COM-480 Data Visualization2024
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Education Diversity Across the World: A Visual Exploration of Schools in the USA, Mexico, Switzerland India

Introduction

We began our project by choosing the data we wanted to visualize. After brainstorming and exploring various ideas, we decided to focus on the theme of educational diversity across the world. Everybody in our team is very passionate about education. We believe education has a long lasting impact on people's quality of life. Our passion for education and the desire to reveal both macro and micro aspects of schooling guided our decision. We asked ourselves: "What is the story we want to tell?" and realized that while many organizations, such as the World Bank and UNESCO, provide macro statistics on global education, there is a lack of focus on the tangible aspects of educational environments that significantly impact students' experiences. The actual experience of going to school is very different to students from different backgrounds and countries. We wanted to show the macro statistics together with a qualitative feeling and micro numbers like tuition, school size, and other school specifics, including images, so that out audience can really get a feel for what it is like to go to school for people from different backgrounds and cultures.

Project Concept and Data Selection

To come up with a novel idea, we decided to visualize both macro statistics and micro-level insights about schools in different countries. Our aim was to combine broad educational trends with detailed information about individual schools, including aspects such as classroom quality, facilities, and labs. This combination approach would help users not only see the statistics but also feel the differences in educational experiences.

We selected five countries for our study: **USA, Mexico, Switzerland, India, and Japan**. For each country, we chose a mix of public and private schools to highlight the diversity within and across educational systems. Our dataset included macro statistics such as GDP and dropout rates, as well as detailed information about specific schools, such as tuition fees, school sizes, and images of facilities.

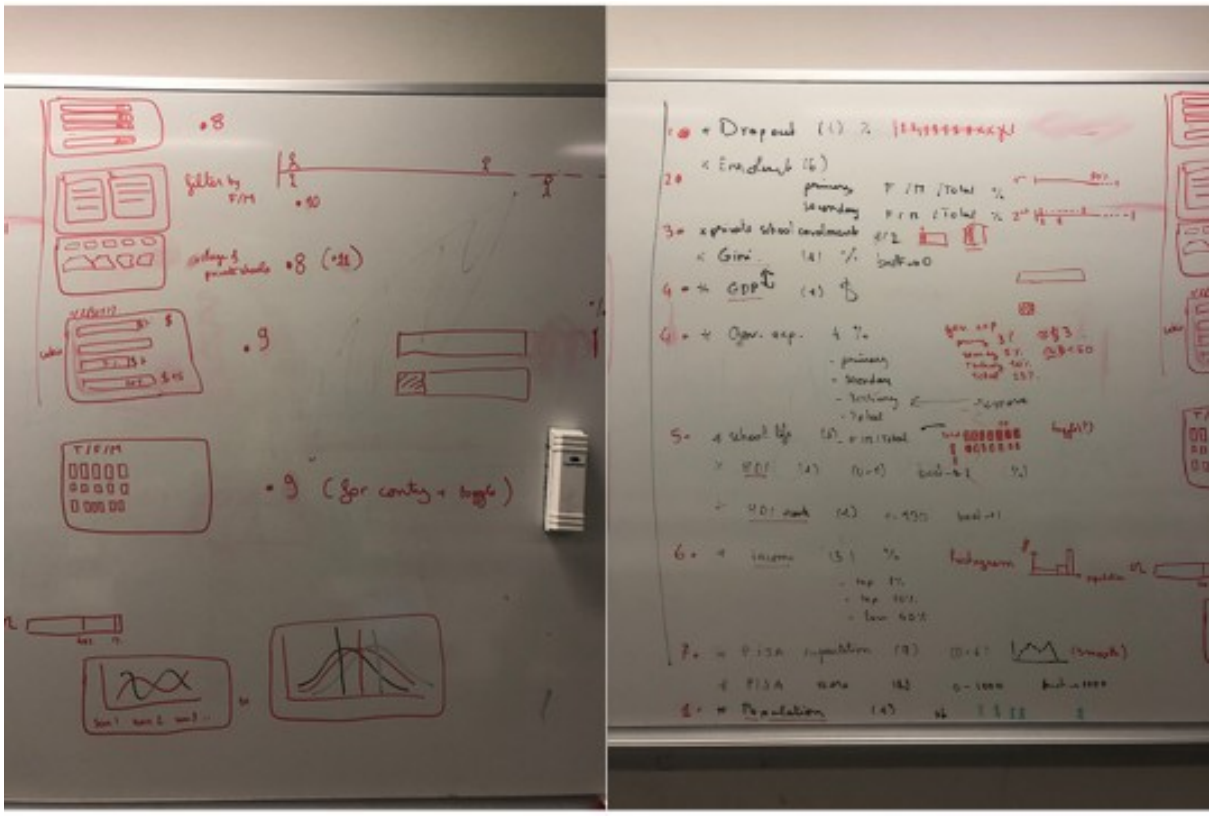
We originally wanted to show many more countries and schools but we realized that it was hard to find information for all of them, and the time needed to implement the project would jeopardize our quality if we tried to reach so many countries and schools.

Data Sources and Collection

We gathered data from various sources, including government databases, educational reports, and online resources. first we focused on macro statistical data from common sources such as the World Bank and UNESCO, collecting micro-level data posed significant challenges. Many big private schools showcase their facilities and have extensive documentation of their programs and environment, but private schools rarely have such presence online, and particularly schools in rural areas, have few pictures and information online. Even harder, collecting data from India, Japan, Mexico, proved challenging because of the language differences and the way each school shows its information. It was very hard to created a standardized feeling, which was important to us because in our website we want to compare pictures, and information. Some private schools also did not have specific pictures of what we were looking for (e.g. a hallway, cafeteria, etc.) so we had to scout social media, watch videos, and piece together images from various sources. This meticulous process ensured that we could provide a comprehensive visual

representation of each school, but it affected the quality and standardization of the images we collected. And storing more than 140 images also proved to be very tedious hand work.

The process to bring our data to life was a challenging one. Most of our ideas begin as sketches. These sketches were design to help us tell our story.



Then we specifically searched for the data to match our storytelling, but many times we could not find the specific data for all countries. So it became an iterative processes to design a story, look for the data, then try to visualize it and iterate until we had a complete final product.

Visualization Approach

One of the most important decisions our team made during brainstorming was to create interactive visualizations that would allow users to explore both macro and micro aspects of education. Our visualizations would enable users to:

- **Explore Multiple Indicators**: Examine various indicators on different scales, highlighting differences and potential causes of disparities between schools and school systems

- **Reveal Disparities**: Quickly discover disparities within and between countries
- **Uncover Links**: Identify connections between different indicators and school conditions

To achieve this, we structured our data in a way that allowed integration and interaction between macro and micro elements. Our inspiration came from platforms like Gapminder's Dollar Street, which effectively illustrates the living conditions of people at different income levels through visual storytelling.

We created a loop where our users can begin exploring, for example, a specific country, then a couple of schools n that country, but if the user becomes interested in exploring the difference with something like a cafeteria across countries, it is also possible. So by clicking a specific image even inside a country, the user will be able to see cafeterias, classrooms, hallways from across different countries, to get a feeling of the differences. and similarly with the macro data, at any point the user can go back to compare macro statistics between countries and see the dropout rate, the Human development index, or other metrics that complement the images for each school. In this way, macro and micro data interact to create a full picture.

Why were pictures so important to us? Imagine hearing a primary school tuition costs around USDS 30k per year. It sounds high, but it is not the same as visualizing students form this school in their music class.

Similarly, you can hear that a public school lacks funding, but it does not strike as hard as looking at the school's playground in the following image.

Challenges

Transition from Python to JavaScript

Our team was initially more comfortable with Python, but as we progressed, we needed to transition to JavaScript for the visualization component. This shift required us to rethink our logic and approach, as JavaScript and D3.js have different paradigms compared to Python.

Challenges

- Transitioning from Python logic to JavaScript logic.
- Building a comprehensive visualization with limited or difficult-to-obtain data.

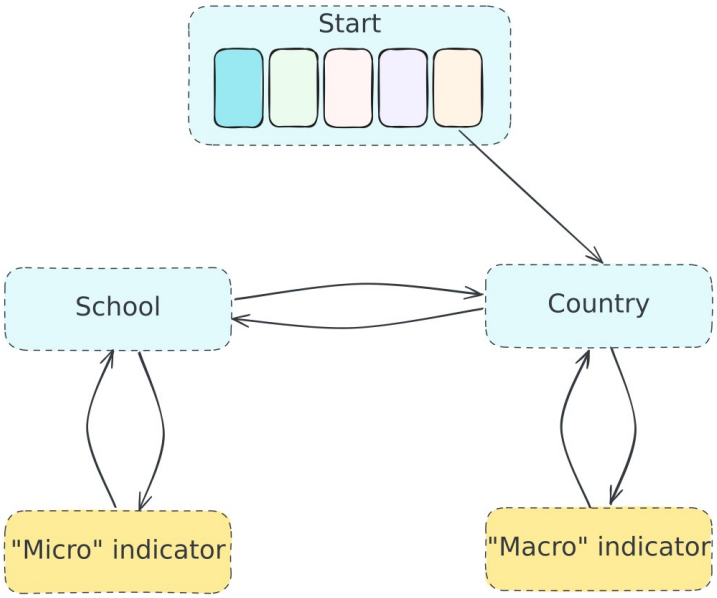
Visual Design and Scalability

Creating a visual design that made sense for one country but could also scale to five countries was a significant challenge. We wanted each visualization to be meaningful on its own while also fitting into a cohesive global narrative.

Challenges

- Designing a visualization that works for both individual countries and a global perspective.
- Representing "simple" data like GDP or dropout rates in a visually engaging way.

To overcome this, we focused on designing the website flow, the process idea, and then putting together the pieces to make it work.



Bridging Macro and Micro Data

Integrating macro and micro data posed its own set of challenges. We had to ensure that the two types of data coexisted harmoniously within our visualization. This involved careful planning and design to ensure that users could easily transition from seeing broad statistics to viewing detailed images and information about individual schools.

Challenges

- Making macro and micro data coexist.
- Bridging the gap between the two types of data and dealing with differences in data availability.

Technical Implementation

The technical implementation of our project involved several key components:

1. **Data Structuring:** Building a JSON file that could be accessed in various ways to accommodate different parts of the visualization
2. **Data Passing:** Ensuring data could be passed between different components seamlessly.
3. **GitHub Pages:** Understanding how GitHub Pages accesses project assets such as JSON files and images
4. **Collaboration:** Managing version control and collaboration among team members working on the same files

Also, many of our implementation did not look exactly how we wanted at the beginning, and we realized we have to adapt things for readability and clarity.

Challenges

- Structuring the JSON file appropriately.
- Passing data between components in a clear and simple way.
- Managing project assets on GitHub Pages.
- Collaborating effectively on the same files.

Final Decision and Implementation

In the final stage, we refined our visualizations to ensure they were both informative and engaging. We incorporated user feedback from friends and family, and made adjustments to enhance the storytelling part of our project. By integrating macro statistics with micro-level data, we aimed to create a tool that not informs but also immerses users in the educational experiences of different regions.

Through this project, we hope to provide a deeper understanding of educational diversity and highlight the unique challenges and opportunities present in various educational environments around the world.

Peer Assessment

This project was possible thanks to all team members. Every team member contributed equally to the project. The following is a detailed peer assessment to meet the criteria specified in the report outline:

Julien Ars Designed the flow so that users could explore the site in an "infinity loop" manner. Contributed to data gathering and processing, with a focus on macro-data.

Francisco Morales Focused on the design and the overarching story we wanted to tell. Contributed to data gathering and processing, with an emphasis on micro-data from each school.

Blanche Duron Focused on the technical aspects to ensure that both the micro-data and macro-data would come together seamlessly, creating a smooth user experience. Contributed to data gathering and processing.