Education Statistics Visualization
Process Book

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Greeshma Mahadeva Prasad, u1141804, greeshma@cs.utah.edu
Tanvi Gangadhar, u1205740, gangta@cs.utah.edu

Project Repository- https://github.com/magsheer/education-statistics-visualization
Visualization Link- https://magsheer.github.io/education-statistics-visualization/

Project Proposal

BACKGROUND AND MOTIVATION

When we started looking for project ideas, we came across many that seemed interesting but these did not have good datasets, for example, visualizing black friday shopping trends across various age groups and cities. We could not find an appropriate dataset for it.

Later we started looking for datasets that seemed interesting and we came across the Education statistics dataset by World Bank. This dataset has indicators that describe literacy rate, enrolment rate, illiterate population across education levels (primary/ secondary/ tertiary), age groups and gender. We decided to use this dataset as education can be associated with various parameters such as a country's economic growth, crime rate etc. We also wanted to draw parallels between the economic state of the country (low income vs high income) and education rate to understand the factors influencing the latter over the years.

PROJECT OBJECTIVES

We have wish to try and answer a set of questions as a part of our analysis through our data visualization. The primary questions being:

- How indicators such as literacy rate among males/females, illiterate population etc, have changed in countries over the last five decades
- Which are the most literate/illiterate age groups
- What's the highest level of education in specific countries
- Does the income of the country impact its literacy rate

As mentioned earlier, education can be related to various factors that influence our society. Visualizing such a dataset might help analyze the impact education has, on the growth of a country/region. In more developing countries, it would be beneficial to see the gender parity in education and whether it is moving towards equality in education.

DATA & DATA PROCESSING

We got out dataset from https://datacatalog.worldbank.org/dataset/education-statistics, The World Bank's Data Catalog.

The dataset includes multiple files and is quite large. It consists of over 4,000 internationally comparable indicators that describe education access, progression, completion, literacy, teachers, population, and expenditures. We do not intend to use all of them for the purpose of this project as this might cause a lag in the webpage. We plan to use indicators that fall under the three essential categories: gender, age group and education level. This will allow us to effectively visualize the Gender Parity Index, highest level of education obtained across regions/countries and drop out rate amongst different age groups with respect to the economic state of the country. We also intend to show a global trend by comparing country statistics with the global data.

Since the data we want to use for this visualization is scattered over multiple files, we need to extract only the data we require depending on the indicators, region and countries. We plan on doing this using Python or Javascript.

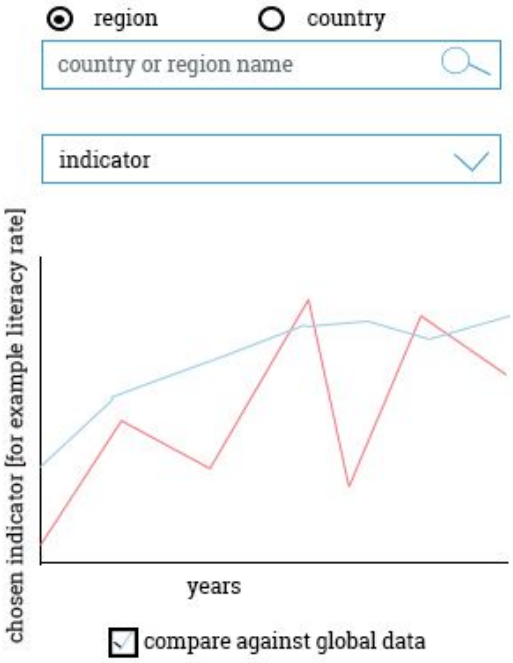
VISUALIZATION DESIGN

Prototype 1

We used some ideas from the assignment 4 for our first prototype. The features include:

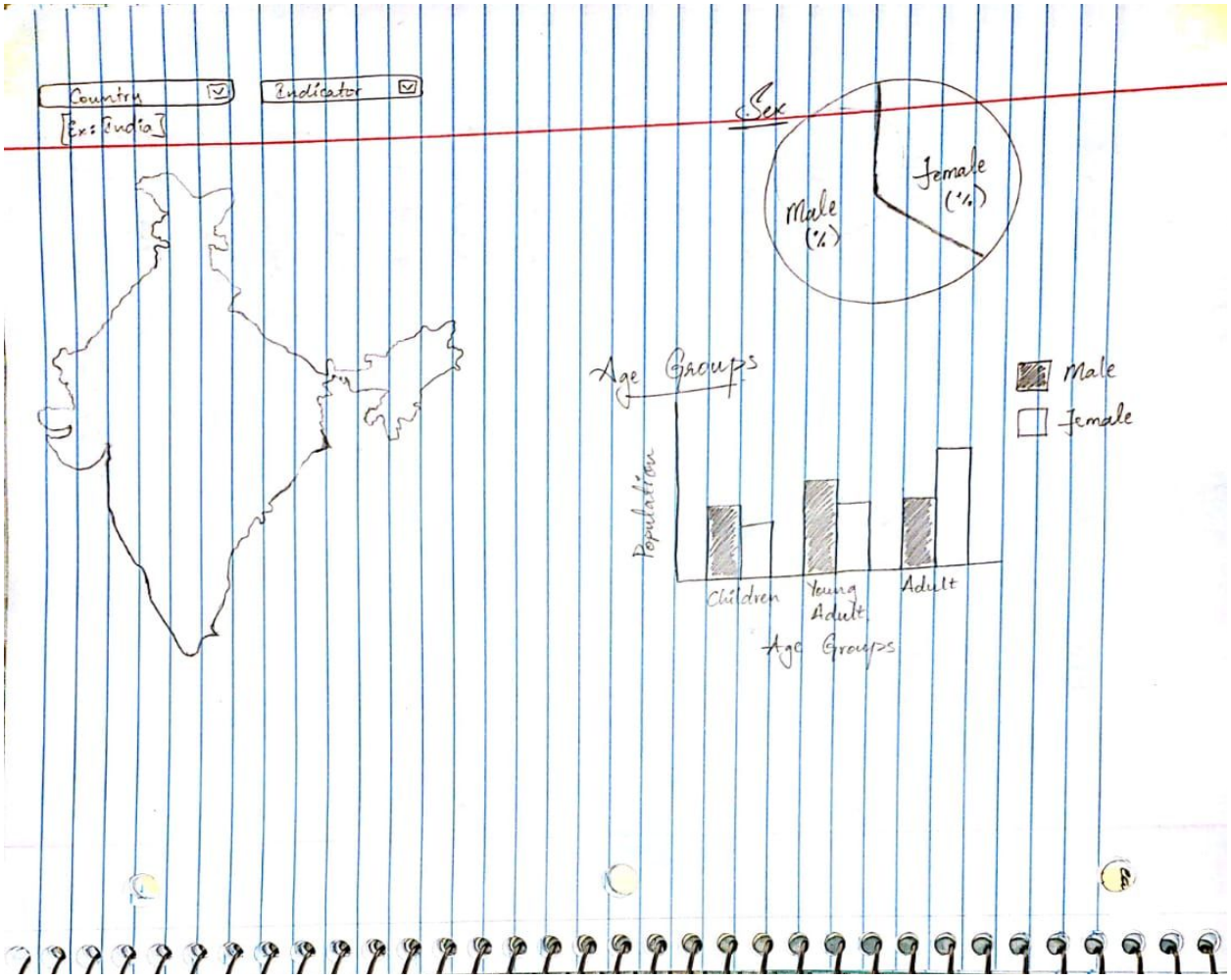
Alternative 1:

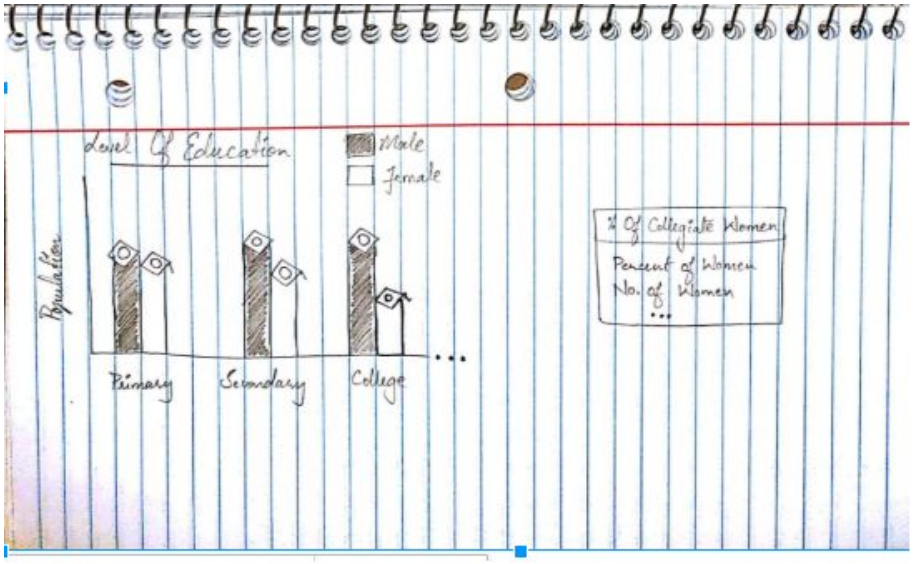
- Select whether a region or country has to be visualized using the radio buttons
- Select the particular country/region using the map or typing it in
- Select the indicator to observe the trend over years
- Check the compare option to compare the global and country/region specific trends.



Alternative 2:

- Select the country you want visualize the data for
- Select a single indicator from the provided dropdown
- Based on the country and indicator selected, the visualization will show, the trend for the particular indicator for last five decades.
- For example, choosing India as the country and sex as the indicator, we show a pie chart with the ratios since there are only two values whereas selecting India as the country and education level as the indicator, will show adjacent bar charts.
- On clicking the bars or sections, details will be shown

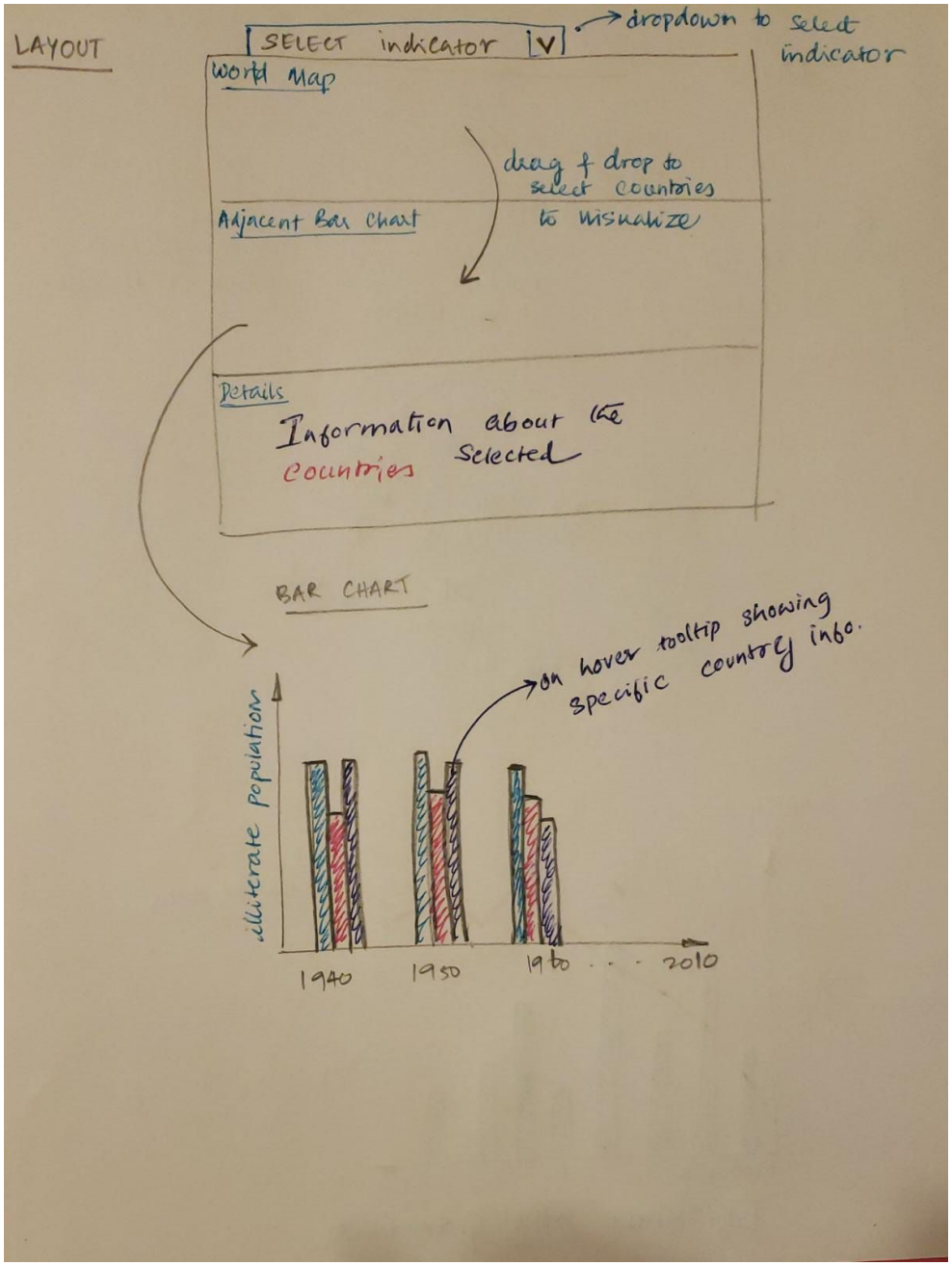

Country
[Ex: India]
Indicator
Sex
Male (%)
Female (%)
Age Groups
Population
Male
Female
Children
Young Adult
Adult
Age Groups


Level Of Education
Male
Female
Population
Primary
Secondary
College
...
% Of Collegiate Women
Percent of Women
No. of Women
...

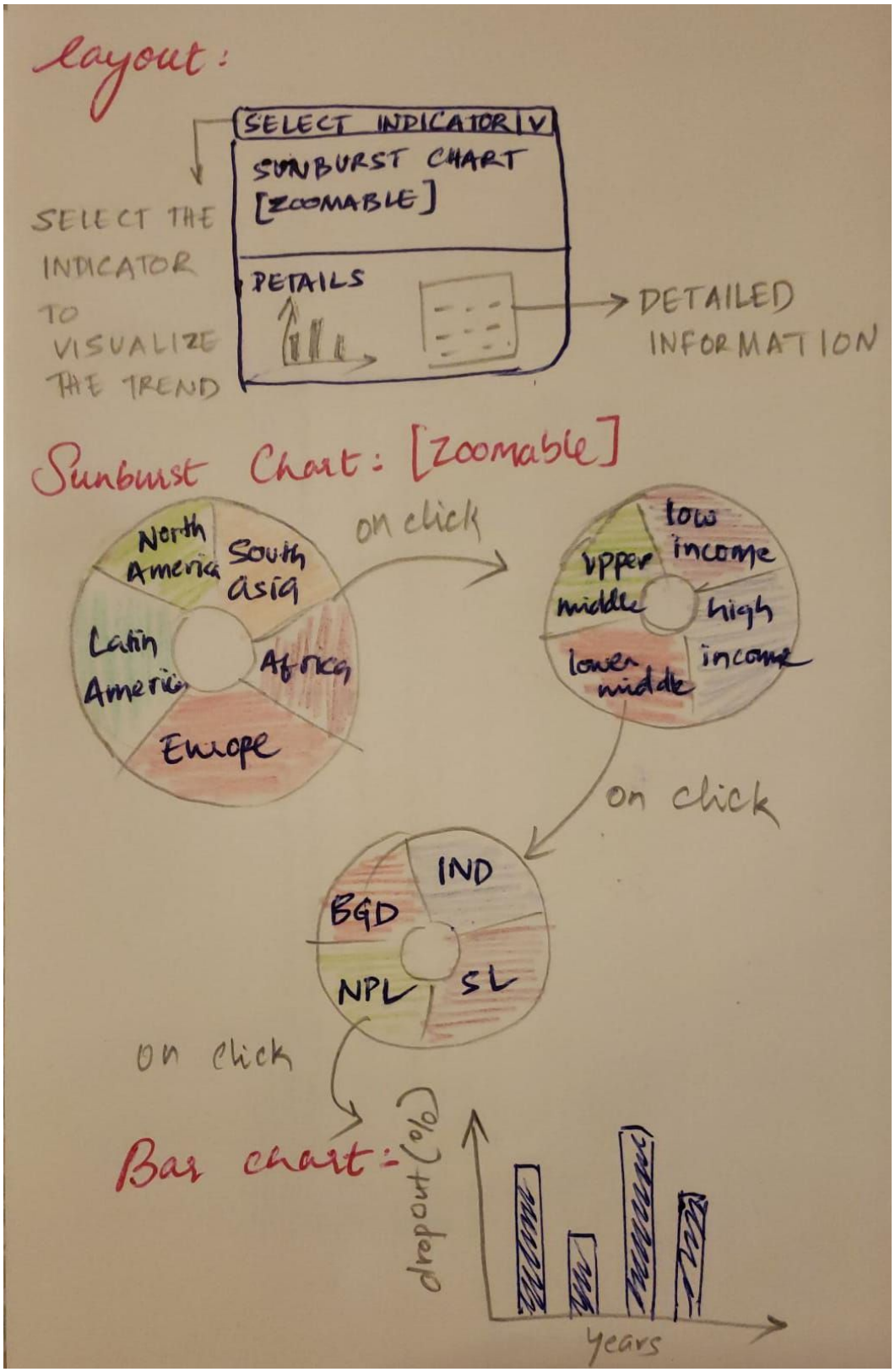
Prototype 2

Compare indicators for all years among countries

- World Map that lets you drag and drop countries (max 5) from it to the side pane
- Bar chart with adjacent bars showing the trend for each country
- Select the indicator to observe the trend over years



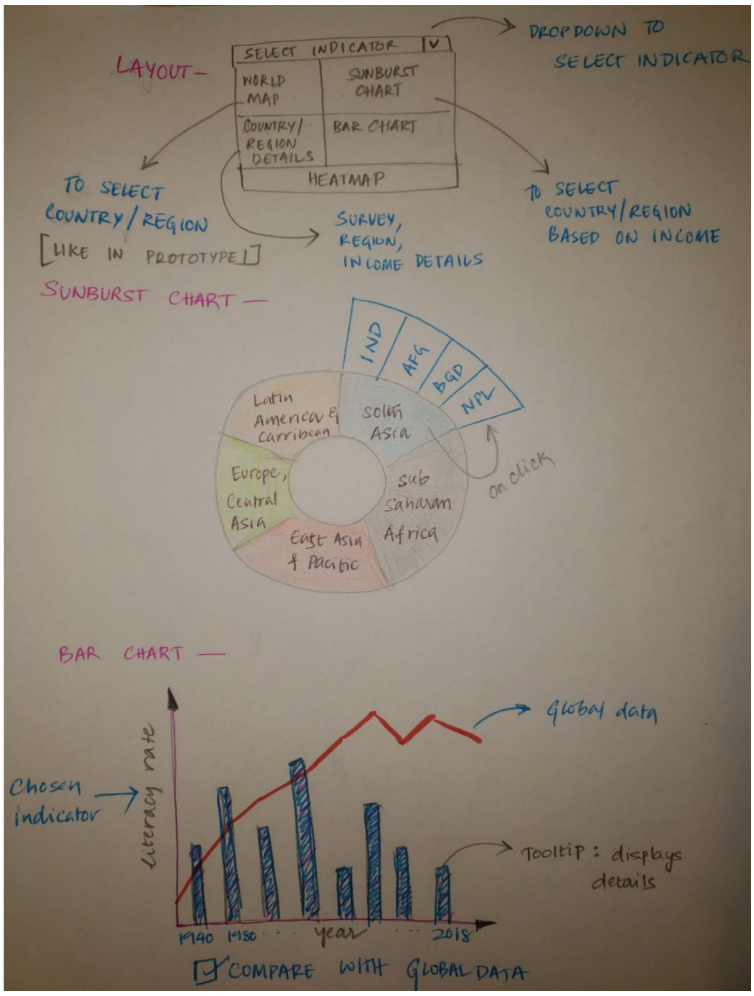
Prototype 3

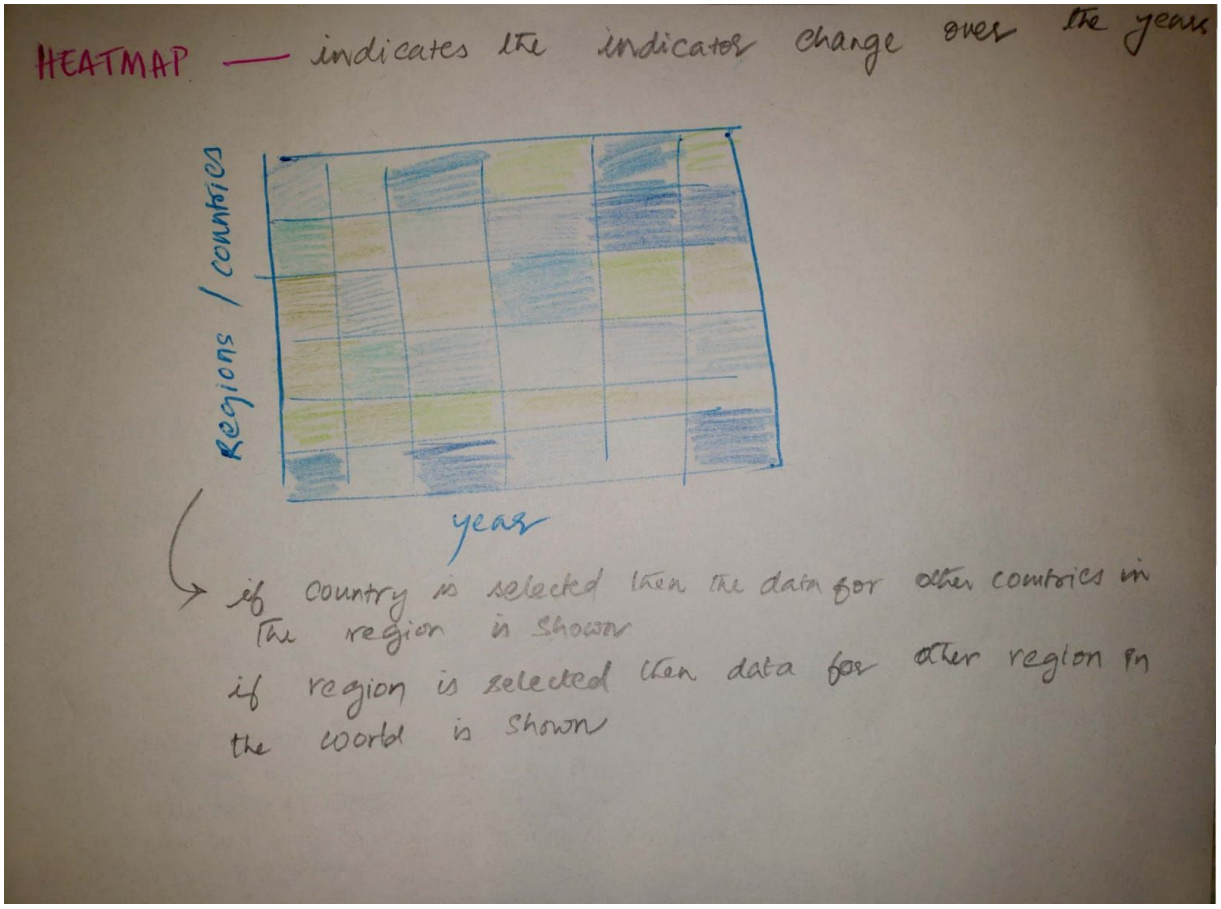

layout:
SELECT INDICATOR
SUNBURST CHART [ZOOMABLE]
DETAILS
SELECT THE INDICATOR TO VISUALIZE THE TREND
DETAILED INFORMATION
Sunburst Chart: [zoomable]
North America
South asia
Latin America
Africa
Europe
on click
low income
upper middle
high income
lower middle
on click
IND
BGD
NPL
SL
on click
Bar chart:
dropout (%)
years

Final Design

We picked up aspects from each of the prototypes that will help us tell the story and visualize education statistics trend.

- World Map that is colored based on the regions such as Sub Saharan Africa, East Asia & Pacific etc
- Sunburst chart with distortion that displays hierarchical data. First level of the hierarchy is represented by regions which drill down to countries, with the World being the innermost circle at the top of the hierarchy
- Bar chart that shows the trend for the selected indicator over the last 5 decades
- Select the region/country that you want to visualize the trend for
- Select the indicator to observe the trend over years
- Check the compare option to compare the global and country/region specific trends with a Line Chart.





MUST-HAVE FEATURES

- Being able to visualize data region-wise and country-wise for at least 5 indicators
- Being able to compare the trend for a particular country with the world data
- Sunburst chart or the world map to select a country with ease

OPTIONAL FEATURES

Heat Map that shows :

- How a selected country compares over countries in the same region as the selected country?
- How a selected region compares with the other regions in the world?

PROJECT SCHEDULE

Week 1 [Oct 29 - Nov 4]

- Do the data processing required for the visualization
- Host the project on github
- Significant work done on getting a working prototype

Week 2 [Nov 5 - Nov 11]

- Have the working prototype ready

Week 3 [Nov 12 - Nov 18]

- Work on incomplete functionalities of the prototype
- Have the basic visualizations working without any glitches

Week 4 [Nov 19 - Nov 26]

- Enhance the visualizations
- Add rest of the planned functionalities
- Fix bugs

Week 5 [Nov 26 - Nov 30]

- Test the visualization
- If there is time, add more extra features and work on making the project better

Project Milestone

OVERVIEW

The main objective of the project is to view how the education statistics indicators have changed over the years and compare different countries falling under different income groups to see the impact of income of a country over education. The visualization consists of four components-

- World map
- Sunburst chart
- Bar/Line chart
- Heatmap

After the peer feedback (Described below and in FeedbackExercise.pdf) and receiving the feedback from the TA, we decided to make some changes to the project.

DATA & DATA PROCESSING

Although the data does not need much processing, since it comprises of several indicators. We decided to extract a csv for each indicator to make data handling simpler. We also had to merge certain files to get the region and income group information. We did some of this work manually and some using a python script.

VISUALIZATION DESIGN

Project Proposal

After considering all the prototypes(Described in ProjectProposal.pdf) we had decided on the design shown below.

- World Map that is colored based on the regions such as Sub Saharan Africa, East Asia & Pacific etc
- Sunburst chart with distortion that displays hierarchical data. First level of the hierarchy is represented by regions which drill down to countries, with the World being the innermost circle at the top of the hierarchy
- Bar chart that shows the trend for the selected indicator over the last 5 decades

- Select the region/country that you want to visualize the trend for
- Select the indicator to observe the trend over years
- Check the compare option to compare the global and country/region specific trends with a Line Chart.

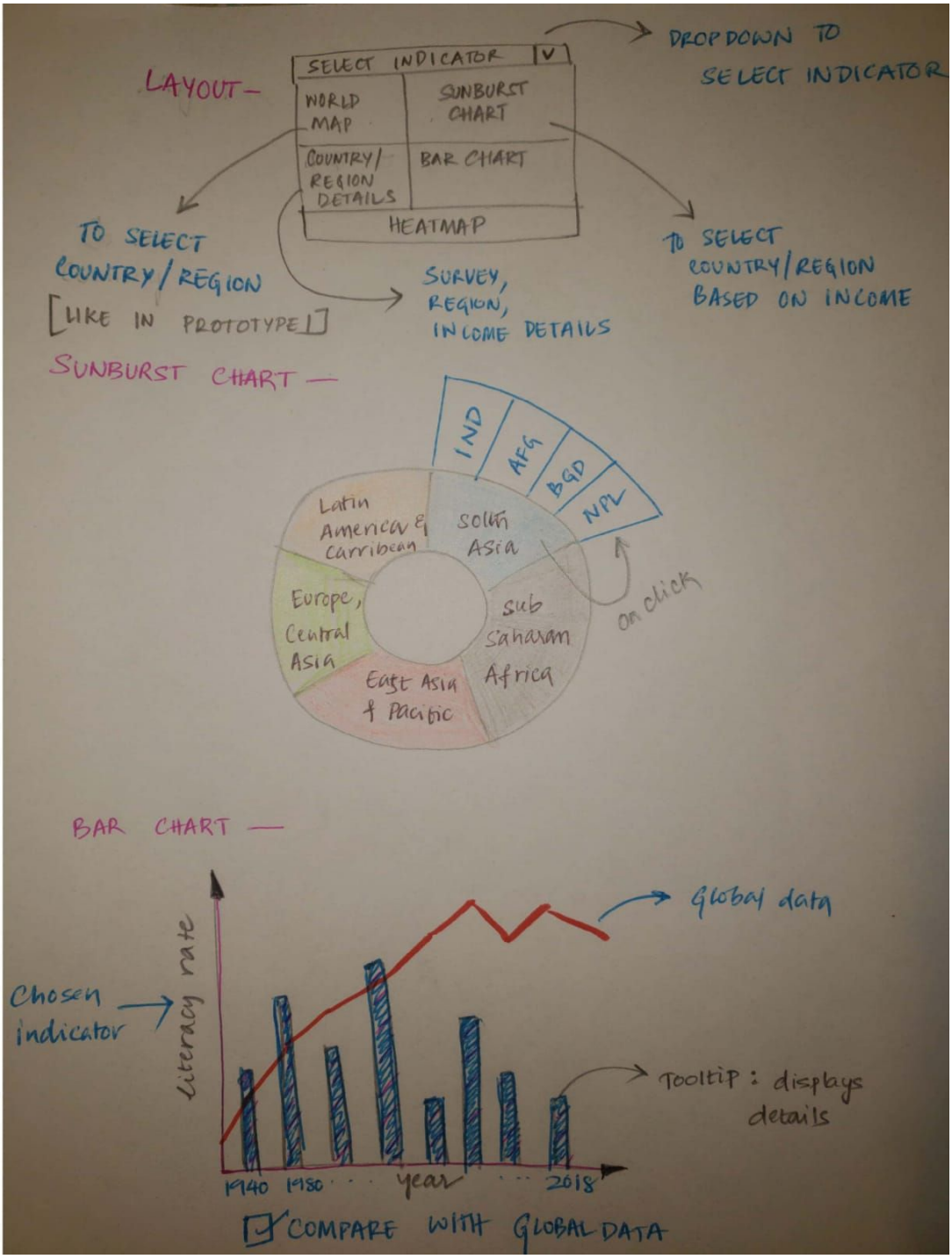
What changed?

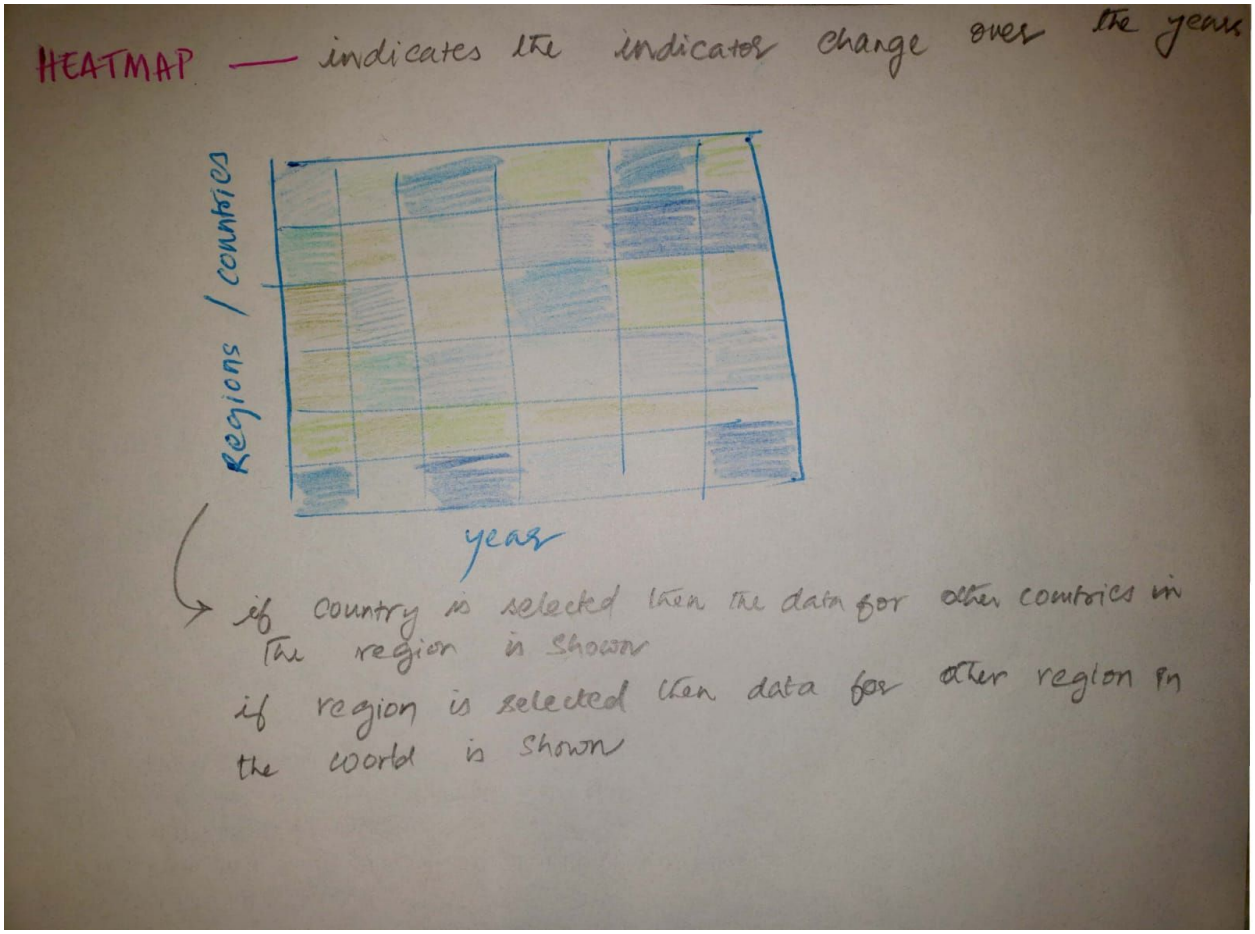
Based on the feedback we received from the peer group: The functionalities of the sunburst chart and world map were almost the same, that is, to select the country or data to visualize. Instead we decided to color code the countries based on the suggestion we got. The countries are now colored based on the indicator selected.

The heatmap representing the changes in the region and country was an optional feature. We decided to make it a must-have feature as it's helpful in visualizing the change over the years and compare the indicator data to other countries.

Based on the feedback we received from the TA: It was unclear how we were going to visualize various income groups impact on education. To address this, we decided to have the line chart or bar chart indicate the trend for all the countries in the selected income group (Region can be selected using sunburst chart/Map).

Also, we decided to encode the most literate/illiterate age group using a tooltip for the both map and line chart.


LAYOUT –
SELECT INDICATOR
WORLD MAP
SUNBURST CHART
COUNTRY/ REGION DETAILS
BAR CHART
HEATMAP
DROPDOWN TO SELECT INDICATOR
TO SELECT COUNTRY/REGION [LIKE IN PROTOTYPE]
SURVEY, REGION, INCOME DETAILS
TO SELECT COUNTRY/REGION BASED ON INCOME
SUNBURST CHART –
IND
AFG
BGD
NPL
South Asia
Latin America & Carribean
Europe, Central Asia
East Asia & Pacific
Sub Saharan Africa
on click
BAR CHART –
Chosen indicator
Literacy rate
Global data
Tooltip : displays details
1940
1980
year
2018
COMPARE WITH GLOBAL DATA

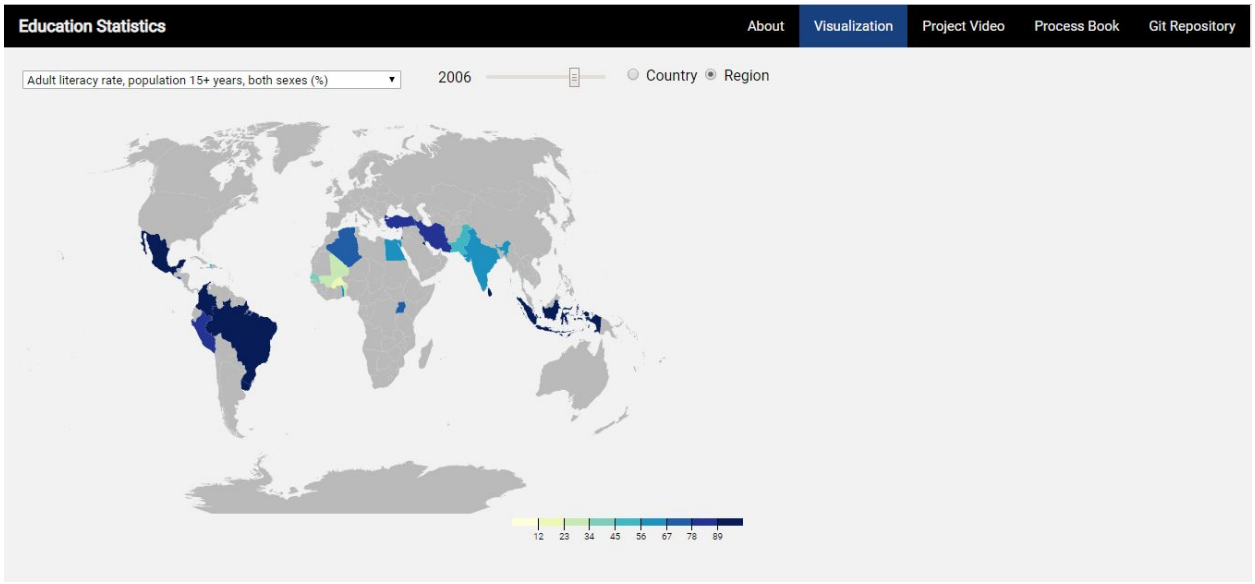


Project Milestone

The screenshot below shows the landing page for our visualization. Currently we have three selections on which the visualizations are based on.

- Dropdown: the indicator which has to be visualized
- Year slider: the year based on which the countries are colored
- Country/Region radio buttons: whether the world map and heatmap should be encoded based on country or region

Implementation of the landing page was straight forward and it is hosted using github pages. Right now, we have based the prototype on one indicator only. We have add support for other indicators. The framework for the map view is in place.



Implementation

Choropleth world map

We had to consider a lot of factors while deciding based on which indicator the countries should be colored or whether we need different colors based on region. In the end we decided to have a country and region option and encode it based on that.

For the project milestone, we have only the country view working. We have the data required for the region view, but there is some processing left before we can complete the visualization.

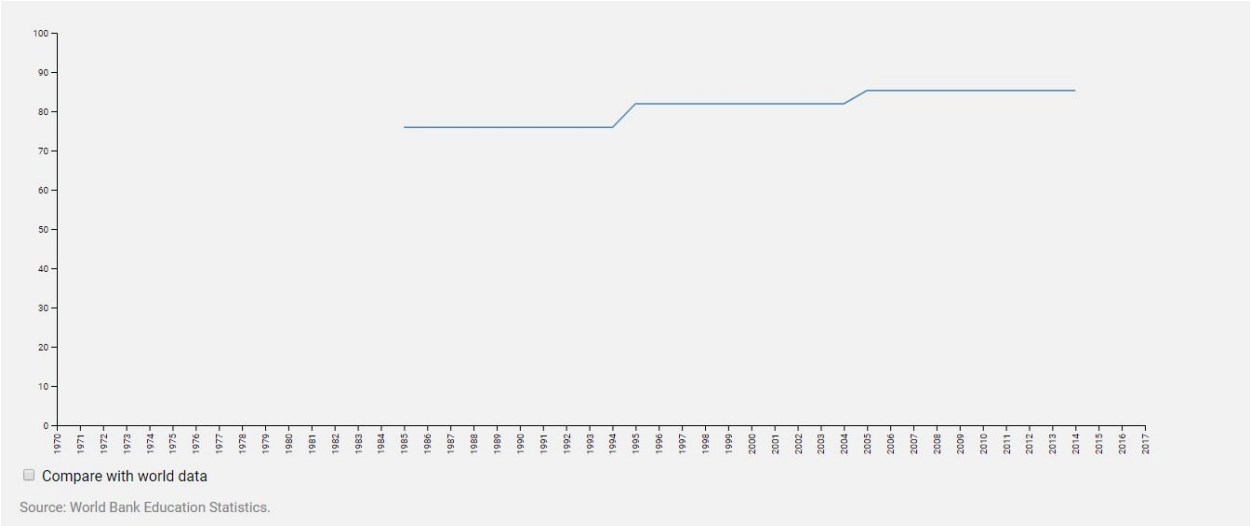
We chose the color scheme to suit our landing page.

Line chart

Our dataset has a lot of missing values, this is because the data is collected using several surveys and not all of them are conducted annually. After discussing with the TAs and going over several ideas, we decided to do something similar to https://bocoup.com/blog/showing-missing-data-in-line-charts. We are still experimenting whether line chart or bar charts can be used to interpret the data well.

Currently, our line chart shows the global data and the checkbox is meant to toggle whether to compare against the global data or not. Our other alternative for this is to also, compare against the countries region data for country view. Also, if a income group

is selected then options to compare against countries in the same income group or region. There are ideas we are still thinking of, for the line chart implementation.



PROJECT SCHEDULE

Work completed so far

As per our schedule mentioned in the project proposal, we are on track and we have completed :

- Data processing. Some of the processing was done manually and some csv's were generated using python (data_processing.py). Our data is arranged in 4 different csv's namely adult_literacy_rate_both_sexes, adult_literacy_rate_gpi, adult_literacy_rate_male, adult_literacy_rate_female.
- We have our landing page ready and hosted.
- We have also completed a working prototype with our world map and line chart.

Team member contributions

Worked together on building and hosting the landing page, data processing. We constantly communicated about what each of us was doing and came up with implementation ideas together.

Greeshma: Worked on getting the world map working.

Tanvi: Worked on line chart and how to represent missing data.