The improvements of “the situation of China’s higher education”

Group-18

Abstract

In the process of making a visualization of a given dataset, there would be a lot of elements that need to take in to consideration. For the user, when reading a visualization, the image can express the relationship between data clearly and accurately, so that the user will not feel confused and upset at the first sight of the visualization, not damaging the structure of the data itself at the same time. Then this visualization can be said to be relatively successful.

In this project, our team selected the story about the situation of Chinese higher education. We used a visualization published by Xinhua News Agency and transformed it into a more readable version. However, it should be noted that the original image is not actually a "failed" visualization, because in its original version, the original image focusing more on decorating the article, that is, it pays more attention to the beauty of the image. The result is that the readability is reduced. For the reader, the first impression of this chart will be the chart itself rather than the data it reflects.

Of course, after our simple transformation, this visualization becomes easier to read. In the process of information visualization for academic purposes, what we focusing on has to be the readability of the visualization. Through such comparison, what we want to illustrate is the importance of information visualization skills in academic papers.

We will first describe the story expressed in the graph, then our improvement, and finally we will summarize the entire report.

The story of the graph

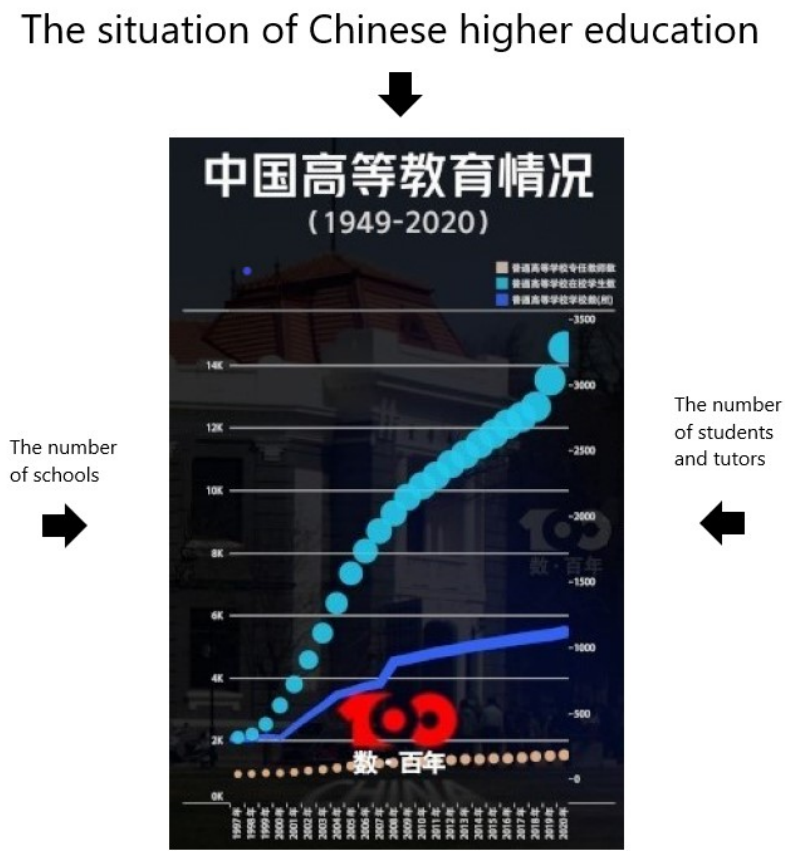
September is the back-to-school season for Chinese colleges and universities. Many Chinese young people go to the campus of colleges and universities. China's institutions of higher education have produced generations of promising young Chinese people who have devoted themselves to all walks of life in China's development.

The spectacular development of China's modern higher education can be traced back to October 2, 1895, when the predecessor of Tianjin University, Imperial Tientsin University, was born in Tianjin.

At the beginning of the People's Republic of China, there were only 205 general colleges and universities in China. At that time, the number of college students in China was far lower than that of other countries with the same level of development. The rejuvenation of the Chinese nation was in urgent need of the popularization of higher education. In November 1998, Tang Min, an economist, submitted a proposal to the central government in his personal name: "On the Effective Way to start China's economy -- Expanding the number of students to double", suggesting that the central government expand the number of students. Later, the suggestion was adopted by the central government. Soon after, the central government formulated a plan to expand enrollment with the goal of "stimulating domestic demand, stimulating consumption, promoting economic growth and easing employment pressure." And in June 1999, the enrollment expansion policy officially came out. To many people's surprise, the number of students enrolled in general colleges and universities in China increased by 513,200 to 1,596,800, an unprecedented growth rate of 47.4 percent. Among them, the enrollment of undergraduates in general colleges and universities increased by 43.41% in

1999, 23.86% in 2000, 19.10% in 2001, and 14.92% in 2002. By 2003, the number of general colleges and universities students in China had exceeded 10 million. After decades of development, especially after the Chinese general colleges and universities began enrollment expansion in 1999, the number of general colleges and universities, the number of students, the number of graduates and the size of schools have all exploded.

In order to understand the specific information, We are in the article (http://www.news.cn/datanews/20211015/C999058529900001C39214B0FE601D68/c.html) ,found a graph: (http://www.news.cn/datanews/20211015/C999058529900001C39214B0FE601D68/20211015C999058529900001C39214B0FE601D68_1211351537_1630390571638_title.jpg) However, when reviewing the data of the graph(fig 1.1), our team found a lot of inadequacies in the visualization of the graph.



(fig1.1)

On the X-axis is the year information, from 1997 to 2020. The Y-axis is divided into the left and right sides, the left side represents the number of schools. On the right, indicates the number of teachers and students. The unit is ten thousand. The Y-axis on the left corresponds to the dark blue broken line in the graph, which represents the number of general colleges and universities; The Y-axis on the right corresponds to the two scatter points in the graph. The blue scatter points indicates the number of students in general colleges and universities, and the brown scatter points indicates the number of full-time teachers in general colleges and universities.We can find that there is an increasing trend in all three graphs, especially the scatter point representing the number of students, which increases particularly rapidly.

The data looks neat, but it actually has some shortcomings in visualization. First, our team found that the relative length of its X-axis was short, which made the X-axis coordinates representing the year vertical and not convenient for us to observe. Secondly, when the scatter points represent the number of people, the change trend is not particularly intuitive, and the scatter points are too large for us to directly observe the specific data of the number of people in different years. Finally, the origin's height of the Y-axis coordinates on both sides is different, the coordinate interval of the left Y-axis is too large (the coordinates of 6K~14K

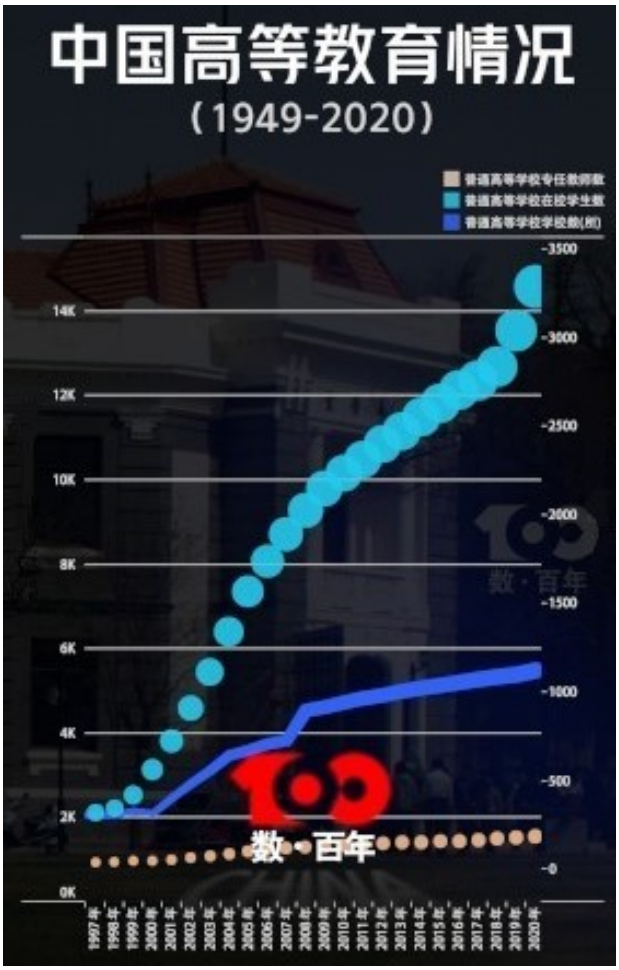
even have no effect), and the coordinate on the right is not guided by a straight line, which is not convenient for data observation.

In response to these problems, our team decided to improve the visualization graph. This graph shows the trend of China's modern higher education (1997-2020) from elitism to popularization and then to popularization. China becomes one of the largest countries of higher education in the world. It is an important graph material for understanding and studying the development of China's modern higher education. Therefore, it is of great significance to improve the graph.

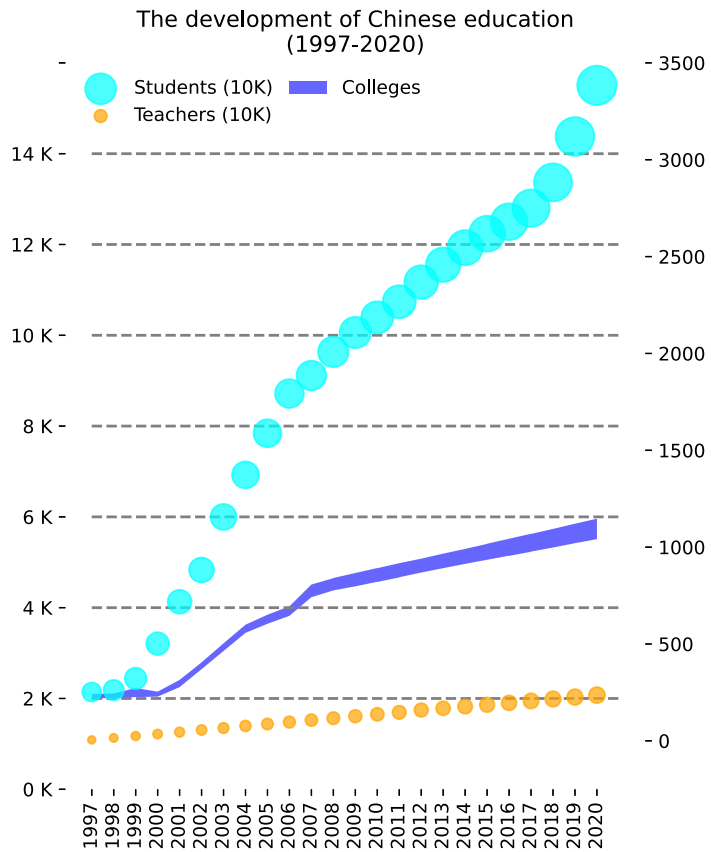
Improvements

To improve this visualization, first we need to restore it in to a vector diagram. We used matplotlib to do this. Here is the diagram we restored. We output it in a .svg format. We put the original image aside for comparison.

Original picture



(fig2.1)



(fig2.2)

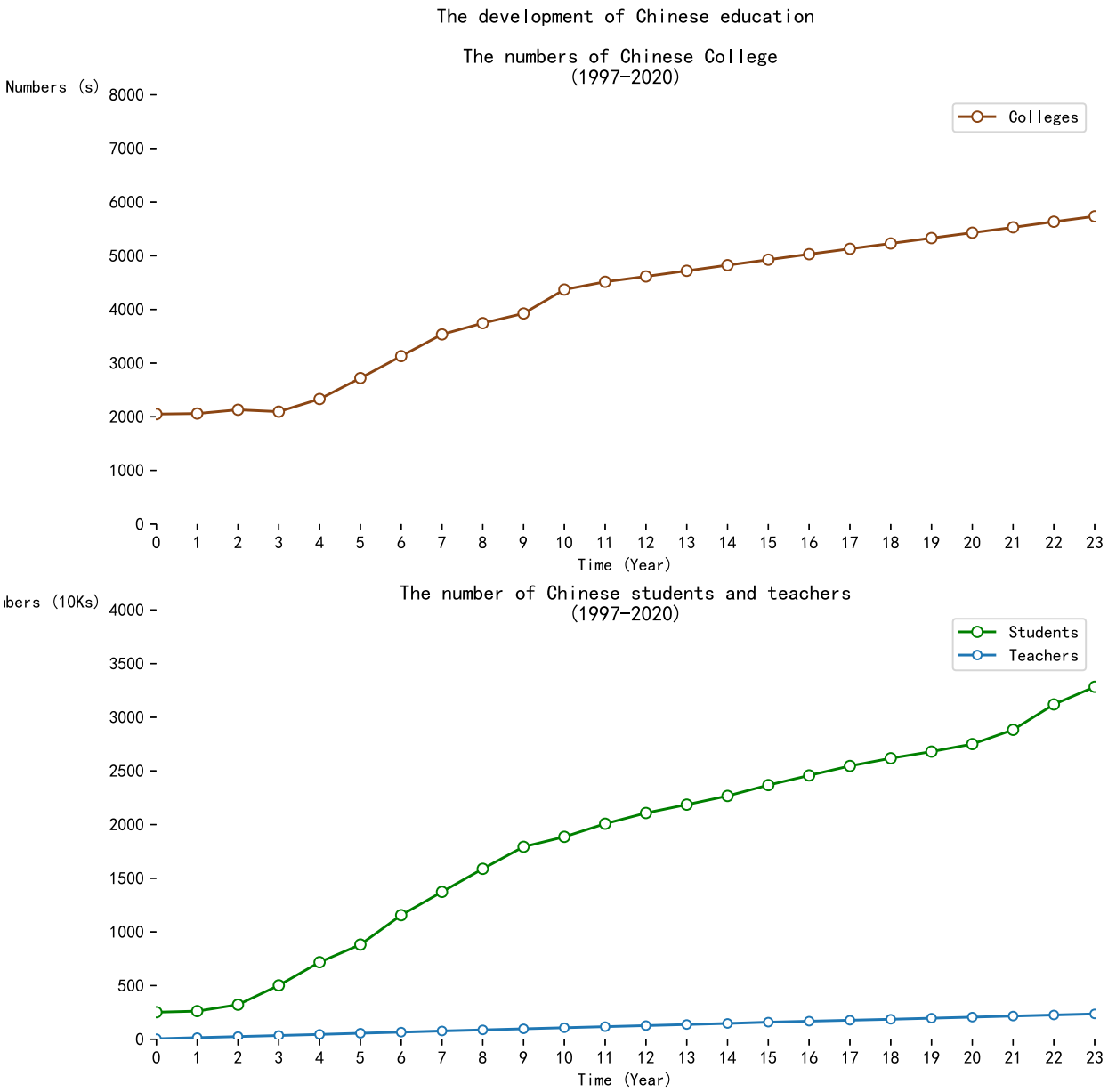
You may find that the data size in the graph is slightly different(fig 2.1 and fig 2.2), because we actually do not have the original dataset, but fabricate a set of approximate datasets for use. This is because there is no specific data set in the original text, so we have to use the data we made up. But this is not the key point. We want to show the improvement of this chart, not the real data.

In the previous context, we mentioned three shortages of the original visualization(fig 2.2). The first is the usage of the two y-axes. The two y-axes of one on the left and one on the right interfere with the resolution of units. The solution is also simple: divide this plot into two subplots. One plot is used to describe the data of

the left y-axis: the number of universities, and one plot is used to describe the data of the right y-axis: the number of tutors and students.

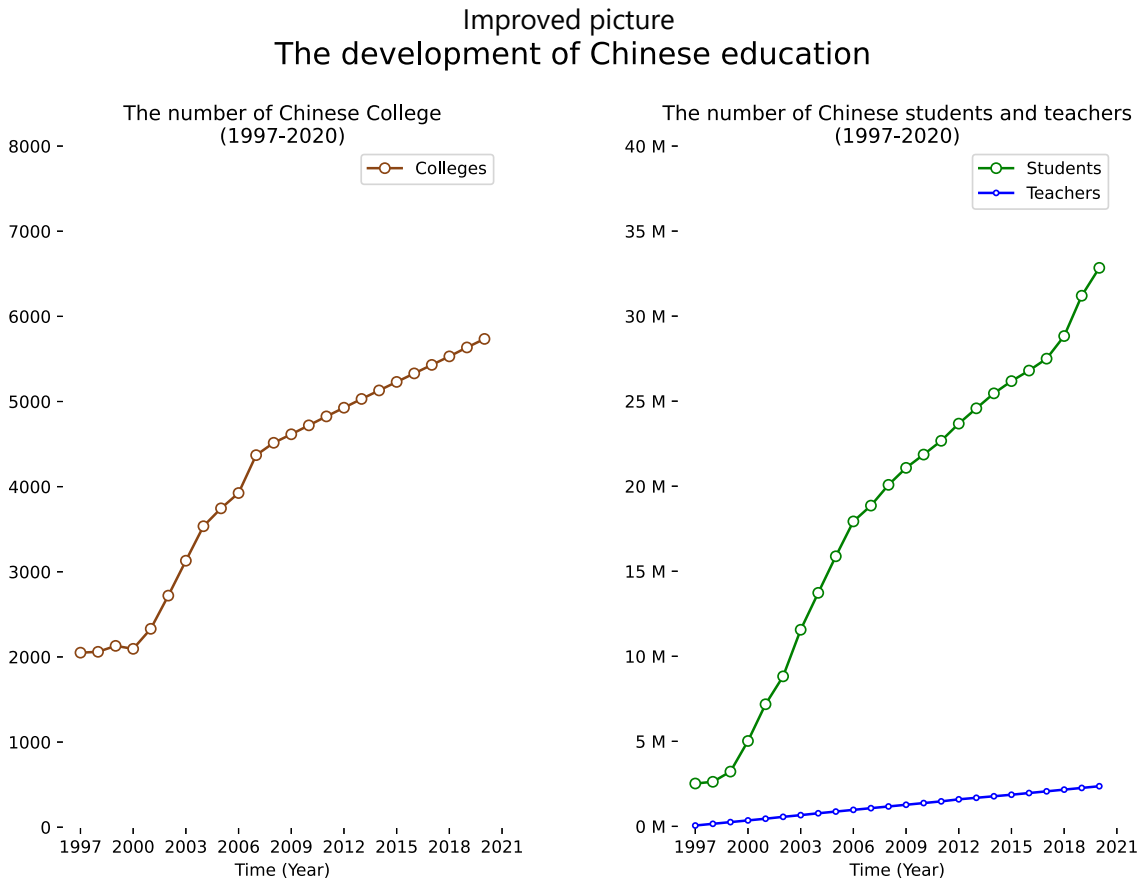
Second, the plot type used is a scatter plot. Although it can roughly show the trend of data changes, it cannot show the size of data accurate enough. Here, we choose the line plot cooperating with nodes for data visualization. On the one hand, it can show the growth of data more clearly, on the other hand, it can show the size of data more accurately. At the same time, we will unify the legend and use different colors to distinguish different data.Finally, the width of the x-axis is too narrow. At the beginning, we lengthened the x-axis so that the plot can output all the years horizontally without overlapping. The following figure is obtained. Finally, the width of the x-axis is too narrow. At the beginning, we lengthened the x-axis so that the plot can output all the years horizontally without overlapping. The following figure is obtained.

Improved picture



(fig 3.1)

However, this figure can't clearly show the development trend of "Teachers", yet the labels on the left side of the image is too redundant, and the label below can't be fully displayed. So we changed our thoughts, making the two graphs narrower, while increasing the height of y-axis. At the same time, since the two graphs have independent units, we remove the y-labels of the two subplots and directly change the y-ticks to synchronize them with the data. The following figure shows our second improvement:



(fig 4.1)

This is our final version of our improvement of the original plot. Comparing it with the original plot, and you will find that it is more intuitive for data presentation. You can see the growth of the data clearly and obtain the size of the data accurately. For example, from 2007 to 2020, compared with 2000 to 2006, the increase rate in the number of colleges has decreased slightly, but it is still growing steadily. The number of teachers has been growing steadily at a certain growth rate in the past 20 years, which is bound to be a good result of the national education welfare policy. In addition, this figure is much cleaner than the original plot, making it easier for readers to read.

Summary

Overall, we stated the reason for choosing this visualization, the story of visualization and the improvement of visualization. I believe you have got a preliminary impression of information visualization technics. In the process of data processing and presentation, information visualization skills for practical purposes can make data presentation cleaner and more efficient. Readers can easily obtain the required information and stories from the visualization, so that they can have a deeper understanding of the dataset displayed.In the process of completing the project, each of our team members learned a lot of relevant knowledge.

Finally, the rapid expansion of the scale of higher education has made college students no longer "rare" and

enabled more Chinese people to realize their desire to receive higher education. With our improvements to this visualization, readers can more easily ingestion this information. And this visualization tells readers that the knowledge density and knowledge capital of China is rising now. There is no other country in the world that has such a large number of people receiving higher education. Once the innovative power of the higher education population is stimulated, it is believed that the whole social order of China will again usher in great changes.