

Presenting numbers: Some guidelines on using numbers, tables and charts in your presentations.

A companion to:

**A Student's Guide to Presentations.
Sage website. 2008.**

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1. Introduction

Our aim is to help you to present numeric data effectively. So, the next few pages focus on key principles and ways of presenting numbers with maximum impact.

We are offering you some guidelines which can be applied generally to most subjects. However, there will almost certainly be some specific guidelines available in your own academic institution and also in your own subject area. Students undertaking medical education are going to be presenting numbers in a different way from students on a media studies or engineering courses, but the underlying principles are similar, whatever the academic discipline.

There are various books and websites which detail “how to” techniques for producing specific kinds of graphs or charts using Excel or similar spreadsheet software. See the end of the section for further sources. In this Appendix, when we say Excel, we also mean any similar spreadsheet packages that provide graphic facilities.

The concentration in the next few pages is not on specific techniques but on general principles of presentation.

2. Use large images or provide the data in a separate handout?

The first issue is whether you are going to project your numbers as a large image or supply them as support materials, for instance in a handout.

Large images: for instance, using overhead projector, PowerPoint, flip chart or interactive whiteboard. Graphic presentations like these work best when you want to provide overall summary data, and make an impact. Use a large image in your presentation when you want to provide an immediate strong overview. However, if you want to make a strong impact, you will probably need to lose some of the detail.

Support material: handouts.

Use these when you want to refer your audience to more detailed numbers, either within the session or to take away and think about after the presentation.

Tip. Whichever method you use, carefully select the data that you are going to use. This is especially true if you are going to project images onto a screen. The essential skill in preparing data for a presentation is to edit, and to only present the most important points of what you want to say. Do not overload the audience with too much information.

Tip. Always make a conscious decision about whether the data you are using is best projected on a screen or given in a handout. That decision will be based on such factors as:

- the nature of the briefing that you have been given on your assignment
- the point that you are making in your presentation
- the nature of the data itself
- facilities available to you
- timescales to prepare and deliver the presentation.

It is useful at this stage to think about the kind of data that you are using in relation to how you are going to present it.

Tip. Always think in advance about whether or not you are going to use colour. Colour can make your presentation more memorable but you have to be careful about limiting your choice of colours. Too many colours can be confusing to your audience. In addition many colours do not reproduce well in black and white.

Similarly, think about shading. You must ensure that there is sufficient contrast between different kinds of shading.

3. Which format to use to present the data?

Here are some useful suggestions about different ways to present numbers. Choose is the appropriate format. This will depend on the specific point that you want the data to make.

Tables

Use tables for precise values or local comparisons. A well constructed table is sometimes much easier to understand than a complicated graphic. However if projecting a table, use only overall summary data.

Tip. Make sure that all columns and the table itself are labelled.

Tip. Ensure that the total number is shown as **N**. If your chart shows a percentage make it clear what the percentage refers to. In the table below, 31 refers to the number of respondents. If you refer in your table to 29 %, lecturers will ALWAYS ask, “29 % of what?” Percentages separated without the numbers from which they are derived are meaningless.

The **N =** convention is an essential component of the table, regardless of whether it is placed in the table or next to it or, underneath on the title line.

Occupation	Number in workplace	%	
Qualified solicitors, including partners	9	29	N = 31
Training contracts	12	39	
Trainee solicitors	6	19	
Other staff	3	10	
Preferred to remain anonymous	1	3	
Total	31	100	

Table 1 Occupations of respondents in survey

Tables are neat, reliable and straightforward. However, they do not always project on to a screen very well. If you are going to project a table, use simplified data, as the following revised example demonstrates.

	Number	%	
Qualified	9	29	
Non-qualified, others	22	71	
Total (N)	31	100	

Table 2 Respondents' occupations.

4. Graphs and charts

Tables lack impact. Graphs and charts can provide considerable impact and allow you to make very direct comparisons during your presentations.

Tip: Always ensure that that everything is properly labelled. You can call your graphics either “figures” or “charts”; the terms are used interchangeably. Just be consistent. Label both axes and again, ensure that the total number is shown.

4.1 Bar charts

Bar charts are used to summarise data, and the statistical values are represented by bars. The height or length of the bar indicates the value of the data. Quite often, the main point is to display the distribution of the data in a simple fashion. Categories are normally placed along the vertical axis (y axis) and values along the horizontal axis (x axis). Bar charts can be horizontal or vertical.

Histograms are a particular kind of bar chart, normally a vertical bar chart. The defining characteristic of a histogram is that there is usually no gap between the bars. Histograms are used for frequency data.

Tip: Ensure that any codes are explained.

Tip: Label both axes and again, ensure that the total number is shown.

Tip: Only use this type of chart when you have got a relatively few values to display.

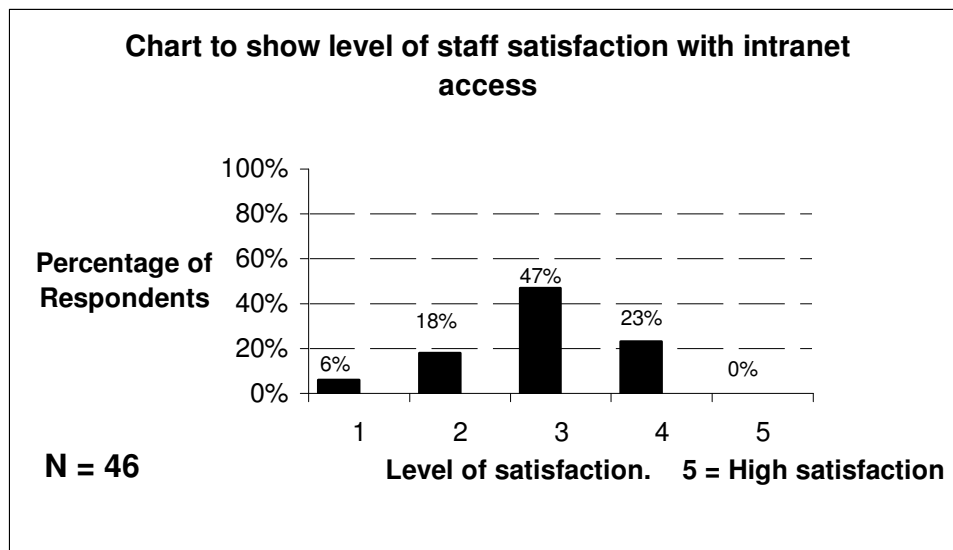


Figure 1. Level of Satisfaction with Intranet Access

Yes! ✓

Easy to read!

Horizontal bar charts are useful for easy comparisons.

However, some audiences may find horizontal bar charts a bit more difficult to understand and interpret than vertical ones.

Tip: It is helpful if bars are sorted into ascending or descending order of value, rather than alphabetically. This is to make the comparison is more visually apparent, more obvious and more pleasing.

Horizontal bar chart

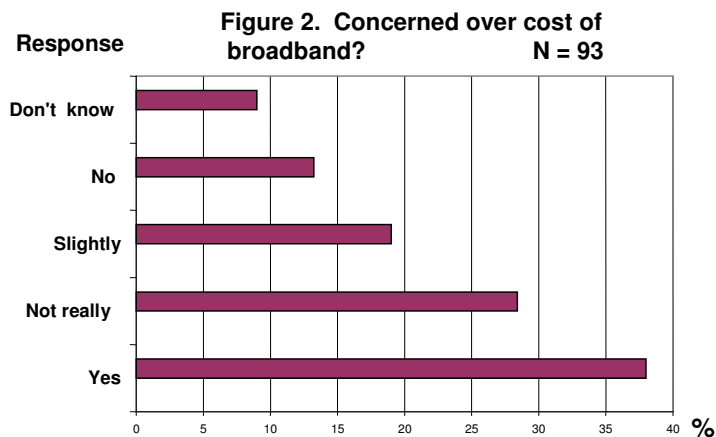


Figure 2. Concern over cost of broadband

Yes! ✓
Bars are in ascending order!

4.2 Line graphs

Line graphs are a familiar way of presenting data. They plot data over a period of time, and are therefore useful for showing trends.

Tip: Avoid showing too many trends simultaneously. Line graphs can easily get untidy and complicated, as Figure 3 on the next page demonstrates.

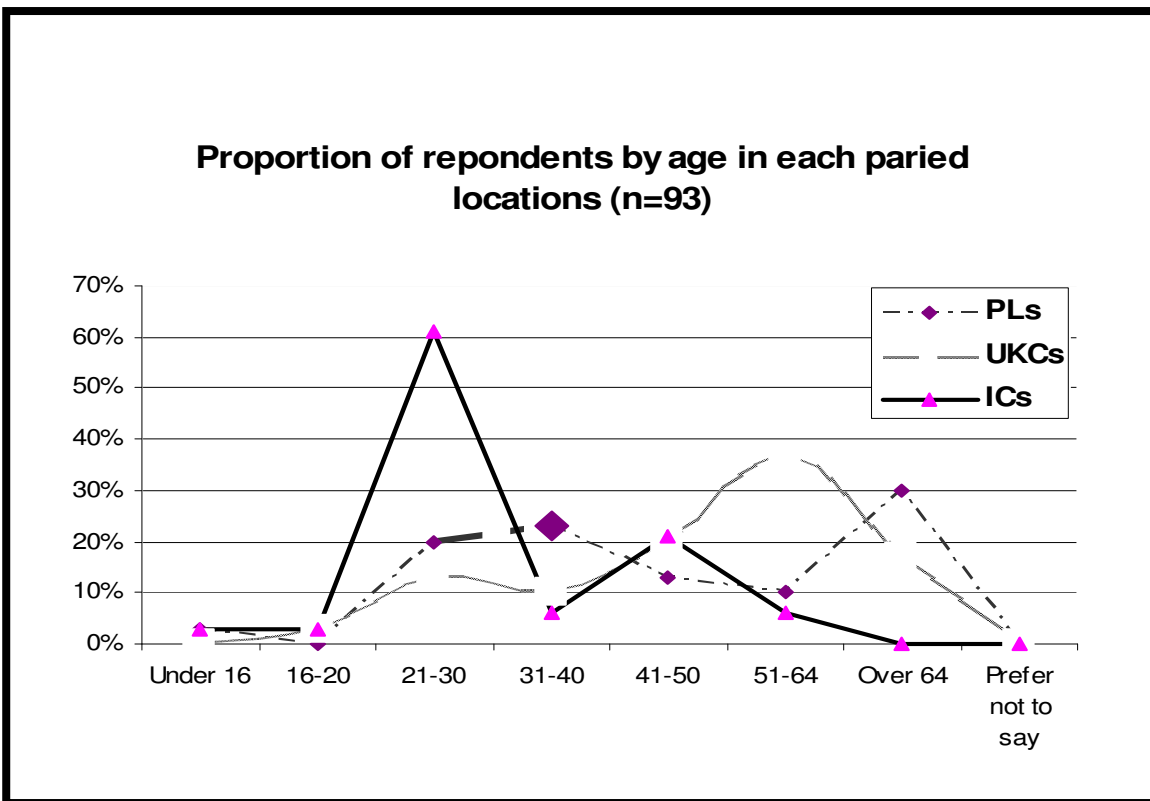


Figure 3. Proportion of respondents by age

No! X
Too complicated!

The following example is more straightforward and more clearly focused on showing one trend.

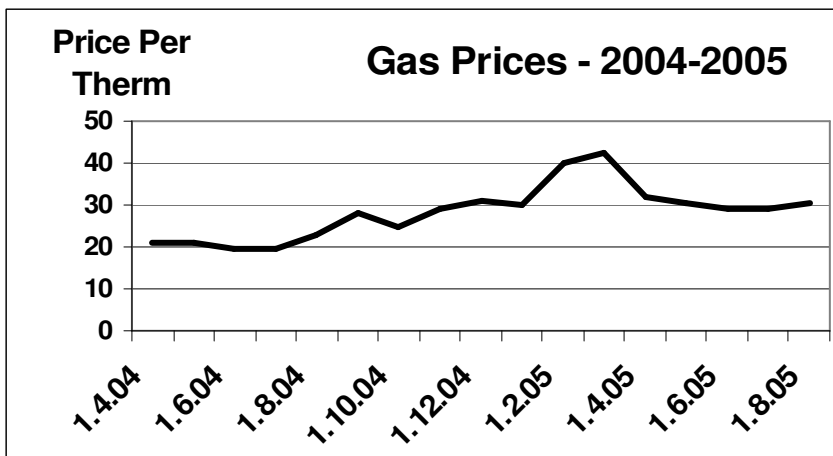


Figure 4. Gas prices April -- August 2005

Yes! ✓
Trend clearly displayed!

4.3 Pie charts

Pie charts are one of the most misused forms of charts. Beloved by students, and relatively easy to produce, the problem is that they often don't work. This is because they are only suitable for displaying percentages of a whole. In addition they only work if a few "slices" of that whole are being displayed at the same time. If you are trying to show more than three or four sets of numbers, they rapidly become difficult to understand.

The American design specialist Edward Tufte (1983) invented the term "chartjunk", that is, unnecessary and confusing visual elements in visual presentations of numbers. Chartjunk is often seen in pie charts, especially three-dimensional ones.

Below is an example of an unsuccessful pie chart.

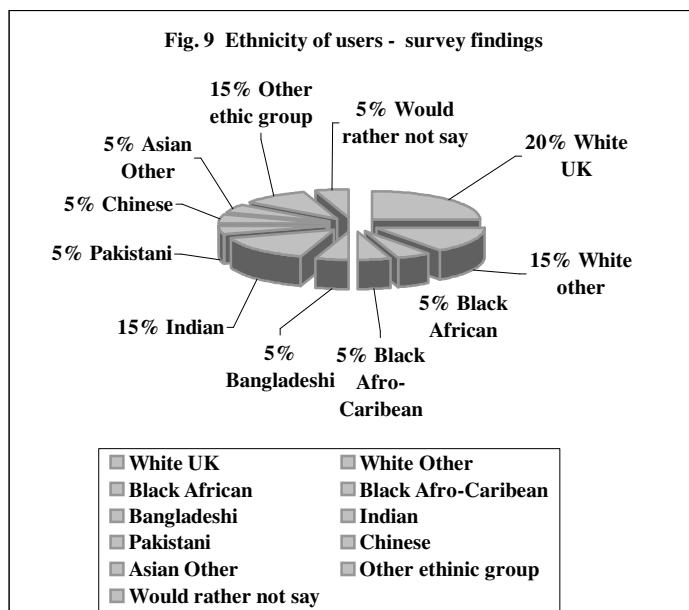


Figure 5. User ethnicity

No! X
Very difficult to read!

This pie chart does not work. It is in three-dimensions and it is trying to cram too much information in, too many slices. A pie chart is not the best way of presenting this kind of data. In this case, a table would be much clearer.

Ethnicity of user	Numbers in survey	%	N = 121
White UK	25	20	
Other ethnic group	18	15	
Indian	18	15	
White other	18	15	
Asian other	06	5	
Afro-Caribbean	06	5	
Bangladeshi	06	5	
Black African	06	5	
Chinese	06	5	
Pakistani	06	5	
Would rather not say	06	5	
Total	121	100	

Table 3. Ethnicity of users

Yes! ✓
Table presents the data more clearly better sorted and easy to understand

So to summarise pie charts:

Tip: Keep the slices of pie to a minimum.

Tip: Avoid three-dimensional slices of pie. Multiple slices in three dimensions do not help the audience to make comparisons. Keep pie charts simple; avoid any kind of over-complication.

Tip: Be very careful with the shading of slices of pie in a pie chart. Select shading collars or patterns that contrast with each other when they are enlarged or projected on to a screen.

On the next page you will find an example of a much simpler pie chart.

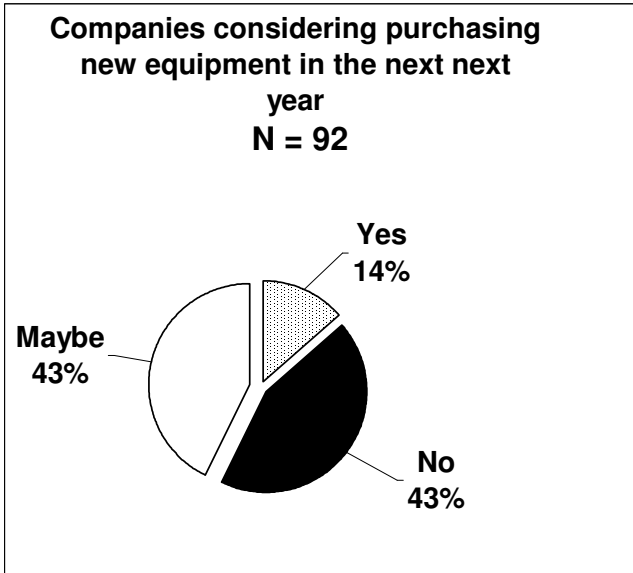


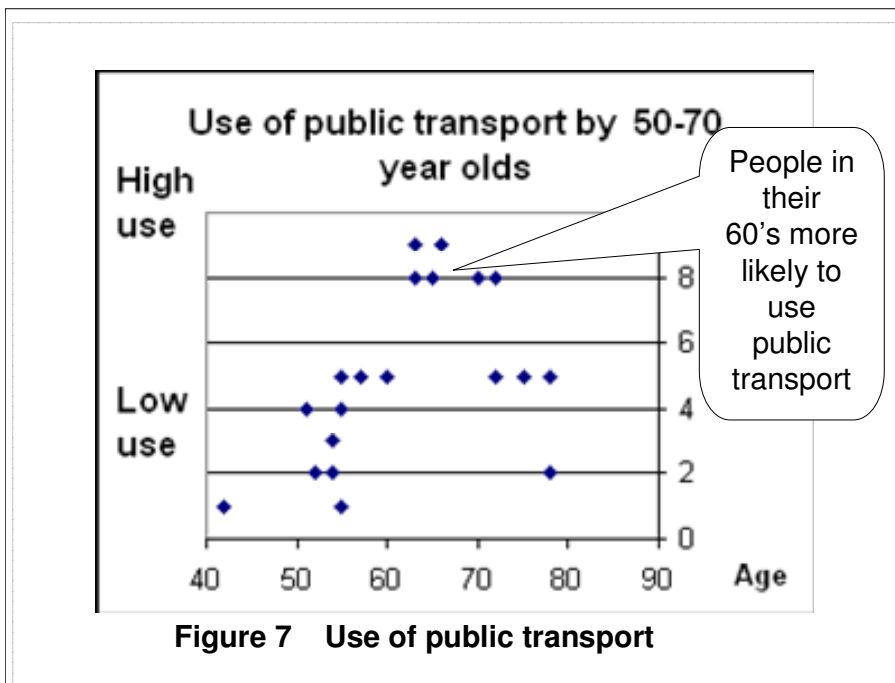
Figure 6. Companies considering purchasing new equipment.

The above very simple display will be effective when projected on a screen.

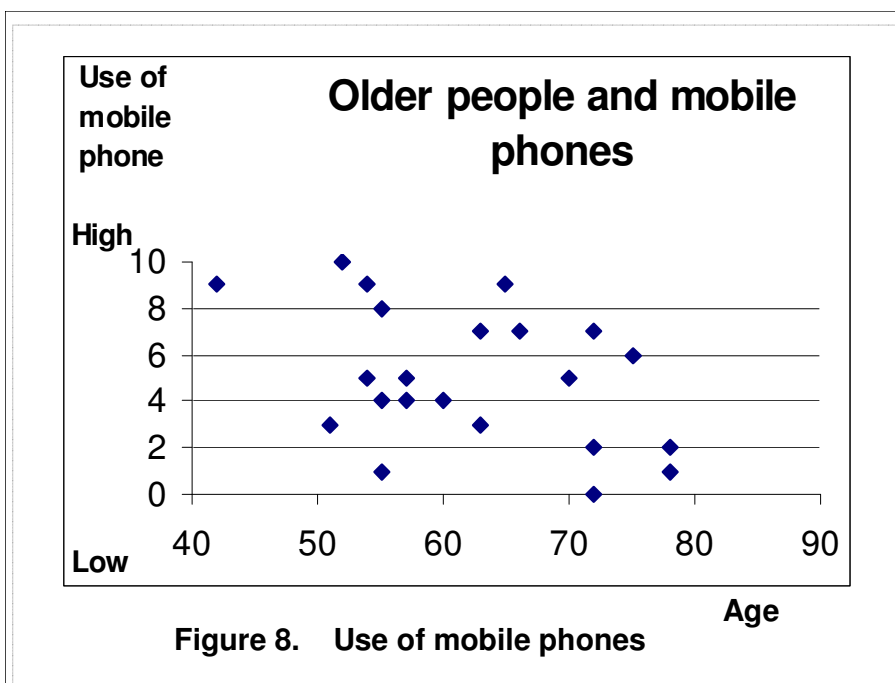
4.4 Other kinds of charts

Scatter graphs

You may have heard of scatter graphs or scattergrams. These are particularly useful because they group the data in clusters to show visually such things as concentrations of activity, comparison of variables and trends. The following example illustrates this diagrammatic quality.



Sometimes, there is no discernible trend, as in the figure below.



As usual, choose the kind of graph which is going to help your audience to grasp is quickly as possible what the numbers mean.

Spell it out!

In some cases, additional labels can be used to make the point clearly, as in Figure 7, above. It is sometimes a good idea to spell out the point with words as well as a picture, to reinforce the point with your audience.

Pictograms

There are many other kinds of charts. For instance, you may have heard of pictograms. These are a helpful form of graphic presentation, where the focus is on a graphic presentation of the overall picture. These can be useful for projecting onto a screen.

You can easily design your own pictograms, create them from your own photographs or use copyright free images from the Web -- see chapter 9 of the book.

On the next page you will find examples of pictograms used in PowerPoint slides.

Fig. 9. UK railways. Fatalities 2005.



1 locomotive = 10 (ten) fatalities.

16* fatalities in total.

* excludes level crossing fatalities

Fig. 10. UK road network. Fatalities 2005.



1 car = 1 000 (one thousand) fatalities.

3201 fatalities in total.

More information about charts

You can find information on these and other kinds of charts at <http://www.bized.co.uk/> (2007) and other educational websites. See the **Finding out more** at the end of these notes.

5. Rounding numbers up and down

When presenting numbers in a graph or a chart, it may be acceptable to round numbers up or down to the nearest whole number.

Much will depend on whether or not you have a specific recommendation from your school or department, and on how precise you have to be in your own subject discipline. Simply follow the guidelines you have been given.

When you are undertaking a presentation and providing visual images, your audience may prefer you to generalise slightly with your statistics, for instance to state 80% rather than 79.81%, unless the difference is critical. In this case, you can leave the detailed tables for an Appendix in your assignment.

Make sure that when the numbers you using your tables have been rounded up or down, they do add up to 100%. If they do not, somebody will certainly point out that they add up to 99.9%, or 100.25% rather than 100%.

Follow the guidelines you have been given. Your tutor will guide you on the level of precision that is required.

6. Referring to numbers in your presentation

In your presentation, make full use of the table or chart. Say something like:

"You can see from the Figure 4 that I'm currently displaying . . . "

or

"Turning now to Figure 5 on your handout, you will notice . . . "

It is never enough just to project a chart, or hand out the table and expect your audience to pick up the points. If you want them to understand, you have to tell them what to look for. Guide them through the data you are presenting.

7. Referencing your sources

If you are presenting data about your project for a dissertation, it is not necessary to reference every single statistic in your presentation, if you have researched the data yourself. It is "your " data. However, it is different if you are referring to data from secondary sources, that is, data that you have not collected yourself but which you have obtained from another source. In that case, you must make it clear where the data comes from.

Often, a handout is more convenient for your audience than a PowerPoint slide.

Here is a handout relating to the above pictograms.

Handout

Sources PowerPoint Figures 9 and 10.

Transport fatalities in the UK, 2005 Sources.

UK. Office of Rail Regulation. (2006). Annual report on railway safety 2005. p5. (Online).
Available from: <http://www.rail-reg.gov.uk/upload/pdf/296.pdf>

UK. Department of Transport. (2006). Road casualties. Great Britain. 2005. (Online).
Available from:
<http://www.dft.gov.uk/pgr/statistics/datatablespublications/accidents/casualtiesqbar/roadcasualtiesgreatbritain2005>

Here's a citation directly on a PowerPoint slide. It works better when printed than displayed on a screen.


<p>7 million adults in the UK <i>couldn't find</i> a plumber in the phone book.</p> <p>Source: Department for Education and Skills. (1998). Improving Literacy and Numeracy: A Fresh Start. London: DES.</p>	
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Figure 11. Adult literacy

Always cite your sources.

8. The big picture

Your audience wants to see the big picture. You know all the detail but the audience can easily become confused by too many details in your presentation. So maintain your focus, and give your audience an interesting story, supported and illustrated by data.

Explanations of data can be given in a handout, in an e-mail, or by referring them to a web site. In most circumstances, your audience will not want too much complicated data in the presentation. They will be more interested in the big picture, trends and perhaps just a few examples.

Help the audience to understand major trends or headline figures in a bold fashion. That might mean a summary table of your results or it might mean a few graphs and charts. Keep to your main points, and do not be tempted to introduce detail which you might find fascinating, but which will probably bore your audience!

9. Key principles for presenting numbers effectively.

Here are 6 principles which will help you to present numbers with style and conviction.

Principle 1. Edit ruthlessly.

In the presentation, only present the numbers that you need to, numbers that help you to make your point. This may mean discarding much of your material.

Principle 2. Make a choice about what you want the data to say.

Make the choice depending on the data you have, and the point that you want the data to make. At that stage you can decide on the particular kind of chart or table you are going to use

Principle 3. Make a choice about the means of presenting your chart or table.

Choose between projecting numbers and issuing them on a handout .Choosing projection or handout will lead you to think about which form of presentation is most appropriate in your particular circumstances.

If you want to both project your numbers and also issue handouts, you will have to do additional work to present the numbers into two different ways.

Principle 3. Label carefully and clearly.

Ensure that you have given your visuals an adequate title, that you have labelled the axes, and if appropriate, the keys, the source, and units of measurement. Always provide a clear title.

Principle 4. Summarise.

Be brief! It is quite acceptable to provide summaries as well as detailed numeric information, to ensure that the audience understands the overall story.

Principle 5. Design your presentation

Whether you are using tables or graphs, follow basic design principles to:

- avoid “chart junk”. Remove any difficult to read or decorative features which do not add value
- keep the design simple
- ensure that there is appropriate contrast between shadings
- ensure that the key detail of the images can be seen from the back of the room, if you are going to project onto the screen
- do extra work to edit and enhance the first draft produced by the software. You will always need to enhance the “first draft “ of the image.

Principle 6. Keep your presentation simple.

Keep your presentation free from overcomplicated graphics and overcomplicated data. Your audience will thank you. Think about what they need to learn and which information will help them to easily understand the content of your presentation.

10. Finding out more about presenting numbers

Over the last few years, the growth in computer graphics has meant that it is become a lot easier to present numbers and consequently a lot more people are presenting numeric later badly! There are many sources of information about this subject and in a brief paper like this, we can only cover a few points. You may receive specialist help from the tutors in your department. In addition, your institution may have a specialist learner support section that can help you. There are also many sources of useful information on the Web which are listed below.

There is of course a great deal of material around about using spreadsheets, especially Excel. You might want to start with a standard book like the ones in the Dummies series, or the Microsoft online support web site. (Microsoft, 2007).

Bized. (2008). Six ways of being economical with the truth. Available from: http://www.bized.co.uk/timeweb/buffing/buff_lie_illus.htm#4
[Accessed February 2008].

BBC. (2008) BBC Bite size.
Available from: BBC. (2006). BBC Bite size. .
Available from: <http://www.bbc.co.uk/schools/gcsebitesize/maths/data/>
[Accessed February 2008].
Tips on pie charts and other kinds of graphs from the reputable BBC.

10. Finding out more about presenting numbers, Continued

Microsoft (2007). Microsoft office online. Excel.

Available from:

<http://office.microsoft.com/en-gb/FX010858001033.aspx>

[Accessed February 2008].

Training and Development Agency for Schools. (2008).

Scatter graphs.

Available from:

<http://www.tda.gov.uk/skillstests/numeracy/practicematerials/areascovered/scattergraphs.aspx?keywords=scattergraphs> [Accessed February 2008].

Useful examples of different kinds of graphs e.g. scatter graphs.

Tufte, E. (2001). The visual display of quantitative information. 2nd ed.
Cheshire, Connecticut, USA: Graphics Press.

The classic book on presenting numerical data in visual formats.

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2008**