Bringing Lessons Alive with Statistics – David Fausch – CIPLC

If you have questions after today's workshop, you can email me at dfausch@ciplc.net

Activity One – Circumference of the Human Wrist

At CIPLC our 4th graders are currently investigating the human body and taking measurements of their bodies in class. This activity will demonstrate how you can use statistics to help your students organize and interpret the data they collect. These techniques are appropriate for all grade levels and subject areas.

1) Use the string and rulers to measure the wrist circumference of each member of your group to the nearest 0.1 centimeter and record it in the table below. Wrap the string around the bony part of your wrist, snug but not tight.

Subject	Wrist Circumference (in centimeters)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

2) Have one of the members of your group ask other groups for their measurements and enter them in your table until you have a total of 12 measurements.

3) Turn on your calculator and push the button labeled **STAT**

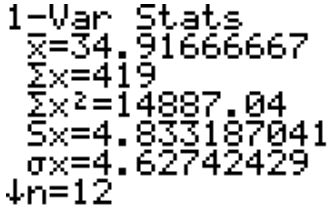
4) The first choice under the **EDIT** menu is **1:Edit**, just push the **ENTER** button to select.

5) The first column is list one (L1). Enter your 12 measurements down the L1 column.

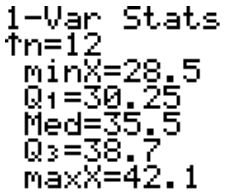
6) To get out of this screen push the **2nd** button (top left) and then **QUIT** which is right next to the **2nd** button.

7) To calculate the *mean* and *5-number summary*, push the **STAT** button and use the right arrow ⟩ to see the **CALC** menu. The first choice is **1:1-Var Stats**. Press **ENTER** to select, and then **ENTER** again.

8) You should see something like this → on your screen.

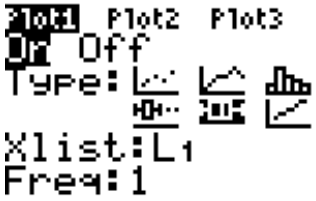


9) You can use the down arrow key to see the rest of the information which is the *5-number summary* for your data (*minimum, 1st quartile, median, 3rd quartile and maximum*).



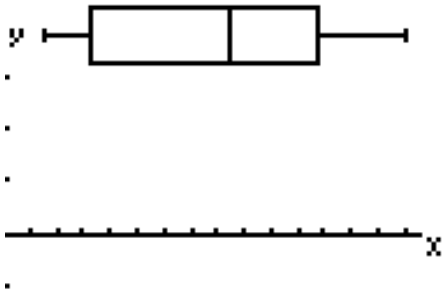
10) A graphical representation of the *5-number summary* is a *box & whisker plot*. Press the **2nd** button and the **Y=** button to select **STAT PLOT**.

11) Use the arrow keys and the **ENTER** button to select On, the figure for box & whisker, L1 and frequency of 1.

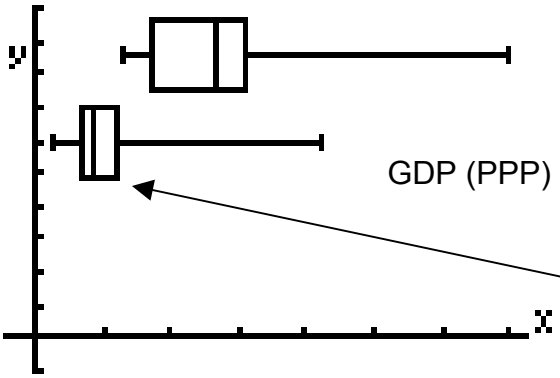


12) To have the calculator choose an appropriate viewing window just push the **ZOOM** button and arrow down to select **9:ZoomStat**.

13) You can push the **TRACE** button and use the arrows to see the values on the graph.



At the ES level, the teacher may want to have the students only collect data and the teacher would use the calculator to project the box & whisker plot on the overhead projector. The graph will give the students a visual representation of the data. At the MS and HS level, students could use descriptive statistics like the box & whisker plot to make an argument and support their conclusions in written assignments. For example, a HS social studies student could use statistics to investigate GDP (PPP) in US$ for EU and non-EU countries in Europe.



GDP (PPP) per capita in US$ for EU member countries in Europe

GDP (PPP) per capita in US$ for non-EU countries in Europe

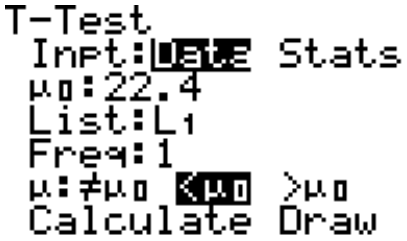
As can be seen on the graph, the bottom 75% of non-EU countries in Europe have GDP (PPP) per capita below the minimum for EU member countries.

Activity Two – Hypothesis Testing

In the United States, the average class size in public elementary and secondary schools was 22.4. Let's say that I believe that the average class size in VANAS schools is less than the U.S. I could calculate the actual average for every class in every school, or I could take a random sample and perform a *T-Test*.

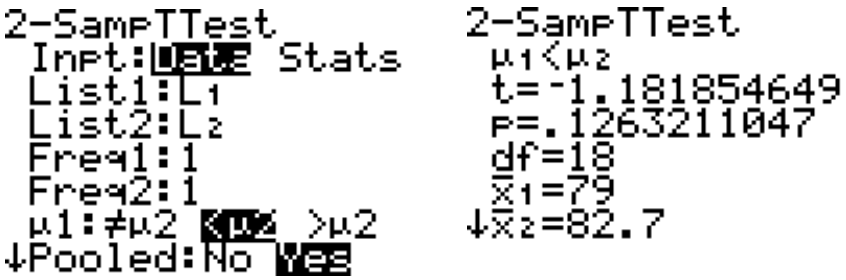
For argument's sake, let's assume that the participants in this workshop are a random sample of VANAS teachers. I'll ask everyone to tell me the average number of students they have per class and we'll test my hypothesis.

I enter the data into list one and push the **STAT** button. Arrow over to the right to the menu that says **TESTS** and select **2:T-Test**



Another example is when you want to compare the mean of two different groups. Let's say you are working on your master's degree and you would like to compare two different reading programs. Your hypothesis is that the new program will result in better reading comprehension as measured on a standardized test. You take a sample of 10 students in the old program and put their scores in list one, and a sample of 10 students in the new group with their scores in list two. Push the **STAT** button. Arrow over to the right to the menu that says **TESTS** and select **4:2-SampTTest**

Your steps would look like this:



In this example, the p-value is 0.126 which means that there is a 12.6% chance of getting results like this by chance. The results are not statistically significant.

Some statistics related websites

http://davidmlane.com/hyperstat/index.html

To refresh your memory about statistics, this is a great online textbook. The table of contents is on the top left of the page and it is very easy to navigate. The page also has links to other statistics sites, textbooks, software and more.

http://education.ti.com/educationportal/sites/US/homePage/index.html

The Texas Instruments site has classroom activities, program downloads, calculator product information and professional development opportunities.

http://www.bls.gov/ US Department of Labor - Bureau of Labor Statistics

Information overload, perhaps, and you have to click through several screens to get to the actual statistics you're looking for, but when you get there they have really nice PDF files to download with tons of data.

http://www.stats.govt.nz & http://www.stats.govt.nz/schools-corner/default.htm

This is the Statistics New Zealand site and has quite a bit of data. The second link is to their school corner page which has statistics lesson plans and activities.

http://www.abs.gov.au/ Australian Bureau of Statistics

This is another country site that is very well organized.

http://www.geographic.org/

If you click on the 'Countries' link you will get tons of information organized by country compiled from several sources including the United Nations, CIA and Library of Congress.

http://unstats.un.org/unsd/methods/inter-natlinks/sd_natstat.htm

This is a United Nations page with links to statistics homepages for many countries.

http://www.ine.gov.ve/ Instituto Nacional de Estadística

When I visited the Venezuelan page it was out of service, but they do list phone numbers to call if you want statistics about Venezuela.