

A dark blue vertical bar on the left side of the slide. A blue arrow points to the right from the bar, containing the date.

11/20/2020

Visualization Critique and Redesign

Data Visualization

Several thin, curved lines in dark blue and light grey originate from the bottom left and sweep upwards and to the right.

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Introduction

The purpose of any **data visualization** is to tell a *story*. A variety of stories have been told since the dawn of time. These stories have taught us that a story with too much information is overwhelming and a story with too little information is underwhelming and does not captivate audiences. The same can be said about data visualizations. If the author of a data visualization inundates the audience with information, the story might not be understood; adversely, if the author does not illustrate the most critical data points, the author might be underselling the story, not painting the entire picture for an audience desiring to be informed. ***How do we find the perfect middle ground when telling a story with data visualization?***

Data Visualization Criterion

In order to tell a good story via data visualization, we must follow a criterion – one that we can universally follow to ensure we never miss a beat. Here is an illustration of the criterion one should follow when building a data visualization to tell a story¹:

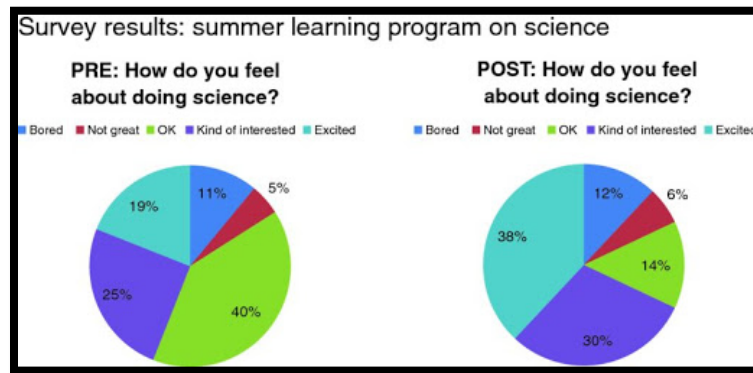
Comparison	Causality	Multivariate Analysis	Integration of Evidence	Documentation	Content
•Is there something we want to compare?	•Is there a correlation or causation between two events that we can capture?	•Is there an opportunity to illustrate multiple variables for a thorough explanation?	•Are the words, numbers, and images used for an evidence-based conclusion?	•Is the content clear and concise and is the content legitimate and trustworthy?	•Is the content to the business problem?

This criterion will be used to provide a **critique** and **redesign** of a data visualization in a particular case study.

¹ The Fundamental Principles of Analytical Design by Edward Tufte

Case Study

As Chief Data Officer (CDO) of an organization, my team of data scientists built a report of data visualizations and I spotted one that will be presented to other executives that needs improvement²:



Visualization Critique

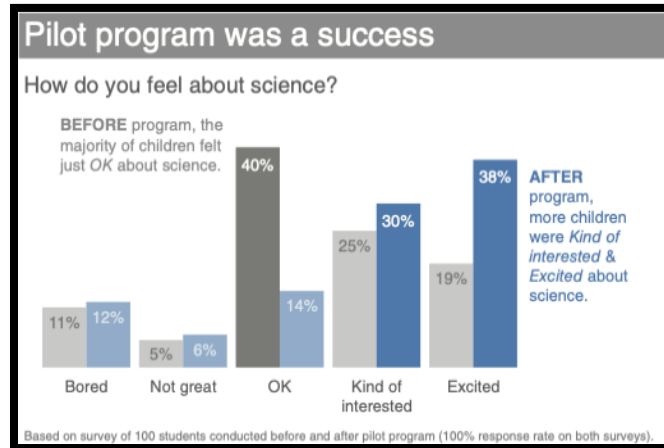
Although this data visualization tells a story about the pre and post survey results of a summer learning program on science, the story could be presented better by leveraging the aforementioned data visualization criterion:

Comparison	<ul style="list-style-type: none">Since the visualization is trying to compare pre and post results, it might be worth comparing the results side-by-side (for example, via a bar graph) instead of in separate data visualizations. Unfortunately, the audience is forced to find the insight themselves, instead of being presented with the insight immediately
Causality & Multivariate Analysis	<ul style="list-style-type: none">Even though the audience would have to dig deep into the multivariate analysis to reach this conclusion, it is apparent that the summer learning program did cause attitudes to change towards science, which is the business problem we are trying to solve. For example, whereas 40% of participants were quite neutral about science <i>before</i> the summer learning program, only 14% of participants were neutral about science <i>after</i> the summer learning program.
Integration of Evidence	<ul style="list-style-type: none">A strength of this data visualization is the sufficient evidence for the conclusion. The objective of the data visualization is to articulate how effective the summer learning program was in changing the participants' attitudes towards science.
Documentation	<ul style="list-style-type: none">Another strength of this data visualization is the documentation, particularly the title and a description of the business problem; however, there could be a highlight or a key takeaway from the data visualization that the author failed to include. Additionally, we do not know the source of the data nor how this data was contrived, such as how many participants completed the survey.
Content	<ul style="list-style-type: none">An additional strength of this data visualization is the content given how relevant it is to the business problem the author is trying to address. Although we could interpret how participants feel towards science a little better from stronger presentation, the content does address the issue

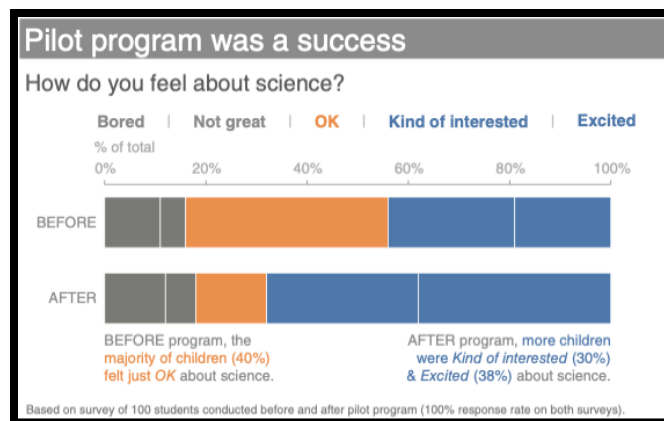
² Storytelling with Data: A Data Visualization Guide for Business Professionals by Cole Nussbaumer Knaflic

Visualization Redesign

There are a couple data visualizations that could replace the original data visualization and provide a stronger story:



Alternative 1: Bar graph



Alternative 2: 100% Stacked Horizontal Bar Graph

Conclusion

Not only do these data visualizations adequately compare the before and after results of the program via a bar graph and a stacked chart, the conclusion serves as the title of the data visualization. An excellent complement to the informative title is the use of color, which magnifies the results making the comparison and insight less difficult to discern. These changes in **marks** and **channels** increase the effect of comparison, adding to the vision of the author. Additionally, the author has included key takeaways next to the bars, which help support the conclusion. Lastly, the footnote explaining the source of the data addresses the strength of the documentation, especially since the original data visualization did not state how this data was contrived. With these changes, the story that we tell to the other executives is much more clear and effective.