge2024 using Tableau

<https://public.tableau.com/app/profile/camaal.moten7357/vizzes>