

Laboratory #5. Evaluating Graphs and Tables

Graphs are an effective way of presenting data and of communicating quantitative relations. Tables can also be used to present data effectively, although their main use is for archiving data for computations. Not all graphs and tables are as effective as they could be, and some graphical and tabular presentations can mislead more than inform.

The purpose of this lab is to give you practice in:

- 1) looking critically at graphs and tables;
- 2) making editorial improvements in graphs and tables.
- 3) developing your own general rules for good graphics

The approach will be to form up into groups of 3 or 4 people to discuss displays from a "Gallery" of graphs and tables.

Table 5.1. Here are some ideas for working effectively in groups.

1. Agree on definition of task.
 2. Everyone must contribute, so that the most voluble person does not dominate the group to the detriment of the shy.
 3. Relevance: stay on the topic.
 4. Listen and try to understand others.
 5. Respond to others' comments. "I like that"
"I partly agree and partly disagree."
 6. Sum up.
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The 6 figures in group 1 of the gallery show several common problems with graphical presentations of data. The even numbered figures show several ways of improving graphical presentation. As you compare Figure 2 with Figure 1, try stating why Figure 2 is more effective at communicating results than Figure 1. Also, see if you can identify a problem that still remains in Figure 2 (hint: look at the improvements in Figure 6).

To carry out this lab, choose a display from the "Gallery," discuss its design and execution, and make a quick list of good and bad points.

Here is a checklist to start your discussion, but try not to limit yourself to this list.

Table 5.2. Checklist for evaluating graphs and tables.

Graphs

- Are the axis labels and titles (or captions) adequate?
- Are units stated for x and y axes?
- Have appropriate symbols or lines been used?
- Does the graph have freak characteristics, such as uninformative decoration?
- Does the graph convey a story (bring out relations between variables)?
- Does the graph mislead the reader in any way?
- Can the data in the graph be pulled off accurately as numbers?
- Are there variables that could be added to help interpret the trends shown?

Tables

- Are row labels, column labels, and captions adequate?
 - Can rows and columns be regrouped or rearranged to facilitate comparison?
 - Would the addition of statistics (sums, deviations, etc) help?
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In looking at each graph or table ask yourself:

- Is the relation of one variable to another quickly and easily grasped?
- Can the information in the graph be translated into numbers? (could you pull the numbers off the graph and redraw it yourself?)

As you look at each display, think of one or two changes that would make the most improvement. Formulate a specific rule for improving that display. For example, a rule for improvement might be:

Put units on axes (display 3)

EACH PERSON in a group should write down the rule (or rules) followed by the display number.

As you accumulate specific rules, try to group them under general rules. For example:

- A. Arrange rows and columns of tables in a way that facilitates comparison.
 - 1. Place comparable columns next to one another (display 47).
 - 2. Arrange rows into groups to bring out relationships (display 51).

After your group has discussed 5 to 10 displays, you should trade places with someone in another group. This is important because it increases the movement of ideas about criticizing and improving graphs and tables throughout the lab, exposing you to a greater range of experience and ideas about graphical and tabular displays. Keeping the same discussion group will tend to isolate the spread of good rules for improving displays. Moving to new groups will increase what you can learn from this lab, increase your list of good rules, and improve your write-up of this laboratory. During the course of the lab try to participate in at least 3 groups and try to evaluate at least 35 displays.

In general you will find that it is more productive to cover many displays, rather than concentrating on an exhaustive analysis of a few displays. If your group finds a display that only 1 or 2 people have seen, then let the people who have not seen the display discuss the graph for a minute or so before showing them what another group decided. They might find something else to improve in that display! But don't spend too much time on any one display. The idea is to gain as wide an experience as possible in as short a time as possible. Try to gain as much experience as you can by using both discovery (ideas generated by seeing a new display) and exchange (ideas generated from previous examinations by other groups).

Write-up for this lab

1. Group effort.

Develop a list of at least 4 general rules for improving graphs, and 2 rules for improving tables. Record the display number (or numbers) after each rule. Arrange these rules in a hierarchical order by grouping specific rules under general rules. State specific rules as concisely as possible. Separate rules for graphs and tables:

I Graphs

- A. General rule
 - 1. Specific rule (Display ____)
 - 2. Specific rule (Display ____)
- B. General rule
 - etc

II Tables

- A. General rule
 - 1. Specific rule (Display ____)
 - 2. Specific rule (Display ____)
- B. General rule
 - etc

2. Individual effort.

Comment on which problems are serious, and which are less so.

State reasons or criteria for judging that some problems are serious, some are not.