

Part III

INTERPRETING THE EVIDENCE AND REPORTING THE FINDINGS



INTRODUCTION

Data collected by means of questionnaires, interviews, diaries or any other method mean very little until they are analysed and evaluated. Gathering large amounts of information in the hope that something will emerge is not to be recommended in any small or smallish investigation, but particularly not for new researchers. As I said in the introduction at the beginning of this book, those of you who have a limited statistical background cannot attempt highly complex surveys involving advanced statistical techniques, but that does not mean that a worthwhile study cannot be carried out. It is all a case of working within your level of expertise, selecting research methods which are suitable for the task and which can be readily analysed, interpreted and presented.

If at some stage you decide to carry out a large quantitative study, then you will undoubtedly need to get to grips with statistical procedures and with a range of computer skills and computer software such as the Statistical Package for the Social Sciences (SPSS). Every institution of higher education should have specialists who will advise. Make use of them. They will keep you on the straight and narrow and will ensure you do not waste valuable time following false trails.

In many projects and theses, it will be sufficient to understand simple arithmetical procedures such as averages and percentages.

If your data-collecting instruments are well devised and have been well piloted, you have already done the groundwork for the collection, analysis and presentation of information.

Before you begin your study of the next two chapters there are a number of issues which have been raised earlier but which need to be reiterated. In Chapter 1, I briefly discussed the question of generalization. Bassey (1981: 85–6) drew attention to the problems of generalizing from insufficient data, and made a strong case for individual researchers working to a limited time scale to produce research structured in response to an existing or potential problem so that the results might be of use to the institution. Such research, he felt, might go some way to solving a particular problem or lead to informed discussion of how a particular problem might be tackled. He commended the descriptive and evaluative study of single pedagogic events and (writing about education case-study methods), concluded that:

> An important criterion for judging the merit of a case study is the extent to which the details are sufficient and appropriate for a teacher working in a similar situation to relate his decision-making to that described in the case study. The relatability of a case study is more important than its generalizability.
>
> (Bassey 1981: 85)

I raise this issue again here because in the analysis, interpretation and presentation of data, care has to be taken not to claim more for results than is warranted, and equal care has to be taken not to attempt generalizations based on insufficient data. In relatively small projects, generalization may be unlikely, but relatability may be entirely possible. Well-prepared, small-scale studies may inform, illuminate and provide a basis for policy decisions within the institution. As such, they can be invaluable. There is no need to apologize about inability to generalize, but there would be every need to apologize if data were manipulated in an attempt to prove more than could reasonably be claimed.

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INTERPRETING THE EVIDENCE AND REPORTING THE FINDINGS

Raw data taken from questionnaires, interview schedules, checklists, etc. need to be recorded, analysed and interpreted. A hundred separate pieces of interesting information will mean nothing to a researcher or to a reader unless they have been categorized and interpreted. We are constantly looking for similarities and differences, for groupings, patterns and items of particular significance.

You may have ideas about categories before the data are collected. Your informed hunch tells you that the likelihood is that responses will tend to fall into any one of six or seven main categories. There can be dangers in placing too much reliance on preconceived ideas, not least the possibility that your line of questioning may direct respondents to reply in certain ways. However, assuming you have been able to eliminate bias of this kind, your first-thoughts categories will give you a start in the process of collating the findings. Others will undoubtedly emerge as your research proceeds but start with broad categories, and only move to more detailed examples when it becomes apparent that they merit a label of their own.

In Chapter 8, Michael Youngman suggested that in questionnaires, it is helpful to identify question types and to work out ways in which responses can be analysed and presented. You will recall that he listed seven question types (list, category, quantity,

ranking, grid, scale and verbal). In this chapter, some of these question types will be used to illustrate ways in which responses might be interpreted and presented.

List questions

Let us say you wish to find out what qualifications your mature students had before they registered for the course. You produce a list question which invites subjects to tick appropriate boxes. They may well tick more than one box and so you will need to be ready to deal with multiple responses. In Question 1, categories have already been selected (None, professional qualification, successful completion of Access or Return to Study course, A level or equivalent and Other).

Question 1

What qualifications did you have before you started your degree course?

(Please tick the appropriate box or boxes)

None	☐	Professional qualification*	☐
Successful completion of Access or Return to Study course	☐	A level or equivalent*	☐
Other*	☐		

Please specify*_____

_____

_____

A summary sheet needs to be prepared for all items before questionnaires are distributed, so that returns can be entered as

they come in. We all have our own ways of recording returns, but if you decide to record question by question, the following is probably as simple a way as any.

Summary sheet for Question 1

Question 1 Qualifications before entry				
None	*Professional*	*Access/Return to Study*	*A level*	*Other*
~~1111~~ *1*	~~1111~~ ~~1111~~ ~~1111~~ ~~1111~~ ~~1111~~ *111*	~~1111~~ ~~1111~~ ~~1111~~ ~~1111~~ ~~1111~~ ~~1111~~ *11*	~~1111~~ ~~1111~~ *11*	~~1111~~ ~~1111~~ ~~1111~~ *1*
6	28	32	12	16

Once the summary sheet is complete, you will begin to have a picture of the types of qualifications the students had before beginning their degree course. The information can be presented in a variety of ways. A simple table, followed by commentary highlighting any items of interest is one option (see Table 12.1).

Table 12.1 Qualifications of mature students before entry to their degree course

None	*A level*	*Professional*	*Access/Return to Study*	*Other*
6	12	28	32	16

The full list of 'Other' qualifications will need to be recorded on a separate sheet and if sufficient recurring types of qualifications emerge, then reference can be made to them in the commentary.

A vertical bar chart would be another option (see Figure 12.1). The variable (qualification/s) would be on the horizontal axis and the frequency (number of students) on the vertical axis. (Note that 'n' = number.)

Which is clearer? The table or the bar chart? Any data which tell you nothing of significance may as well be abandoned, but there are interesting features here. Thirty-two of the 50 students in our sample (64 per cent) took Access/Return to Study courses, whereas only 12 (24 per cent) had A levels or equivalent. It might be interesting to discover which group performed better in examinations. Six students (12 per cent of the total of 50) had no qualifications at all on entry. How then had they prepared themselves for their undergraduate studies? Are they coping? It might be useful to follow up these and similar issues in interviews.

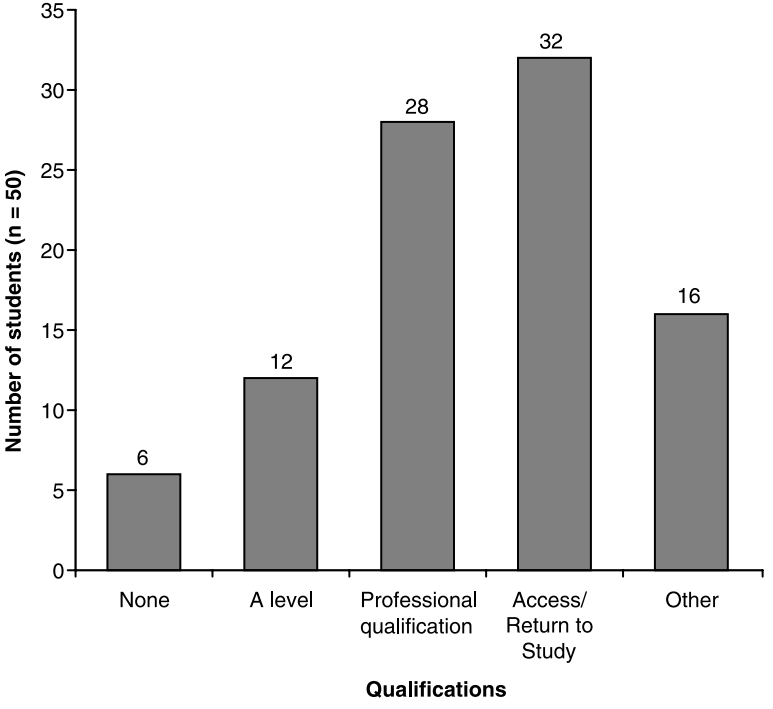


Figure 12.1 Qualifications of students before entry to their degree course.

Quantity and category questions



What Michael Youngman described as quantity and category questions are, at first sight, simpler to deal with. They require one answer only. The response to a quantity question is a number (exact or approximate), giving the amount of some characteristics. The response to a category question is one only of a given set of categories. For example, if age categories are provided (20–29, 30–39, etc.), the respondents can only fit into one category.

In the mature students' study, you will probably need to know students' ages. If you have spent time on question wording and have refined the focus of each question, you will have decided whether you want to know students' ages at the time they registered, at the time they completed the questionnaire, or at some other stage. You decide to ask a straight question.

Question 2

> **How old were you when you first registered for your degree course?**

What will you do with responses? *What exactly do you want to know?* The average age of students? If so, you will need to decide what sort of average (or measure of central tendency) will suit your purpose – *the arithmetic mean, the median*, or *the mode*.

Measures of central tendency

The **arithmetic mean** is simple. It is obtained by adding together each item (or value) and dividing by the total number of values. So, if we take 12 respondents (Group A) whose ages are 26, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 34, and add those values together: that gives us 360. Divide 360 by 12. The mean is 30.

Another group of 12 (Group B) might have a different range of ages. For example, 21, 22, 24, 25, 25, 29, 31, 31, 32, 35, 40 and 45. The mean is also 30 but in these two cases, there is a clear difference in the dispersion of results.

The **median** allows us to find the middle value. This is particularly useful when there are extremes at both ends or at either end of the range which may affect the mean to a significant extent. To find the median, values must be listed in order – which in this case has already been done. If we had an odd number of values, the middle value would be the median. Where we have an even number, as in Group A, the average of the two middle values (30 + 30) is taken and so 30 is the median. The fact that in this case the mean and the median are the same is because there are no extreme values at either end. There is an age progression, but if the ages were 21, 22, 29, 29, 30, 30, 33, 33, 33, 36, 39, 84, then the differences would become apparent. The mean would be 34.9, whereas the median would be the average of the middle points, which would be 31.5. You would then need to decide whether the median gives a more realistic picture than the mean.

The **mode**, which is not often used in small studies, relates to the most frequently occurring value. In this last example, the modal score is 33.

Each of these measures of central tendency has different uses. As always, it all depends on what you need to know and why.

Look at the Group A and Group B examples again. The two groups have a very different spread of age. In Group A, the range is from 26 to 34 and so ages are close to the mean and the median. In Group B, they range from 21 to 45 and so are not clustered around the mean age. Is that worthy of comment? If so, ways have to be found of dealing with measures of spread, or dispersion. Commonly used measures are **range**, **interquartile range** and **standard deviation**.

Range is simply the difference between the highest and lowest values measured. For Group A, the range is 8 years, but for Group B it is 24 years. The range is not a particularly good measure of dispersion, as it can be influenced by one high and/or one low value and takes no account of the numbers of responses in the middle of the group.

The interquartile range gives a more accurate picture and reduces the importance of the extreme ends of the range. It is derived from the median. The highest and the lowest quarter of the measures are omitted and the interquartile range of the middle 50 per cent of the values is quoted.

For Group A, the top three values (34, 34 and 33 – one quarter of the twelve values) are omitted, as are the lowest three values (26, 26 and 27). This gives an interquartile range of 28–32, or four years.

For Group B, the values 45, 40 and 35 are omitted, as are 21, 22 and 24. That gives an interquartile range of 25–32, which is seven years. Is that worth commenting on? In some cases, it certainly will be. If the median has been selected as providing the best indication of the average of a set of data, then the interquartile range will indicate the extent to which data vary.

If the mean has been selected, then the standard deviation has to be used to summarize dispersion. It reflects the spread and the degree to which the values differ from the mean. It uses values for all the group rather than for a section, whereas other measures do not. Any book on statistics will give the mathematical expression for standard deviation and how it can be calculated. To carry out the calculations by hand can be tedious, particularly for a large group. However, many calculators can do this very quickly and the calculation is written into many computer programs so that the standard deviation is automatically produced in association with the mean. In fact, the standard deviation for Group A is 2.8 and for Group B it is 7.

In the case of these two groups, all the measures – the range, interquartile range and standard deviation – indicate that Group B has a wider spread than Group A. Used on their own, means and medians may not be sufficiently descriptive to provide a complete picture of the data. You will need to decide whether one of these measures of dispersion is also necessary when you analyse and interpret your data.

It was a straightforward matter to determine the mean and the median of data derived from Question 2. However, you might decide you do not wish to ask subjects to say how old they are. Perhaps you consider it would be more sensitive to ask them to tick a box or circle a number to indicate the age category into which they fit. Decide whether you wish to have categories (or class intervals) of five (20–24, 25–29) or ten (20–29, 30–39). How important is it to have the groups of five? If the answer is 'not very', then take the wider span. It will be easier to manage.

Make sure your instructions are clear. In the Alternative Question 2, respondents would be asked to circle the number (1–5) under the appropriate age category. A respondent of 32 would circle the number 2 underneath the 30–39 age category. Take particular care to ensure that the likely full age range of your respondents is provided.

Alternative Question 2

Age when you first registered for your degree

20–29	30–39	40–49	50–59	60+
1	②	3	4	5

If you wished to find the arithmetic means of respondents' ages from the class intervals this is still straightforward. Take the mid-point of each class interval and multiply that age by the number in each class. That is, mid-point × frequency, as follows:

Table 12.2 Arithmetic mean of respondents' ages

Age	*Frequency*	*Mid-point*	*Frequency × mid-point*
20–29	34	25	850
30–39	10	35	350
40–49	4	45	180
50–59	1	55	55
60+	1	60	60
Total	50		1495

If 1495 is divided by the number of respondents (50) that gives a mean of 29.9. The first class interval (20–29) includes those who entered higher education on their twentieth birthday and also those who entered the day before their thirtieth birthday. The interval therefore covers almost 10 years, with the exception of the final class (60+). Usually, it is anticipated that only a small number of responses will fall into the final class. In the above

example, the one respondent could be any age from 60 upwards and so it is necessary to assign an arbitrary mid-point. For the purpose of this exercise, the age 60 was selected.

You would then need to decide how to present the information in a way which best illustrates the age balance of the sample. You have several options. You could provide a simple chart derived straight from your summary sheet (Table 12.3).

Table 12.3 Age distribution of students at initial registration

Age	*Number of students*
20–29	34
30–39	10
40–49	4
50–59	1
60+	1
Total	50

The same data could be represented by a histogram. A histogram is the same as a bar chart, but the bars are touching, to reflect the continuous nature of the variable which in this case is 'age' (Figure 12.2).

Alternatively, you might decide a pie chart would represent a clearer (or different) picture. Pie charts can be awkward to draw unless you have access to a computer graphics program but easy if you have. They are useful, particularly if you wish to illustrate the **proportion** of students who fall into the different age groups. In this case, frequencies are changed to percentages. The 30–39 age range accounts for 20 per cent of the total sample. The circumference of a circle is 360° and so one per cent will be 3.6°. Multiply 20 by 3.6 which gives an angle of 72°. If you are producing the pie chart by hand, this simple calculation will allow you to draw in the segments using a protractor and a compass but it's tedious so if

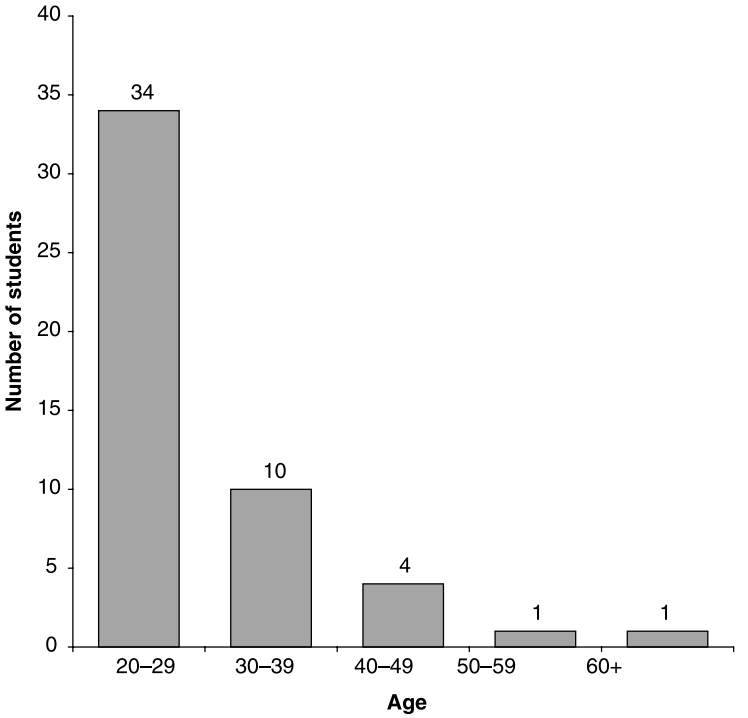


Figure 12.2 Age distribution of mature students at initial registration.

you possibly can, make use of a 'Tables and Figures' computer program. Once you know how, it's easy, but not until you learn 'how' – and that can take a little time. It becomes immediately apparent from Figure 12.3 that if numbers are small, percentages can be misleading so if at all possible, include numbers with the percentages.

Do the table, histogram or pie chart provide any interesting findings? You might comment on this skewed age distribution, to the effect that few students over the age of 39 had committed themselves to the three-year full-time undergraduate course. But why would that be interesting? Subsequent interviews might provide further information about motives. Would you have expected the age distribution to be weighted at the younger end? When you examine the university records for the full mature

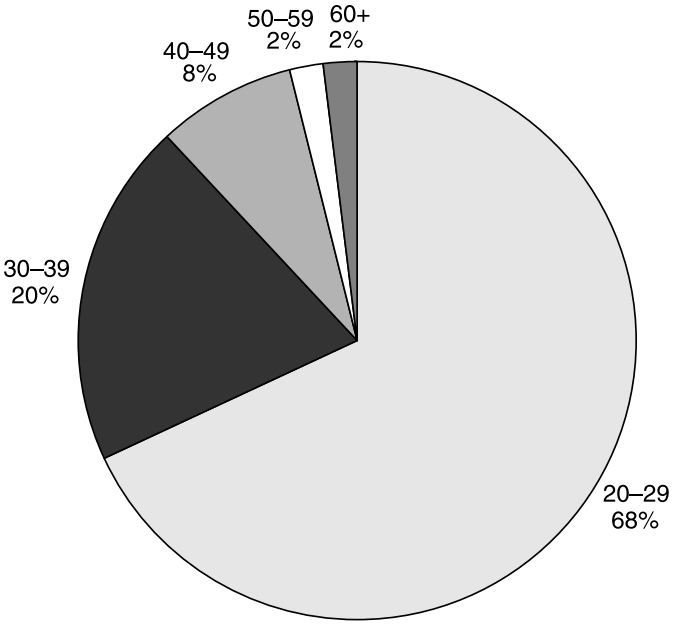


Figure 12.3 Age distribution of students at the start of their course.

student population (assuming you have permission to get access to the records), does your sample follow the same pattern, or is it different? If it is significantly different, then that might indicate that further study is needed to try to find out why. Do university records indicate a gradual (or sudden) change in the age profile of students? What about the balance of women to men?

Would it be helpful to know whether most of the younger students are women? If you have asked students to indicate whether they are male or female, you would be able to find that out, *but* if you have not, it will be too late once the questionnaires are returned. Your pilot and trial collation and presentation of data should give you clues as to which information is likely to be of interest and at that stage there is still time to make adjustments to your data-collecting instruments. The trials will also allow you to prepare the types of summary sheets which will suit your purpose – and for that, you may need to code your data.

Coding

Miles and Huberman, writing about qualitative data analysis explain that:

> *Codes* are tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study. Codes are usually attached to 'chunks' of varying size – words, phrases, sentences or whole paragraphs, connected or unconnected to a specific setting.
>
> (Miles and Huberman 1994: 56)

They take the view that it is not the words themselves that matter, but their *meaning*.

> Codes are used to retrieve and organize the chunks . . . The organizing part will entail some system for categorizing the various chunks, so the researcher can quickly find, pull out, and cluster the segments relating to a particular research question, hypothesis, construct, or theme. Clustering, and . . . display of condensed chunks then sets the stage for drawing conclusions.
>
> (Miles and Huberman 1994: 57)

So, coding allows you to 'cluster' key issues in your data and allows you to take steps towards 'drawing conclusions'. The data you have collected mean very little until you have identified your clusters and can begin to understand what they all mean.

If you plan to enter your data direct on to the computer, you will need to use the numerical labels, as in:

Question 1: Qualifications

None	1
Professional qualifications	2
Access/Return to Study	3
A level or equivalent	4
Other	5
No reply	9

You might decide to break down the 'Professional qualifications' returns, if you have sufficient items, and possibly to indicate 'degree in another subject', 'nursing qualification', 'engineering qualification' or 'forestry management qualification'.

In Alternative Question 2, codes for 'age' could be allocated in the same way:

20–29	1
30–39	2
40–49	3
50–59	4
60+	5
No response	9

These numbers are **nominal scales** which have no numerical significance and so any numbers could have been used. Remember that there must be no overlapping categories. It's obvious with the age example because a respondent could not be classified as being in the 20–29 and the 30–39 category, but particularly when you are dealing with open or verbal responses and invariably with qualitative rather than quantitative analysis, it can be really quite difficult to select guaranteed non-overlapping categories.

If you are involved in a very small project and only need basic information, such as additions or percentages, you may decide you don't need to go to the lengths of coping with computer statistical analysis, unless you are using the exercise as a trial for a larger investigation. However, you will still need to prepare a coding frame, which is your classification system and your key. In questionnaires, you will have a good idea of many, or even most of the categories and so will be able to plan your coding frame at the same time as you design your questionnaire. Even so, it's unlikely you will have covered all possibilities, so wait until you have returns from your pilot studies and again, after a number of returns from the main distribution before you begin to complete your coding frame. It's irritating if you find you were originally wrong because that means you have to adjust codes and to go through all the returns again.

Open questions may well produce unexpected items. Type out all the responses and then try to identify any recurring items. They will form the basis of your coding system, but remember that quite often only two or three identical, or similar responses may give you too many categories. Particularly in a small project, there is likely to be a limit to how many are reasonable. You will always need an 'odds and ends' category and remember to allow for a 'no response' category. The number '9' is often used for 'no response' and if this number suits you, keep it for all 'no response' items. If you don't need numerical codes, then use 'NR' because there is considerable merit in adopting letters, or even words, instead of numbers. Letters and words are easily identified, whereas numbers have to be checked against your coding frame.

If you have an **ordinal scale**, as in a Likert scale (Likert 1932), where numbers are rated or ranked, the numbers are already provided for you, so the coding frame would follow the same numerical approach, namely:

Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
1	2	3	4	5

Of course, if you are not concerned about computer recording and analysis, you could equally well decide to use the easily recognized letters SD, D, N, A and SA. At least with the letters you are not constantly referring back to the coding frame to make sure you have the right number.

There are no set ways of coding. It is a case of deciding on a system which will suit your data and your way of managing it. Try out different summary sheets and coding frames. Keep things as simple as possible. If you are concerned mainly with a quantitative study and wish to make use of computer software to analyse your returns, prepare as well as you can before you finalize your data-collecting instruments. As I've said before (but it's sufficiently important to repeat again here), find out if there is anyone in your department or institution whose job it is to help students to organize and code data and to select suitable computer packages which will not be beyond your level of

computer expertise. Attend any courses which are offered by your computer centre, IT department or library. Try out imaginary returns from your questionnaire and see if your program can cope with them. Better to find out you asked the questions in the wrong way as soon as possible than when all returns are received.

Time to move on to grids, scales and verbal questions.

Grids

The simple response questions such as list, quantity and category are relatively easy to deal with. Grids require a little more care. A grid (or table) question will ask students to provide answers to two or more questions at the same time.

Go back to the question about students' qualifications before they started their degree course. Instead of merely asking whether they had 'no qualifications', a 'professional qualification', 'A level or equivalent', 'successful completion of an Access or Return to Study course' or 'other' qualification, you might decide it would be more useful to learn about study carried out after the age of 18. If so, a grid question could be devised.

Question 3

Since the age of 18, how many years have you spent on the following? Ignore periods of less than one academic year.

	1–2 years	*3–4 years*	*5–6 years*	*More than 6 years*
Professional qualification				
GCE A level or equivalent				
Access/Return to Study course				
Other (please specify)				

Here there are two dimensions – years of study and type of study. Students might have spent one year on an Access course, two years on an A level course, four on a professional qualification, three on some other course. In that case, ticks would be placed in three of the boxes.

The returns could be presented in table form in much the same style as the original question, but it would also be possible to produce a compound bar chart which compares numbers of students by years of study spent on different courses (see Figure 12.4).

Scales

The examples so far ask respondents to give factual information. **Scales** are devices to discover strength of feeling or attitude. There are many different types of scale, some of which require quite complex construction and analysis. Thurstone (Thurstone and Chave 1929) and Guttman (1950) scales in particular require careful handling. The most straightforward and easiest to manage

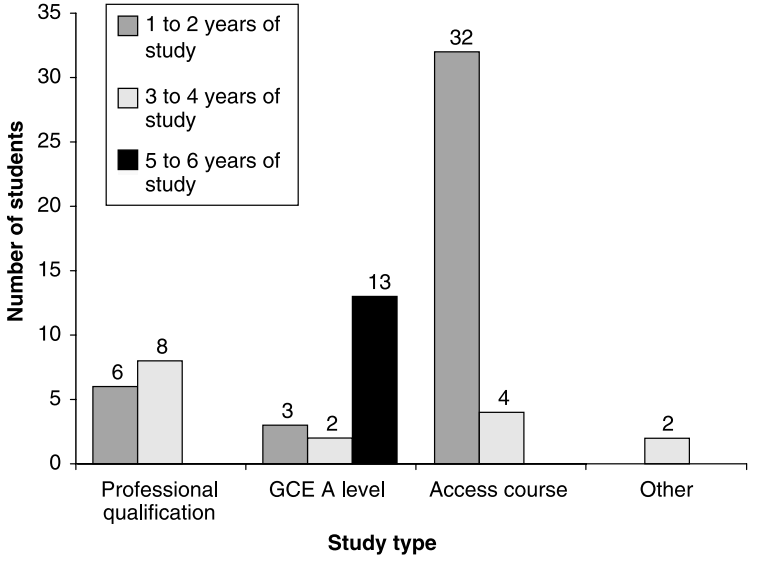


Figure 12.4 Years spent on study since the age of 18.

attitude scale is probably the Likert, devised by the man who invented them (Likert 1932). Likert scales ask respondents to indicate strength of agreement or disagreement with a given statement or series of statements, generally on a five- or seven-point range, by circling the appropriate number. Answers are then scored, generally from 1 (strongly disagree) to 5 (strongly agree) and a measure of respondents' feelings can be produced.

A simplified Likert scale might be used in the following case:

Question 4

I consider my chances of doing well in finals are good

Strongly disagree	*Disagree*	*Undecided*	*Agree*	*Strongly agree*
1	2	3	4	5

Responses could be presented as shown in Table 12.4. A bar chart would also illustrate the range of responses, as in Figure 12.5.

Table 12.4 Levels of agreement among mature students that chances of success in finals are good

Strongly disagree	*Disagree*	*Undecided*	*Agree*	*Strongly agree*	*Totals*
10 (20%)	7 (14%)	6 (12%)	16 (32%)	11 (22%)	50 (100%)

It is clear from Table 12.4 and from the bar chart (Figure 12.5) that more than half the students (54 per cent) are optimistic about their results, but what about the rest? Will these percentages be influenced by the faculty to which students belong? It would be interesting to find out.

Early findings from the pilot study may have alerted you to the likely importance of the faculty dimension. If so, you would have been able to ask students to complete a combined Likert scale/grid question, which might produce the results shown in Table 12.5.

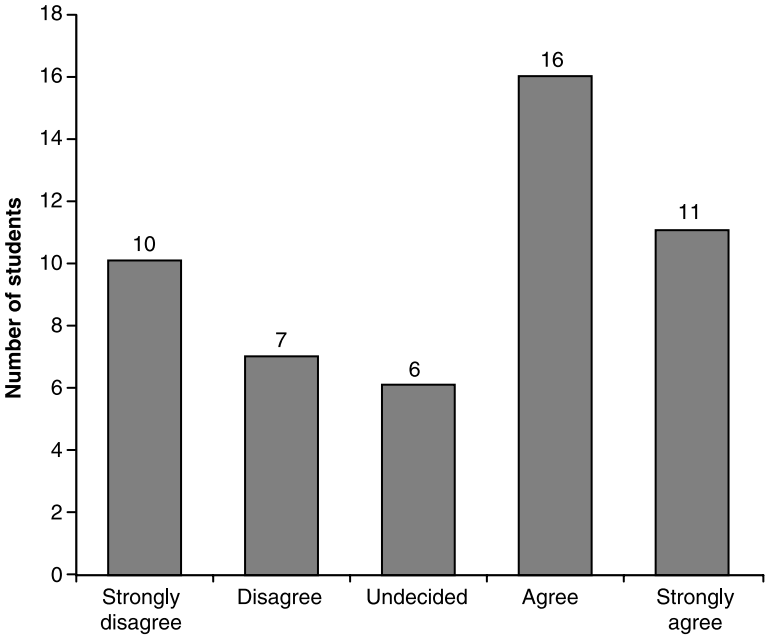


Figure 12.5 Levels of agreement among mature students (n = 50) that chances of success in finals are good.

Table 12.5 Levels of agreement among mature students that chances of success, by faculty, are good

Faculty	*Strongly disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly agree*	*Total*
Maths	4	0	0	0	0	4
Science	6	6	2	0	0	14
Social Science	0	0	4	16	0	20
Humanities	0	1	0	0	11	12
Totals	10	7	6	16	11	50

Presenting these data in tabular form is perfectly acceptable, but ask yourself whether other methods of presentation would illustrate the position more clearly. In this case, numbers may not present the same picture as would percentages, though as

I've pointed out before, in small studies it is dangerous to use percentages without the associated numbers. They can be misleading and give the impression that the sample is bigger than it in fact is. However, if you decide it is likely to be important to discover the proportion of students who disagree or agree with the statement *by faculty*, then frequencies can be converted to percentages and a percentage component bar chart produced (Figure 12.6).

Does Figure 12.6 illustrate the position better? You will need to decide. What does emerge is that the table and the bar chart make it clear that there are major differences in the perceptions of Maths and Science students compared with Social Science and Humanities. The percentage component bar chart demonstrates the extent of the differences. So, what is happening in Maths and Science? Were the students inadequately prepared? Are there lessons to be learnt from these data? Or are the students

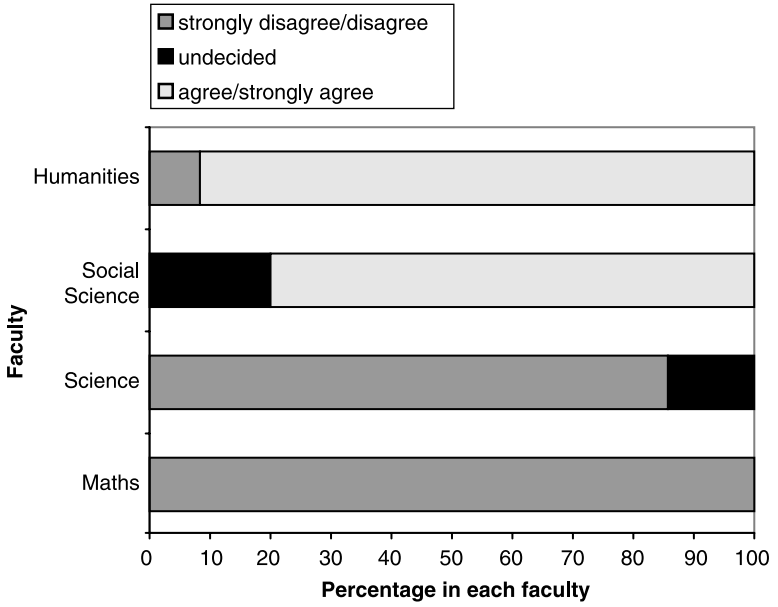


Figure 12.6 Percentage of students by faculty who feel their chances of doing well in finals are good.

unnecessarily pessimistic about their prospects? All these questions could be followed up in interviews with students and with tutors.

The table and bar chart illustrate the extent to which there is a relationship between faculty and students' perceptions of chances of success in finals. Data plotted on to a scattergram (or scattergraph) may also indicate a relationship between two variables. As part of your investigation, you may have hypothesized that first-year coursework scores will be the same as the first-year examination scores. Unlikely though that would be, let's say that the results support your hypothesis. You discover that first-year examination scores are indeed the same as coursework scores. If you produce the figures in a table they will be the same as in Table 12.6.

It's obvious that both scores match exactly, though I imagine a few questions might be asked at examination board meetings if such results were produced. However, never mind. These figures are merely being used to illustrate how a 'perfect' positive correlation, which is what we have here, might be presented. If these data were to be plotted on a graph, with the examination score as the horizontal axis and the coursework score on the vertical axis, then a perfect straight line would be produced, as in Figure 12.7.

Another sample might produce different data, as in Table 12.7.

Table 12.6 First-year examination and coursework scores (1)

Student number	*Examination score*	*Coursework score*
1	30	30
2	35	35
3	40	40
4	45	45
5	50	50
6	55	55
7	60	60
8	65	65
9	70	70

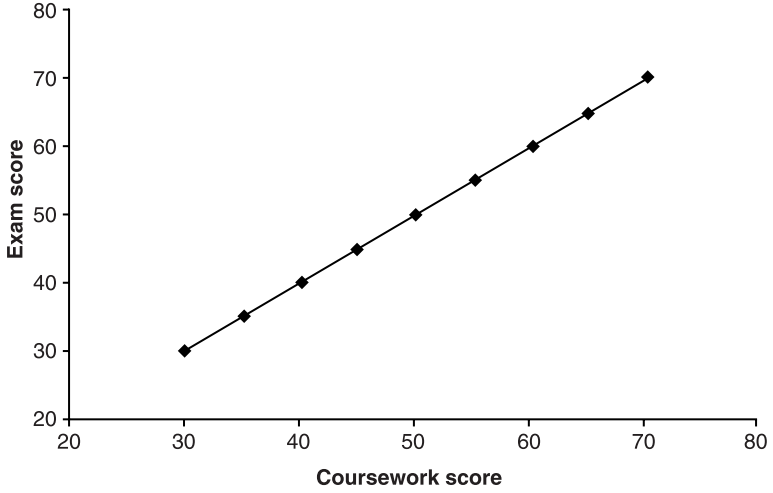


Figure 12.7 Positive relationship between examination and coursework scores.

Table 12.7 First-year examination and coursework scores (2)

Student number	*Examination score*	*Coursework score*
1	30	70
2	35	65
3	40	60
4	45	55
5	50	50
6	55	45
7	60	40
8	65	35
9	70	30

These data, transferred on to a graph (Figure 12.8), demonstrate that again, the correlation is 'perfect', but this time, as the examination score increases, the coursework decreases, and vice versa. There is therefore a negative relationship between the two variables. In reality, such relationships are rare. More realistic data might be in the third example (Table 12.8).

When the points are plotted on the graph, the resulting figure

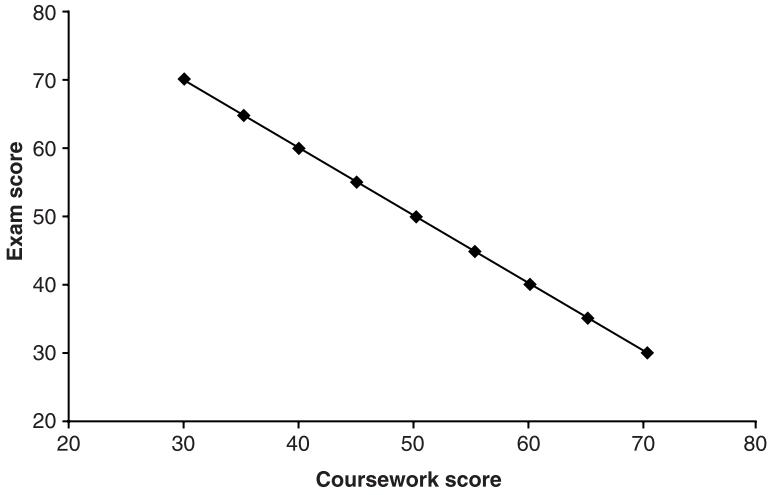


Figure 12.8 Negative relationship between examination and coursework scores.

Table 12.8 First-year examination and coursework scores (3)

Student number	*Examination score*	*Coursework score*
1	37	45
2	42	40
3	46	44
4	53	68
5	54	60
6	59	50
7	63	55
8	72	85
9	74	75

(Figure 12.9) shows whether there is a general trend in the results and indicates the scatter of results. In this case, since the general trend is for an increase in examination score associated with an increase in coursework score, a positive relationship exists, but it is not perfect. (The line drawn here is merely to illustrate the extent to which the scatter points relate to the perfect relationship.)

Some data, when plotted on a scattergram, may be completely

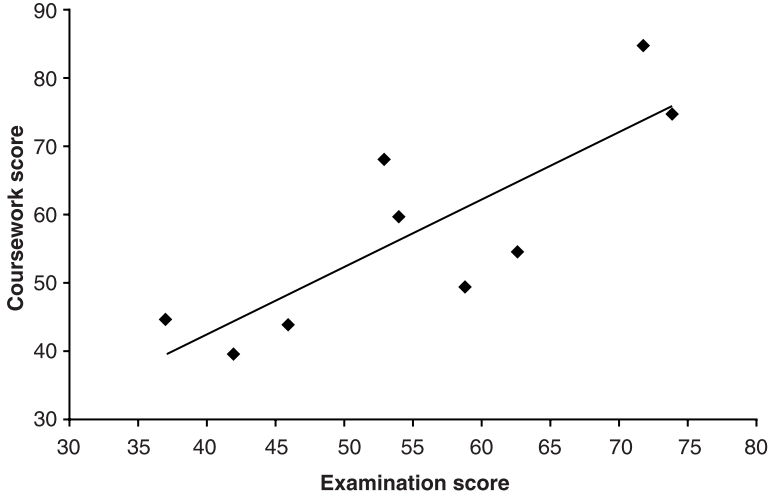


Figure 12.9 Positive (though not perfect) relationship between examination and coursework scores.

random, with no discernible pattern. In this case, it is reasonable to assume that there is little or no relationship between variables. In other cases, there may be clusters, or groups of points on the scattergram, suggesting that within the total sample, there are smaller groups within which the individuals have similar characteristics. Take care though. Unless calculations for correlation coefficients are carried out, only inferences can be drawn – not direct causal relationships. If you feel correlation coefficients are necessary, then you will have to become familiar with the necessary statistical techniques or to make use of a computer package such as the Statistical Package for the Social Sciences (SPSS) or whichever package your supervisor suggests.

Verbal questions

A study of responses to verbal (or open) questions will often provide useful pointers to the types of issues it may be worthwhile to follow up in interviews. These questions are often included on questionnaires to allow respondents to draw attention to

anything about which they feel strongly. Referring to such responses is often a way of starting an interview.

The usual practice is to write or type out all the responses on separate sheets. This allows all items to be scanned in order to see whether there are any recurring themes. If you are interested in discovering whether students identify any barriers to learning, you will be looking particularly for statements which relate to problems with study, tutor support, etc. Some of the responses will probably provide useful quotations to illustrate certain points in the report – though the temptation to give greater emphasis to statements which happen to support your particular point of view has to be resisted.

Some form of content analysis may be necessary in order to deal with such material. If so, follow the same content analysis procedures as would be applied for the study of documents (see Chapter 7). As always, you will be looking for categories and for common criteria, if any.

Conclusions



Only the simplest methods of presentation have been considered in this chapter. They provide a starting point. The tables and charts are easy to manage, whether or not you have access to a computer graphics program. You may be able to devise different question types and different methods of analysis and presentation. The advantage of familiarizing yourself with a range of question types is that once you have experimented with different formats and know how to produce tables, charts or graphs, you will be able to draw on whichever format suits the data and the purpose. A diagram can often simplify quite complex data which could take a paragraph or more to explain.

When you move on to larger and more complex investigations, you will need to familiarize yourself with more complex methods of analysis and with the use of appropriate computer programs. These days you can generally access such programs from your own departmental, computer centre or library terminal – or from your home computer, always providing you have the appropriate password, user word and permission/s. Try out some of the

programs, using data with which you are familiar, possibly data which have been collated, analysed and presented 'by hand' in connection with one of your 100-hour projects. This will allow you to understand the principles and get to grips with the practicalities of the system.

Interpreting the evidence and reporting the findings checklist

1	All data must be recorded as soon as they are available.	Make sure you prepare and pilot summary sheets before the main data collection begins.
2	Look for similarities, groupings, clusters, categories and items of particular significance.	100 separate pieces of interesting information will mean nothing to a researcher or a reader until they are analysed and interpreted.
3	First-thoughts categories will be a start in the process of collating findings.	Though you may find you have to amend them after your pilot studies and when your data are assembled.
4	Prepare final summary sheets.	Your pilot studies will show you whether they are appropriate for your purposes.
5	Experiment with different ways of presenting findings. Tables, bar charts, histograms? Other diagrams or graphs?	If you plan to use computer statistical packages, find out what help is available *before* you begin your pilot studies and try out possible packages.
6	If you need to discover the average of certain values, decide whether the mean, median or mode is the most suitable.	Remember that each of these measures of central tendency has different uses.
7	Used on their own, means and medians may not be sufficiently descriptive to provide a complete picture of the data.	A measure of dispersion may be required – range, interquartile range or standard deviation.

8	Try out codes for your data. If you plan to use computer statistical packages, you will require numerical codes. If not, letters will suffice.	Do not attempt complex statistical techniques unless you have the expertise to cope. It is perfectly possible to produce a worthwhile investigation without an in-depth knowledge of statistics and without access to a computer. However, if you can familiarize yourself sufficiently well with computer techniques, it can save you many hours and produce good-looking charts, tables and figures – once you know how.
9	All data require interpretation.	It is not enough only to describe.
10	Don't claim more for your research than your evidence will support.	And watch out for possible bias.

Further reading

There are many good books on the market now which deal with basic statistical techniques. If you feel you need to learn more, ask your supervisor for suggestions, consult what is available at your library and see what is on the shelves of good bookshops. Consult the introduction, contents pages and indexes of books to see whether your understanding of 'basic' is the same as the author's. If any of the following are in your library catalogue, you might also wish to consult them.

Argyrous, G. (2002) *Statistics for Social and Health Research*. London: Sage publications. This book discusses various statistical concepts and an introduction to SPSS. Includes a CD-ROM with sample data sets.

Bryman, A. and Cramer, D. (1994) *Quantitative Data Analysis for Social Scientists*. London: Routledge. I still find this to be the most readable book on the topic. 'Rather old' in publishing terminology but still very good value.

Cramer, D. (2003) *Advanced Quantitative Data Analysis*. Buckingham: Open University Press. This book considers a variety of techniques used to analyse quantitative data. Useful examples are provided, together with a glossary of key concepts. Very sound, but some previous basic statistical knowledge will be a help.

Cramer, D. and Howitt, D. L. (2004) *The Sage Dictionary of Statistics*. London: Sage Publications. Very helpful reference work for use by anyone studying statistics in the social sciences and readable for first-time and for more experienced researchers.

Hardy, M. A. and Bryman, A. (eds) (2004) *Handbook of Data Analysis*. London: Sage Publications. This is a really good guide to basic issues in data analysis. Not a book to read from cover to cover but very good to keep on hand for reference.

Miles, M. B. and Huberman, A. M. (1994) *Qualitative Data Analysis* (2nd edn). Thousand Oaks, CA: Sage Publications. Everything in this excellent book is worth reading and noting. I particularly like Chapter 3, 'Focussing and bounding the collection of data', which includes 'Linking qualitative and quantitative data', 'Management issues bearing on analysis' and 'Data management', and Chapter 4, 'Early steps in analysis', which considers issues relating to codes and coding – and, of course, much more.

Opie, C. (ed.) (2004) *Doing Educational Research: A Guide to First-time Researchers*. London: Sage. Chapter 7 by Clive Opie considers the statistical analysis of quantitative and qualitative data. Chapter 8 by Ann-Marie Bathmaker outlines the use of the NUD-IST (Non-Numerical, Unstructured Data Indexing, Searching and Theorising) software for analysing qualitative data. She considers the practicalities of using NUD-IST, provides a critique of the software in the light of experience and concludes with recommendations for new users. Really helpful. Chapter 9 by Michael Pomerantz discusses the ATLAS.ti computer software application which allows the user to study and analyse interview transcripts. Clive Opie ends the book with a glossary of terms used in quantitative analysis.

Oppenheim, A. N. (1992) *Questionnaire Design, Interviewing and Attitude Measurement* (New Edition). London: Cassell. Chapter 9 discusses some basic measurement theory, including ordinal scales, nominal measures, the reliability and validity of scaled measures. Chapter 14 considers coding (code books, coding frames and problems of coder reliability). Very thorough and useful to keep on hand for reference.

Pallant, J. (2004) *SPSS Survival Manual: A Step By Step Guide to Data Analysis Using SPSS for Windows (Versions 10 and 11)*. Maidenhead: Open University Press. This new edition outlines basic techniques of data analysis

and provides examples of how to present results in reports. It is thorough, as clear as this topic can be and offers useful research tips. A web site accompanies the book (www.openup.co.uk/spss) and to access the two data files from which the examples of research are taken, go to www.openup.co.uk/spss.data. Part one: Getting Started, includes designing a study, preparing a codebook and getting to know SPSS. Parts two to five discuss the preparation of data files and preliminary analysis and consider the use of a variety of statistical techniques. I found Part four: Statistical Techniques to Explore Relationships among Variables, to be particularly helpful. This book is not bedtime reading, but if you plan to use SPSS, it could be invaluable as a reference manual. However, it is detailed and you will need to allocate a significant amount of time to absorb the parts you need.

Punch, K. F. (1998) *Introduction to Social Research: Quantitative and Qualitative Approaches*. London: Sage Publications. Chapter 7 deals with the analysis of quantitative data and Chapter 10 discusses the analysis of qualitative, including a good section on coding. All well worth consulting and absorbing.