

# A Handmade Graph to Imply the Global Warming: To Show the Urgent Issue Based on the Local Data

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It has been long since the global warming was alarmed as a common threat of human being. And a number of practices have been developed as the useful materials for the environmental education. For example, teachers have used the experiment to show the greenhouse effect of carbon dioxide, the graph showing the change in concentration of carbon dioxide, and the figure showing the decrease of the Arctic sea ice area. Even though local people testify "It was much colder in 30, 40 years ago", teachers have failed to make students convince the fact.

This study proposes a handmade graph which clearly shows the global warming, based on local data, and shows the effectiveness of the graph when it was introduced to prospective teachers.

## Method

### Procedure

There was enormous data accessible in the webpage of the Japan Meteorological Agency (JMA). After opening the webpage, you click "Types of data and materials", "Weather data search", in turn, and select city (Fig.1). Then, you scope "Yearly data", "Detail (Temperature, Vapor pressure & Humidity)" in order. The Table 1 shows the extracted example of the data, shown in the website.



Figure 1. Searching page (Tokyo)

After copying and pasting the data to Excel, a clear graph which shows the local change of warming will appear (Fig.2).

47 prospective science teachers from the college of science in a local university in Japan were asked to

access the website of the JMA and develop the same graph based on their home town data.

Table 1. Change of days of each class (Tokyo)

Year	Days (Lowest)		Days (Highest)		
	<0°C	25°C ≤	<0°C	25°C ≤	30°C ≤
1876	86	0	1	89	49
...	...	...	...	...	...
2014	8	29	0	125	45

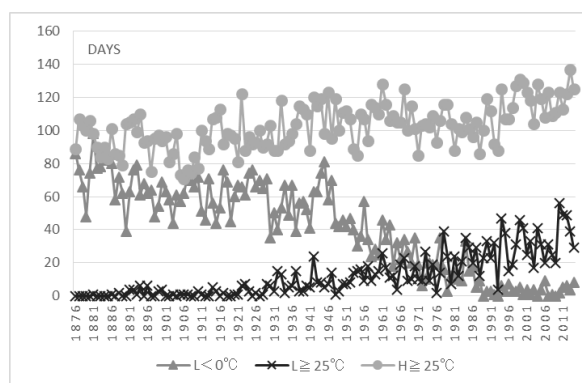


Figure 2. Change of days of each class (Tokyo)

## Results

19 graphs of cities in the east part of Japan were collected. Most graphs show the tendency of global warming clearly. The number of days with the highest temperature exceeding 25 degree in Celsius is increasing, the number of days with the lowest temperature exceeding 25 degree (we call them "tropical night") is increasing as well, and the number of days with the lowest temperature which was lower than the freezing point has been decreasing.

## Summary and Concluding Discussion

Most of the prospective science teachers who worked on this task reported that they have been satisfied with the work. And some even became eager to show the local graph to their students in the near future. This tool seemed to be relatively powerful to make the concept of global warming understood.

## References

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