

Oldways Survey Visualization

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ABSTRACT

We present Oldways Survey Visualization, a tool that allows the nutrition non-profit organization, Oldways, view the survey results of students who have taken their cooking classes. Our data visualization tool generates summary statistics and graphs using survey data such that Oldways administrators can easily see student performance summaries grouped by class, by teacher, and by year. Additionally, our tool has markers to direct the user's attention to certain noteworthy things in the data, such as a struggling class, as well as including a survey panel that color codes students based on whether or not they have improved in a specific category after taking the class.

INTRODUCTION

We have been working with a nutrition non-profit, Oldways[2], which holds cooking classes, teaching students how to be healthier. They collect surveys from teachers and students and analyze this data to see how each class is progressing and how students have improved over the duration of the class. The dataset is comprised of the answers to the surveys which ask questions such as “how many days a week did students cook at home before the class began and after the class began” and “what recipes did the students enjoy the most”. They wanted a data visualization tool that can help them quickly answer many questions such as “how many students have increased their consumption of vegetables?” and “are certain teachers struggling to see improvements in their student behavior?” They also wanted to be able to group their data in various categories such as by class, by teacher, and by year to generate more summary statistics.

Unfortunately, we were not granted access to their full survey dataset and only had the column headings of their dataset. As a result, we generated a fake dataset using these headings for future testing.

RELATED WORKS

The Racial Dot Map: One Dot Per Person for the Entire U.S. [1] served as inspiration for our color-coded dot visualization. In the Racial Dot Map visualization, each dot represented a person. For our work, given limited space and ease of readability, we equated each dot to 1% of the class.

We also were inspired by the old layout of Freerice[3], which donates ten grains of rice through the World Food Programme for every question someone answers correctly on their webpage. Their layout included a left sidebar with a description and brief visualization on how getting questions right benefits people, a right sidebar with how many grains of rice the player has obtained in total and a middle portion which shows the main part of the webpage - the question that the player had to answer. Their webpage was mostly monochromatic - including different shades of the green color.

Since we were working with another food related charity, we thought it would be easier to work with our webpage if our layout paid homage to another famous webpage. Our webpage included a left sidebar which had all the filters that a person had access to, a right panel that shows our color-coded dot visualization and the center, which have the main visualizations pertinent to our charity. Our webpage is almost mostly monochromatic - including different shades of brown color.

METHODS

Statistics

Through working with Oldways, they provided us a list of desired statistics that they would like to be able to easily see. This is because they put together monthly reports and would like a place to go to automatically generate the numbers to put in these monthly reports rather than having to manually compute them every month. This is the base of our website as we decided to display these statistics in multiple titled boxes that are easy to skim over.

On the front of the cards in the Cooking Lifestyle tab, we provide the user with the percent that a user has improved in each category. On the front of the cards in the Physical Improvement tab, we provided the user with the percent improvement along with the average improvement. On the front of the cards in the Overall Statistics tab, we illustrate how many categories were positively impacted which is an aggregated sum. Working with Oldways, these were the main requested statistics and their goal was to easily look at a webpage and pull this number out, so this is the reason that we made sure to display this on the card front and center rather than incorporating other statistics or placing this information on the back of the card. Additionally, since we were working with a non-profit knowing that they would be our audience, we did not provide any additional textual explanation for what this percent improved means in the context of each of the cards as we assumed that Oldways would know.



Figure 1. Front of the cards. Three tabs - Cooking & Lifestyle, Physical Improvement and Overall Features are shown. Filtering is shown on left and panel of color-coded dot visualization is shown to the right. The card flip animation is also being shown.

All of these statistics are calculated through Javascript manipulating the CSV containing the answers to survey data (in our case this is currently a fake dataset). We have added a loading page so that the data appears seamlessly on the cards.

Filtering

Oldways wanted to be able to filter by various features so that they can more easily analyze different subsets of the data.

We allow the user to filter by class, teacher and/or year. We implemented a sidebar to ensure that the filter is always visible. The font of the filters is also larger than the rest of the text in the page as we suspect that the filter will be the most important tool to compare classes, assess teaching abilities of specific teachers and see progress of the students over the years. Since there are multiple classes, teachers and years that the user may filter by, initially, we hide all the specific class names, teacher names and years so that the user is not overwhelmed. When the user clicks on either class, teacher or year, the menu expands to display all the values that the user can select. We opted to use checkboxes rather than a search bar as we figured that the user may not know all the class or teacher names; additionally, checkboxes are easy to select and keep track of what is currently selected. Checkboxes also make it clear to the user that this is a filtering option; additionally, on the main screen we provide instructions detailing that the user can filter using the menu on the left. Lastly, we have a "View results" button that the user has to click before having the filter applied. We chose to use a button rather than having the filter apply whenever a checkbox is clicked as this allows the user to know exactly when their filter is being applied rather than seeing intermediate results if the user was de-selecting multiple teachers at once.

Ideally, if given more time, we would add a select all button so that the user can easily reset the filter to include all the survey data. Additionally, currently, when the user clicks on view results, it sends the user to the home page which can be

tedious to have to click back to the tab you were on before; ideally, we would have the user remain on the tab they were on when they click view results.

Color-Coded Dot Visualization

On the right panel, we displayed a color-coded dot visualization that displays the statistics of all the students in the category of the card that the user is hovering above. When the user's mouse leaves the card, we decided to not reset the color-coded dot visualization to all black; instead, we keep the same colors until the user hovers over another box. We include a title of the dot visualization which indicates what category the dots are currently representing; therefore, even if the user is not hovering over the card, they are aware what the visualization is currently showing.

We displayed green dots for students who improved in a specific category (exercised more, ate more vegetables, etc.), red dots for students who did worse than their previous performance, yellow dots for students whose performance did not significantly change and gray dots for students who did not respond to the survey question; we chose these colors as green, yellow and red are usually associated with good, okay, and bad respectively. While these colors may be intuitive, we also included a legend demonstrating what the color of each dot represents so that the user knows it for certain.

We did not display a dot for every person as we felt for larger classes, the visualization would be overcrowded, but rather had 100 dots represent a group of students; this ensures that we are not overwhelming the user and that we are able to display all the dots on one page. We also included text indicating the number of surveys that are being considered; this orients the user to approximately how many surveys are being represented by each dot.

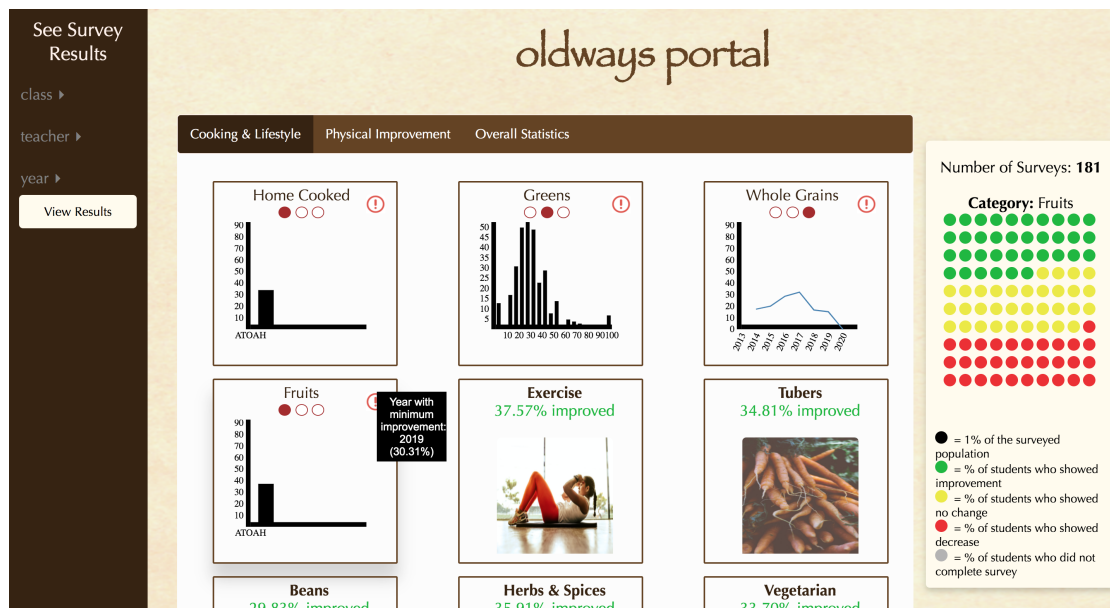


Figure 2. Back of some cards. Three different graphs corresponding to per class, per teacher and per year are shown as each card is on a different navigation dots can be seen. The exclamation mark is on the top right hand of the back of the card.

Histograms

On the back of the card, the first dot displays a histogram detailing the percent improved for each class; the x axis is the class name and the y axis is the percent improved. Currently, there is only one class, but if there were more classes, we would be able to use this graph to easily compare classes and see which are doing the best. Since Oldways told us that the number of class types would not go beyond 3 for the foreseeable future, we reasoned that we could put the class name on the x axis and this would be a good way to compare classes.

The second dot displays a histogram detailing how many teachers fall into each percent improved for that category; the x axis is the percentage improved and the y axis is the number of teachers. Since there are a significant number of teachers, we decided to not put the teachers on the x axis (which would have been similar to the aforementioned histogram for the classes) as this would lead to many teacher names and would be very crowded. Instead, this histogram can be used to easily determine the number of teachers that are doing well or poorly. Ideally, we would have highlighted the average percent with a red line, so that the user could easily estimate the number of teachers that fall below the average percent and the number that are doing better than average.

Another ideal feature is we would have added in axis labels and titles for these graphs so that the user would know exactly what they are looking at.

Line Charts

On the back of the card, the third dot displays a line graph detailing the percent improved for each class; the x axis is the year and the y axis is the percent improved. This allows the user to easily see progression over time and hopefully see a positive trend. We also rotated the x axis labels so that each year could fit in the x axis without being too crowded.

Visual Markings

On the back of the card, we also have a exclamation mark which users can hover over to view the year with the minimum improvement.

Ideally, this would have displayed specific teachers that were lagging behind average that administrators should look into and potentially contact.

Navigation Tools

There were a few types of navigation tools that we used in order to aid the user to interact with the data.

Tabs

There were multiple different columns in the database - some columns were more related than others. We divided similar columns into sections: Cooking & Lifestyle, Physical Improvement and Overall Statistics. These groupings help the user create a more cohesive story in their mind about how students are faring in specific categories. Each section is much more manageable - there are only 2 to 9 cards in each section rather than having all the information on one page.

Card Flip Animation

Giving the card the ability to flip (and thus, have a front and back side) allows us to cleanly display more graphs without scrolling in such a small space, which would be inconvenient to the user. The added interactivity also allows the user to see additional graphs of a specific category, if necessary, thereby not overcrowding the interface. We also tilted the card when the user hovers over the front of it to suggest to the user that there is an added interactivity of clicking that they could explore; this allows us to not have to include specific instructions which could crowd the card. However, when the user is on the back of the card, we decided to not have the card tilt when the user hovers over it; this is because the back of the card

displays graphs and it may be distracting to have the card tilt when the user is trying to analyze the graphs.

Horizontal Navigation Dots

To display multiple graphs for each category on the back side of the card, we have horizontal navigation dots. The dots are not labeled since we do not want to overcrowd the card. We can switch from grouped by class to teacher or year. For the sake of consistency, the dots are grouped in the same order as the filter on the left hand side menu.

RESULTS

Since we were working with dummy data, it was difficult to get any data insights from this project. However, we were able to learn a lot about web development and interactive visualizations through this project. As some of our team had never worked with D3 before, it was very useful to learn how to apply D3 to create dynamic visualizations that can help Oldways get insights. We met with Oldways to demo our website and they are very excited to incorporate their data set and letting administrators and even students and teachers use the tool.

DISCUSSION

Through making this visualization, we enabled Oldways to more easily visualize and interact with the massive amounts of survey data that they have. Currently, when they generate their monthly reports, they manually query all the survey data in Excel to get all the statistics that are now displayed in each tab of our tool. This provides a streamlined process where Oldways simply has to reupload the CSV every time new survey data is added, and the results will be reflected on the tool and they can easily collect their desired statistics.

Our audience is Oldways administrators and students and teachers that are familiar with the Oldways surveys; therefore, these people will be able to understand the statistics that are being displayed. This tool could also be used to spark some

competition as students and teachers can filter by what class they are in and compare themselves to other classes and aim to be part of the class with the best improvement.

Coding this visualization allowed us to familiarize ourselves with D3 more; while it was frustrating at times, it was a learning process that we really enjoyed. Due to time constraints, there were some minor features and visual tools that we were unable to incorporate that we have discussed throughout this paper.

Additionally, as we were working with fake data, it was difficult to structure our code and determine how many classes and surveys would need to be displayed in the end result once real data is fed in.

FUTURE WORK

We will be working with Oldways to integrate their real dataset into this project. They appreciated all the features we incorporated and don't desire much more other than small changes to certain features which have been mentioned throughout the paper.

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Images used in our project are stock images from pexels.com and 123rf.com.