# Learning Enhancement Team

Steps into Statistics

Bar Charts

This guide describes bar charts and how to present them. It also discusses the data types and situations for which they are appropriate.

Introduction

Presenting data in a visually pleasing and meaningful way is very important in statistics. You should remember that a diagram or chart is there to communicate your numerical data to an audience. One of the most popular charts you can use is a **bar chart**. Bar charts were introduced over 200 years ago by William Playfair who believed that numerical data presented in tables was easily forgotten or misunderstood. In response to this he developed a number of visual aids for data presentation including the bar chart and pie chart.

Bar charts are used to present **counts** of **discrete** or **categorical** data and are ideal for **nominal** or **ordinal** data scales with fewer than 10 categories (see study guide: *Levels of Data*). The count of each particular category is represented by a bar. The bars in a bar chart can either be horizontal or vertical (vertical is more common). The example below shows the numbers of butterflies of certain species recorded at a nature reserve.
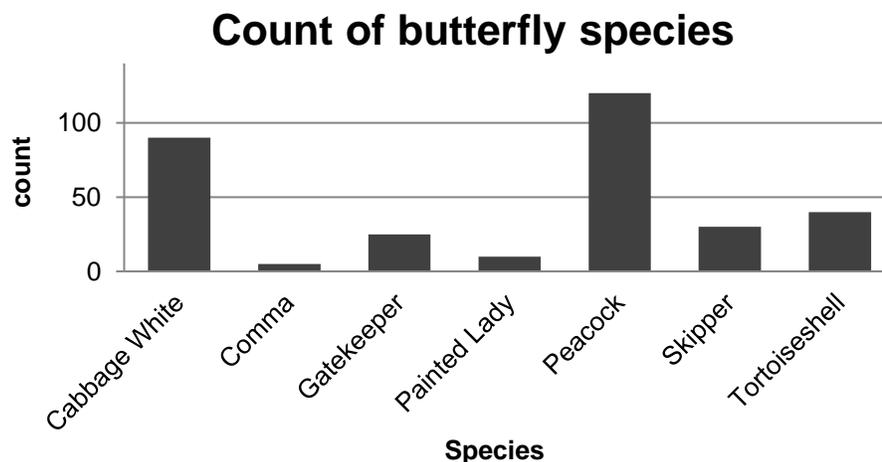
You should notice that there is a gap between the bars and that each bar is labelled with the name of the species it represents. The count for each species is on the vertical axis. The scale on the horizontal axis is discrete, not continuous. Bar charts are an inappropriate format for presenting continuous data scales such as heights, weights,

temperatures and so on. If you have continuous data then you can use a histogram to present your data (see study guide: *Histograms*).

As the data scale of butterfly species is nominal you can present the data in any order you wish. This a great advantage of a bar chart. For example, here are the same data presented from largest count to smallest count rather than alphabetically:

Count of butterfly species
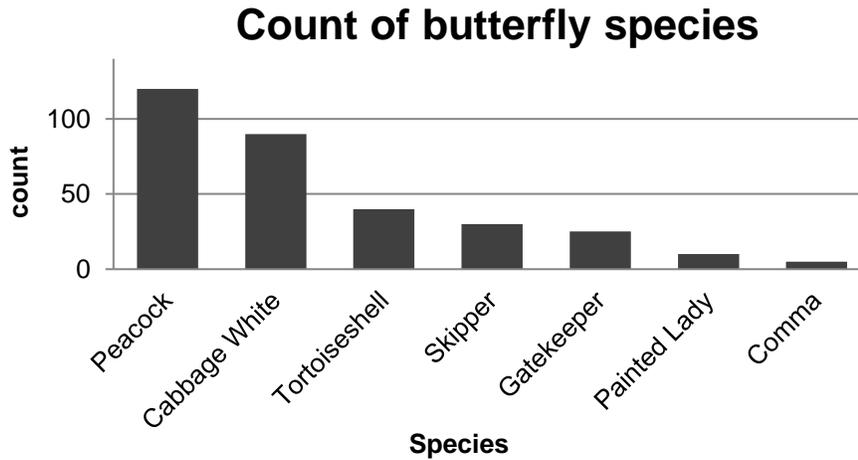
The two bar charts above represent the following data:

Species	Count
Peacock	120
Cabbage White	90
Tortoiseshell	40
Skipper	30
Gatekeeper	25
Painted Lady	10
Comma	5

The second bar chart makes it easier to distinguish between the counts of tortoiseshell, skipper and gatekeeper butterflies. You can easily adjust bar charts to help highlight any message from your data you wish to show.

Both bar charts and pie charts can be used to present similar data sets (see study guide: *Pie Charts*). There is an inherent advantage of bar charts over pie charts as the human eye is better at distinguishing difference in height than differences in angle. As a rule of thumb, **any data which can be presented in a pie chart is better shown in a bar chart**.

Different types of bar charts

Bar charts are highly versatile and many different types have been developed to help interpret more complicated data sets. The most common types are discussed below.

Clustered or grouped bar charts

When data categories are subdivided you can use a **clustered** or **grouped bar chart** to show the information relating to the subgroups. For example if data were collected on the food plants of the peacock, cabbage white and tortoiseshell butterflies then this could be shown in a clustered bar chart.

Food plant choice of butterflies by count
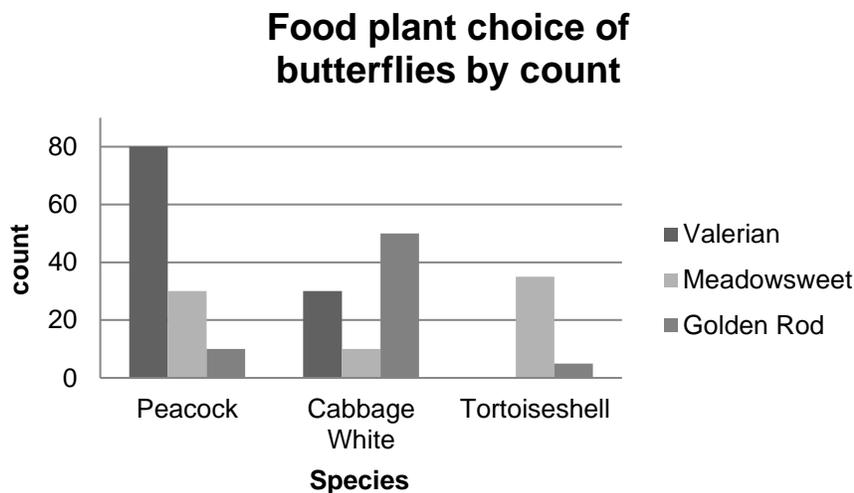
The bar chart above represents the data in the following table:

|	Valerian	Meadowsweet	Golden Rod
Peacock	80	30	10
Cabbage White	30	10	50
Tortoiseshell	0	35	5

Note that the order of food plant is the same in each cluster in the bar chart. You can see that the bar chart allows you to see and compare the data more easily than in the table. This becomes more obvious when there are more subgroups and categories to compare.

Stacked bar charts

You can also represent subdivided data in a **stacked bar chart** where the different sub groups are stacked on top of one another. These types of charts are often used to highlight percentage data, where all the bars would be the same height, representative of 100% (see study guides: *Percentages* and *Using Percentages*).

The table of data relating to butterflies and their food plants can be represented in a stacked bar chart as:

Food plant choice of butterflies by count
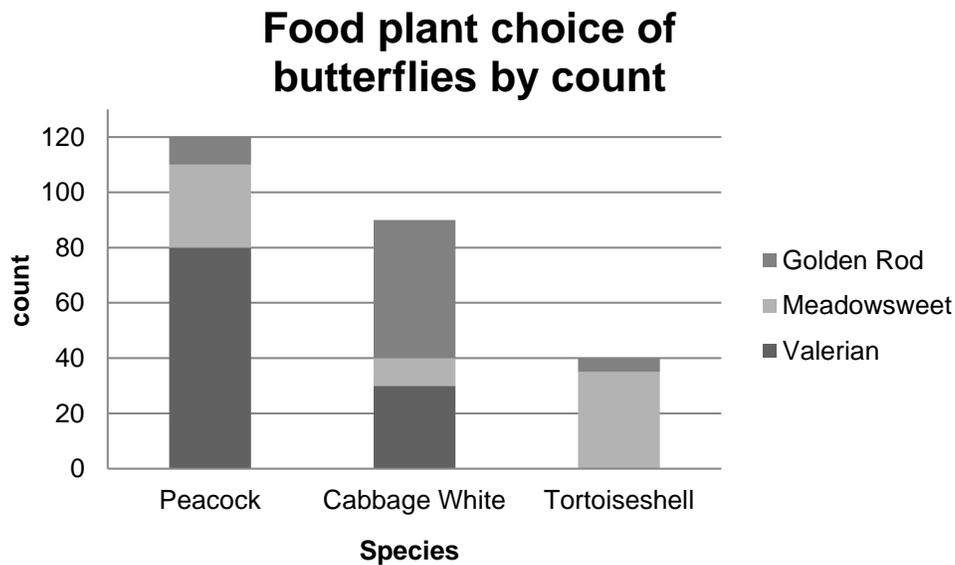
Or, if you prefer, you can express the numbers as percentages of the total count of each butterfly like this:

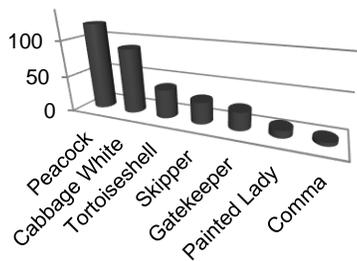**Food plant choice of butterflies by percentage**
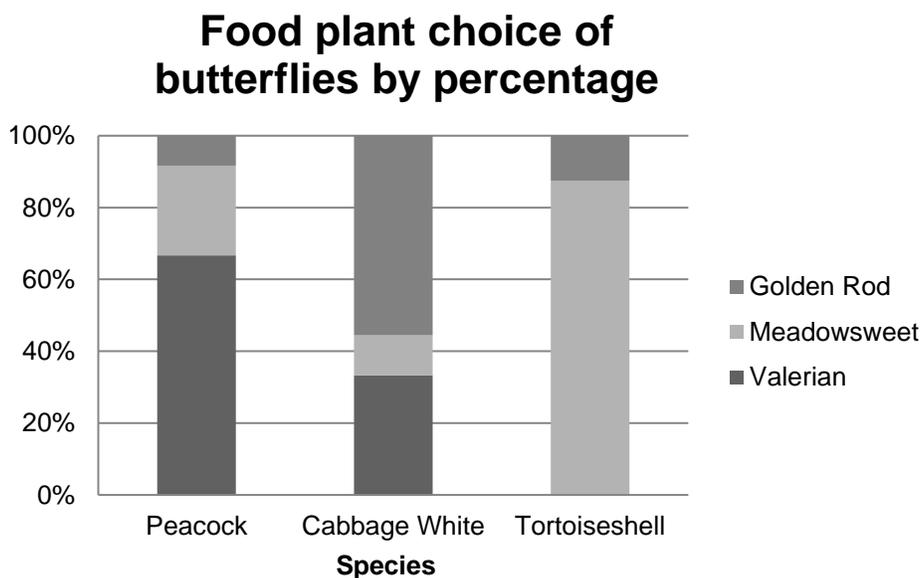
The choice of stacking method is entirely yours but each has its own merits:

- Using the raw count data retains the original data and allows you to show how some of the species were not observed as regularly as others. However this makes comparisons difficult.
- Using percentages makes comparing across species and food plants much easier but the fact that Tortoiseshell butterflies were not as commonly observed is lost.

Bar charts with added effects

As with other chart types, such as pie charts, there are many different effects that you can add to your bar chart to, seemingly, make it more interesting. You must remember that the purpose of the bar chart is to present data **clearly**. Take the bar charts below which represent the same data as the simple bar chart on page 2 of this guide, the one on the right has cylindrical bars and the one on the left has conical bars. You can see that the subtle difference between the counts of Skipper and Gatekeeper butterflies has been lost for the sake of an effect.
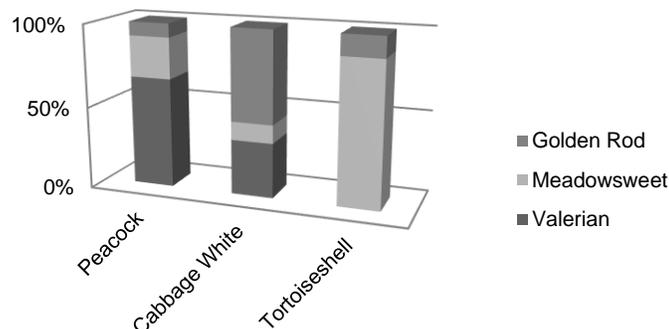
Count of butterfly species

Count of butterfly species
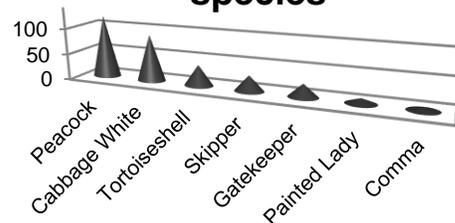
Similar effects can also be applied to clustered and stacked bar charts. Although the effect is not as invasive here, the added shading to the bars can be confusing and is unnecessary.

Food plant choice of butterflies by percentage

■ Golden Rod
■ Meadowsweet
■ Valerian

Remember that bar charts should be clear, unambiguous and easy to interpret. If you choose an effect which interferes with these principles then you are probably better off without it. Also, if you produce bar charts which employ bright colours or multiple shading effects, you should think about whether those effects will still be useful if the chart is photocopied. It is probably best to choose grayscale shading which are as different as possible to avoid these problems. Many visually stimulating bar charts become unfit for purpose when they have been photocopied in black and white.

Want to know more?

If you have any further questions about this topic you can make an appointment to see a **Learning Enhancement Tutor** in the **Student Support Service**, as well as speaking to your lecturer or adviser.

☏	Call:	01603 592761
⌨	Ask:	ask.let@uea.ac.uk
🖰	Click:	https://portal.uea.ac.uk/student-support-service/learning-enhancement

There are many other resources to help you with your studies on our website.
For this topic there is a webcast.

Your comments or suggestions about our resources are very welcome.