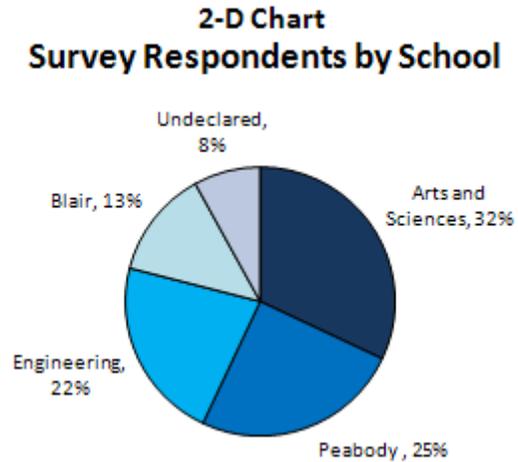
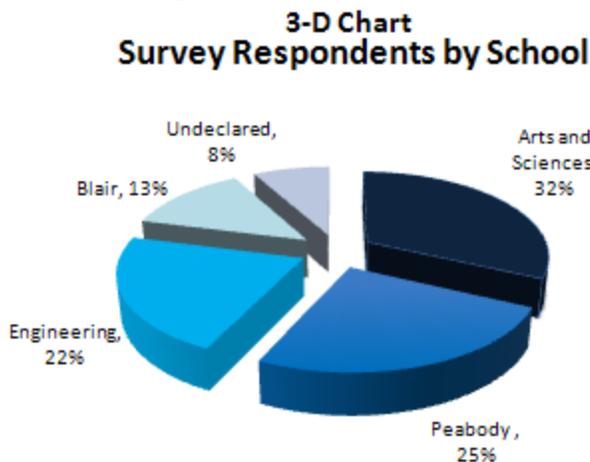


Presenting Data in Charts and Graphs

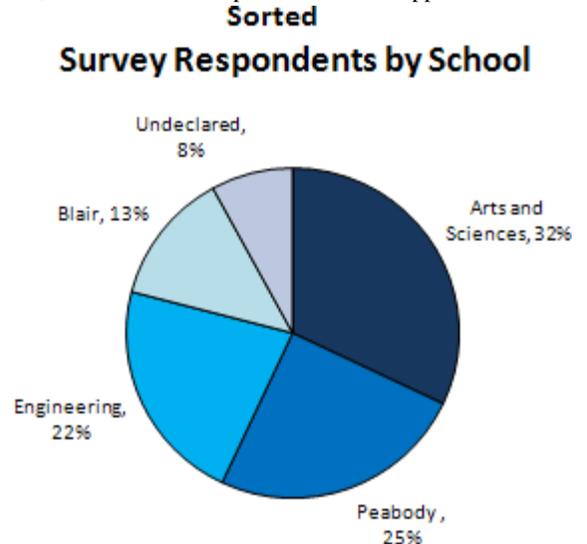
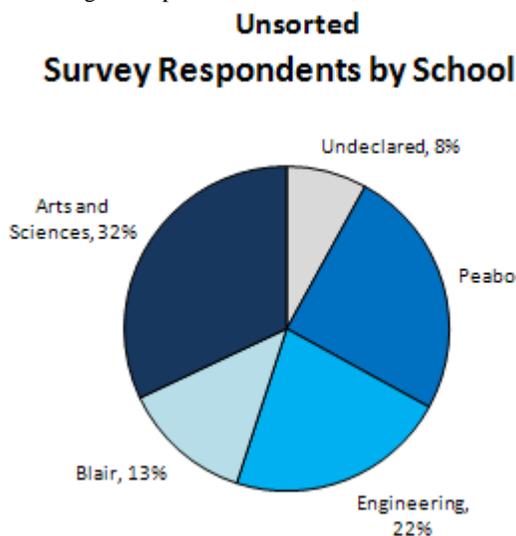
Charts and graphs are often the best way to demonstrate trends in data and make comparisons between different groups. Different types of graphs are required to most efficiently and effectively present different types of findings. The following sections detail the most common types of charts and graphs and the important rules governing their use.

Pie Charts

- Pie charts have limited utility. They can only be used to show parts of a whole (if all parts total 100%).
- Pie charts emphasize general findings, but do not make small differences apparent.
- Pie charts should only be used to represent categorical data with a relatively small number of values and should not consist of more than five or six slices.
- When presenting a pie chart, it is better not to use 3-D features, or break out the pieces, as this often makes it more difficult to compare the relative size of the slices.



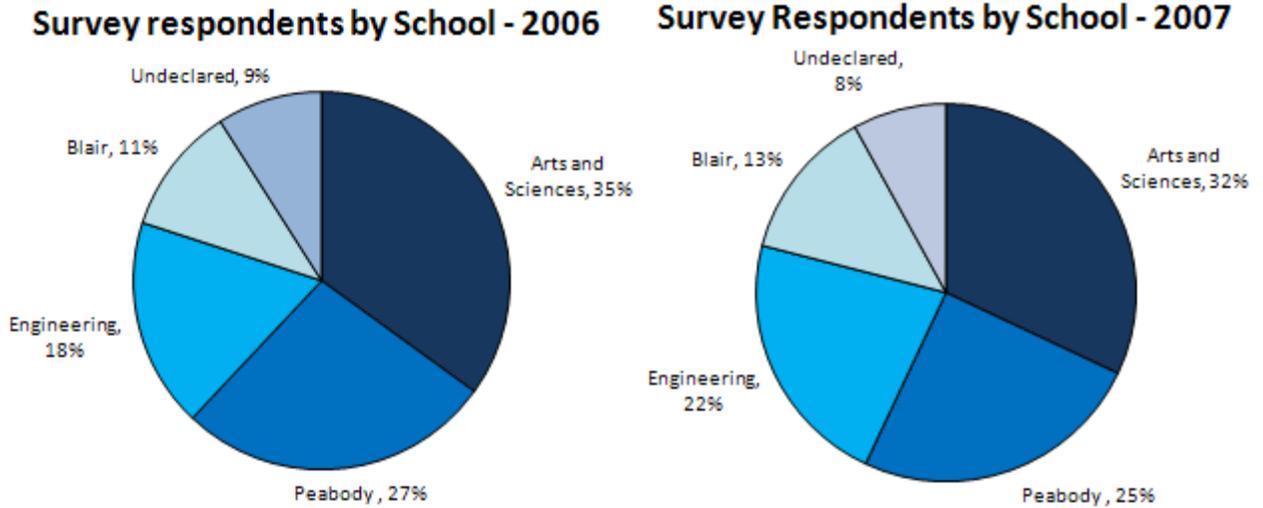
- It is always necessary to include category labels or a legend that describes which slice corresponds with which category. If labels are brief enough, it is better to place category labels directly next to the pie slices to which they correspond.
- It is good practice to include value labels (indicating the percentage of the pie represented by a given slice).
- It is also good to pre-sort data so that, clockwise or counter-clockwise, the relative size of pie slices is most apparent.



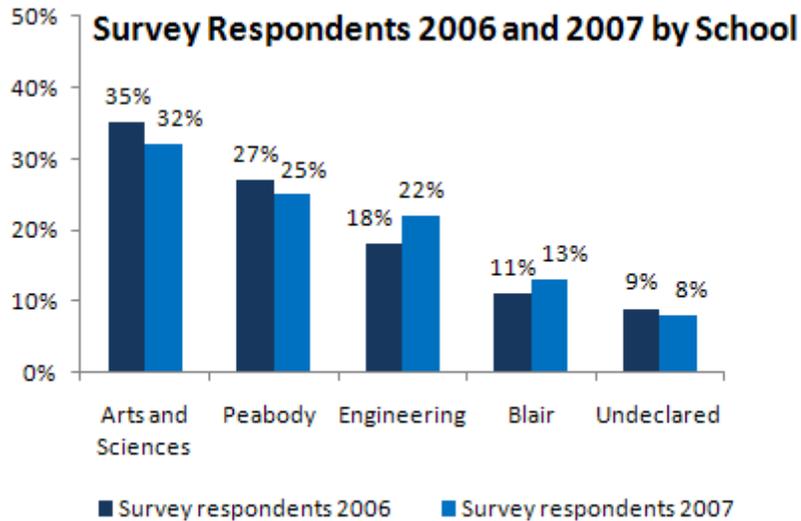
- The purpose of color in pie charts is to differentiate between pie slices to further facilitate comparison. When using color, it should be used thematically. The best use of color in a size-ordered pie chart is a progression of dark to light hues from the largest slice to smallest slice (see 2-D pie chart above).

- A bar graph, rather than multiple pie graphs, is the better option if data need to be compared by more than one value. Pie graphs should not be used to represent more than one categorization of data.

Multiple Pie Graphs



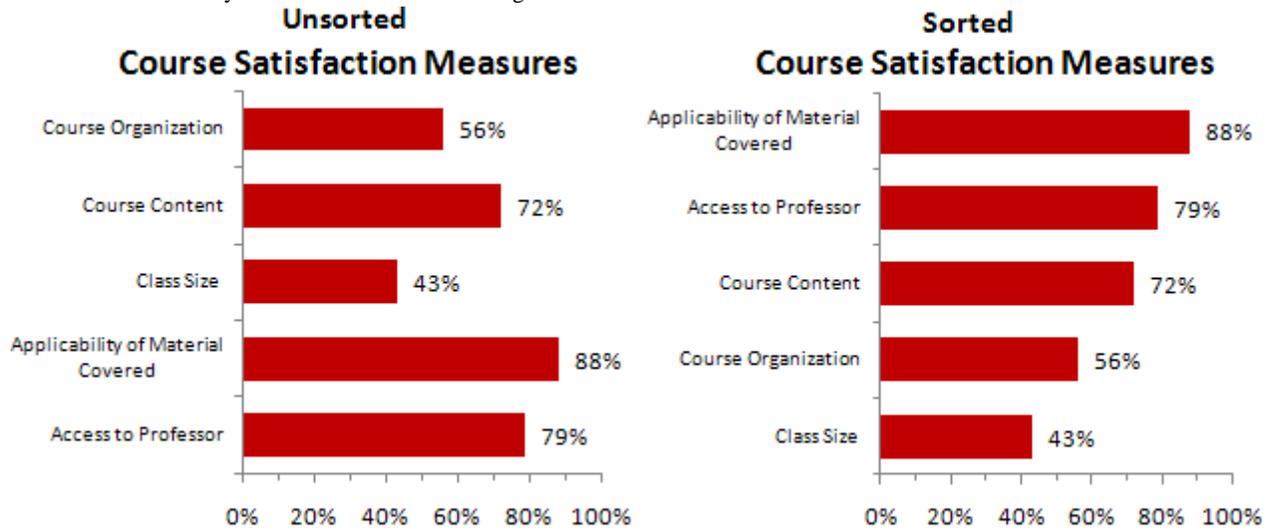
A Single Bar Graph



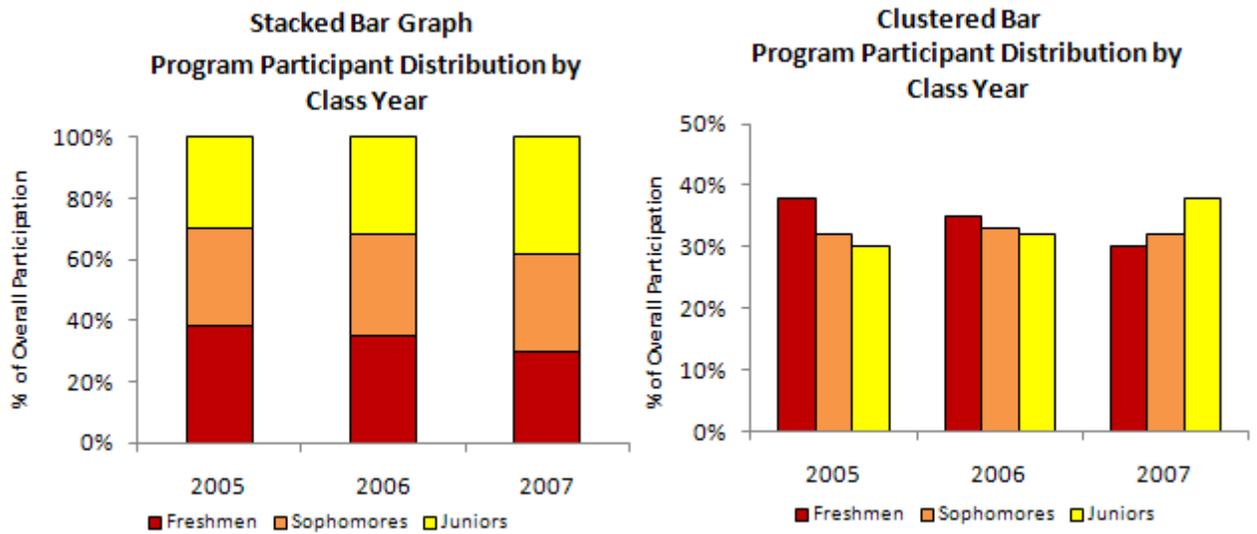
Bar Graphs

- Bar graphs are used for direct comparison of data (e.g., student GPA's by class year).
- Bar graphs can also be used to show time series data when the number of time intervals is small.
- If all values are positive integers, the scale should generally use 0 as a baseline. In the event that values include both positive and negative integers (e.g., in graphing differences in means), 0 should be the midpoint of the scale.
- Scale ranges should be standardized and not vary between graphs, when possible.
- Always try to avoid using 3-D features in a bar graph. The complexity of 3-D graphs makes them ineffective in conveying results to most audiences and there is usually a greater amount of data distortion that occurs.
- Bar graphs may be vertical or horizontal. The only difference between horizontal and vertical bars is that horizontal bar charts are seldom used to portray time series.

- To facilitate comparison and analysis, it is desirable that columns be sorted in some systematic order. The most common and visually effective schema is according to size of value.



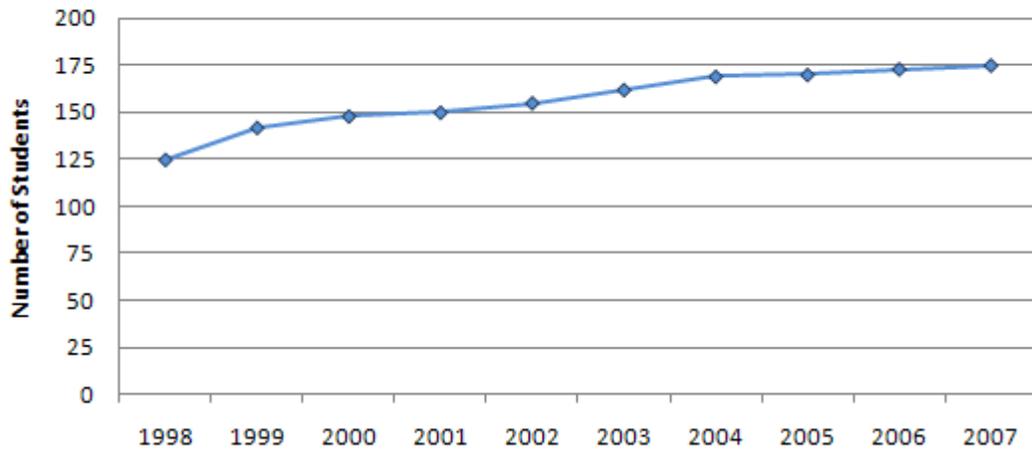
- It may also be desirable to order findings by a particular category such as class year (see Clustered Bar Graph below), where it is best to order sequentially from freshman to senior year or visa versa, or by grade achieved, where it is best to order by the standardized grade scale.
- Stacked bar graphs, which consist of one or more segmented bars where each segment represents the relative share of a total category, are generally not preferred because it is difficult to make comparisons among the second, third, or subsequent segments without a standard baseline.
- When graphing data from two or more different series, or different classes within the same series, it is preferable to create a bar graph that groups these values together, side by side (see below).



Line Graphs

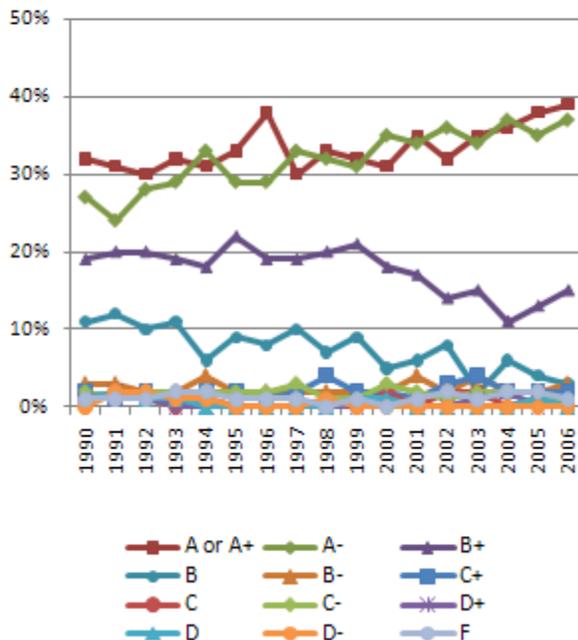
- Line graphs are most often used to display time series data (e.g., the average GPA of students in a starting cohort over their first eight semesters, or program enrollment over the past 10 years). See graph below.

Program Enrollment - Past 10 Years

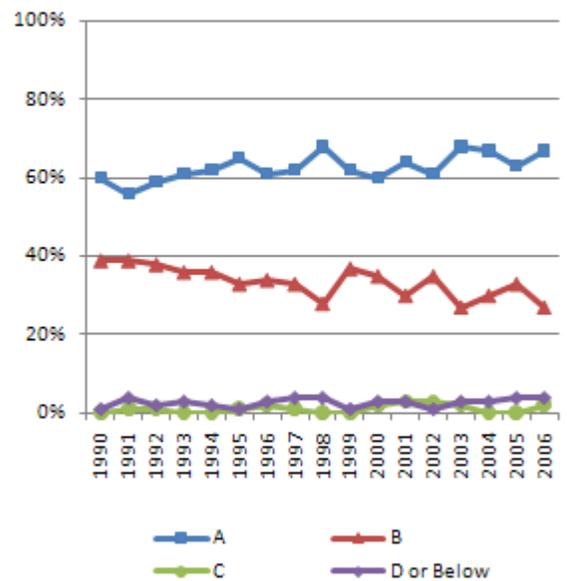


- Compared with bar graphs, line graphs are more effective in presenting five or more data points, but less effective in providing emphasis on differences over relatively few periods of time.
- When plotting time series data in a line graph, it is convention that the x-axis (horizontal) contains the categories of time (e.g., days of the week, months, years – depending on the data), and the y-axis (vertical) has frequencies of what is being measured (see graphs below).
- Graphs with more than four or five lines tend to become confusing unless the lines are well separated.

More than 4 or 5
Grade Distribution for Course
X - 1990 to 2006



4 Lines Only
Grouped Grade Distribution for Course
X - 1990 to 2006



- In a line graph with more than one line, different line styles (e.g., solid line, dashed line, etc.), colors and/or plotting symbols (e.g., asterisks, circles, etc.) should be used to distinguish the lines.