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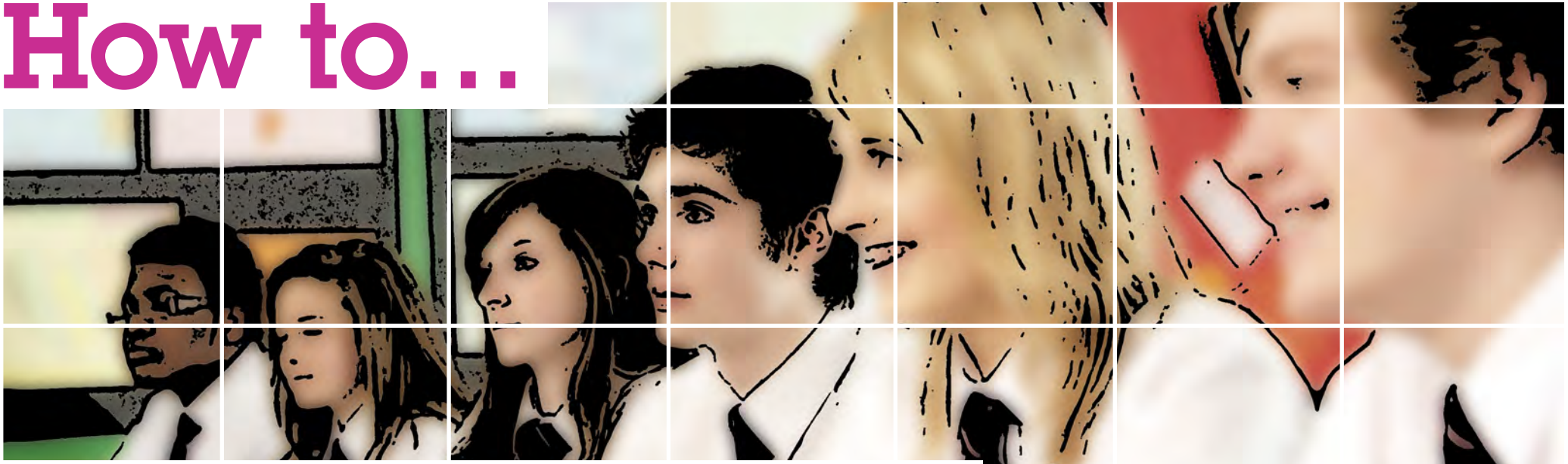

Run qualitative and quantitative research

From definitions through to analysis

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Run qualitative and quantitative research 2

This *How to guide* provides an introduction to qualitative and quantitative research. The guide is intended for senior leaders, teachers and other school staff who are interested in carrying out research.

1 What is qualitative and quantitative research?

Researchers have long debated how to define 'qualitative' and 'quantitative' research. We are not going to go into that debate here, but instead provide a definition of each which we feel best describes each approach (see Figure 1 below).

Figure 1 Definitions of qualitative and quantitative research

Qualitative research is 'interested in understanding the meaning people have constructed, that is, how people make sense of their world and the experiences they have in the world.'

(Merriam, 2009, p.13)

Quantitative research is 'explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics).'

(Aliaga and Gunderson, 200)

Indeed, some people think of qualitative research as researching **words** and quantitative research being about **numbers**.

The figure opposite shows some general characteristics of qualitative and quantitative research.

Figure 2 Characteristics of qualitative and quantitative research

Qualitative research

- Data is complex, impressionistic, personal, rich.
- Explores attitudes, beliefs, feelings and perceptions and considers experiences as they are lived, felt or undergone.
- The data collected is not in the form of numbers.
- Explores the topic in depth.
- Can use examples which might be illuminating rather than which are representative of the group you are researching.
- Findings are not able to be generalised, but may be able to be related to other, similar contexts or situations. For example you may have only studied your own school, but it is likely that the findings are applicable to similar schools.
- Suggests reasons why two variables might be linked (a variable is something which can change) (see section 6.2.1).
- Needs to be well thought out at the beginning, particularly how you will collect and manage data.
- Requires you to be able to think on your feet during data collection.
- Requires you to be able to make links between the data during the analysis.

Quantitative research

- Often explores a topic broadly.
- Data is hard, impersonal and factual. It minimises any biases the researcher might have.
- The data collected is in the form of numbers.
- Findings can be generalised to a specified group (or 'population').
- Establishes relationships between variables.
- Focuses on things which can be observed and measured.
- The design and planning stage needs to be very detailed and disciplined. It can take quite a long time to devise surveys, pilot them and make revisions.
- Data collection is generally straightforward and the write-up is largely defined by the survey.

It is possible to mix qualitative and quantitative methods. This is sometimes preferable, where time and resources allow. It enables the research to explore a topic broadly (using quantitative methods) and more in-depth (using qualitative methods). This is known as **mixed methods research.**

When undertaking any research, there are ethical and legal considerations that need to be made. Briefly, these relate to ensuring your research does no harm to anyone involved in the research and that the Data Protection Act and other laws are adhered to. Further information on ethics can be found on the website www.nfer.ac.uk/ris

2 An overview of the main methods used in qualitative and quantitative research

Here is a brief overview of the main methods that can be used in qualitative and quantitative research.

2.1 Interviews

These can be used to explore issues, views and attitudes in-depth. Interviews can be 'structured', 'semi-structured' or 'unstructured'. A structured interview contains specific questions and follows a specific pattern with all participants; it is more like a questionnaire. An unstructured interview is very broad and open-ended; it is more like a conversation led by a small number of questions. Between these two extremes is what is known as a 'semi-structured interview'. A semi-structured interview involves working from an 'interview schedule', a document that outlines the main questions to ask. It offers greater flexibility than structured interviews, as the order of questions can be moved to best fit the conversation or individual participants. It also offers the opportunities to ask additional follow-up questions.

Figure 3 Examples of question types

Structured question example

To what to extent do you agree with the statement 'I became a teacher because I wanted to work with young people'?

To a great extent
To some extent
Not at all

Semi-structured question example

Can you tell me about why you became a teacher at this school?

Unstructured question example

I am interested in hearing about how you became a teacher, can you tell me a bit about that?

Notes

Interviews can be conducted face-to-face, by telephone or online – via webcam for example. Most unstructured and semi-structured interviews will be audio-recorded (but only where the respondent gives you permission to do so) and then typed up. There is no need to type up structured interviews as the range of responses is limited, but you do need to record which response is given each time. Remember to type up notes so that there is a written record of the interview for use during analysis.

2.2 Focus groups

Instead of one-to-one interviewing, focus groups are interviews carried out with a group of people on a specific topic. They can offer an efficient way of gathering a range of views on a particular topic. Participants tend to comprise similar characteristics (for example, a group of primary school teachers, or Year 7 learners) rather than a mixed group of participants with dissimilar characteristics (e.g. teachers from primary and secondary schools or learners from different year groups[1]). Focus groups tend to have between five and ten participants per group.

Although they have much in common with one-to-one interviews, focus groups differ in that respondents often lead the discussion, while the facilitator's role is to keep the discussion on track. This enables the group to express a variety of views and can bring any differences of opinion to light.

When running a focus group, it is preferable to have a note-taker, to help the facilitator manage the group and take notes. More experienced researchers may run focus groups alone and rely on the audio-recording to capture the data. See the '*How to... Run focus groups*' guide available at www.nfer.ac.uk/ris

2.3 Observations

These provide insights into individual or group behaviours. It is possible to do overt observations, where the participants are aware that they are being observed, or covert observations, where participants are unaware. Within research, overt observations are far more common and this is what we discuss here. There are additional ethical issues to bear in mind when undertaking covert observations.

Observations can be structured – for example you may record the number of times a specific event or events happen during a lesson – or they can be very open. The observer can participate in the event being observed (this is known as being a 'participant observer') – for example a teacher might observe how learners are engaging with a task within their own classroom. Alternatively, observers can take no active role (being a non-participant observer). In these cases, the observer will sit at the back of the room or out of the way to make notes. Where appropriate, researchers can video record the session they are observing for review at a later date.

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1 Depending on your research, it may be appropriate to carry out a focus group with participants with dissimilar characteristics. However, it often helps the flow of the conversation and the group dynamics if the group shares key characteristics, as everyone is more likely to feel at ease.

2.4 Surveys

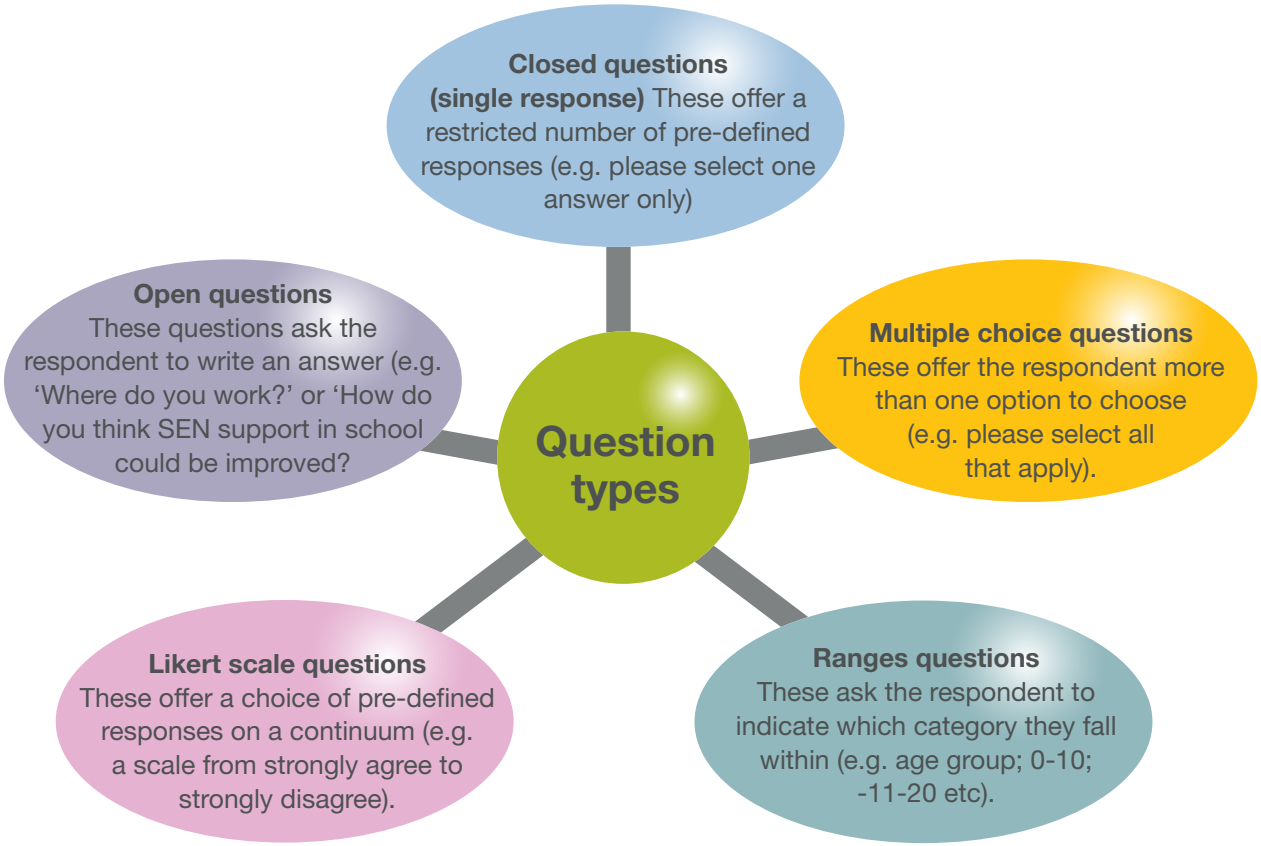
Often the terms 'survey' and 'questionnaire' are used inter-changeably. Surveys are a systematic way of collecting information from individuals and groups, whereas a questionnaire is a set of questions that you ask respondents. Surveys can be self-completed (i.e. the respondent completes the questionnaire individually) or an interviewer can ask respondents the questions. In the latter example, the questions should be asked in exactly the same order and way for all respondents.

Surveys can include questionnaires, face-to-face interviews and can also include observations of people and events (for example how learners use the dining facilities or a library). Surveys are the main method used in quantitative research. They provide an efficient way of collecting views and information from a wide range and large number of people.

Questionnaires can be paper-based or administered via online survey software programmes, such as NFER School Surveys (www.nfer.ac.uk/pps) or Survey Monkey. Using online survey software offers several advantages over paper surveys. These include having no postage costs and the researcher not needing to invest time entering the data manually. Online survey software can also do some of the analysis for you, creating tables of data, for example.

Surveys can include questions of different types and formats. These are presented in Figure 4.

Figure 4 Different types of survey questions



2.5 Quasi-experimental

With a scientific experiment, it can be easy to identify cause and effect. For example, in a laboratory with inanimate objects it is possible to run an experiment several times, each time changing one variable and keeping all the other variables the same. If a change is identified, you can then be confident that the effect you are seeing is a result of the variable you changed. It is not possible to do this in social science research where you are dealing with people. It is hard to control for all the variables, to say nothing of the ethics involved. Instead there are a group of related techniques, referred to as quasi-experimental, which you can use.

The most common quasi-experimental approaches compare two groups. This method is particularly useful if you want to explore the effect of some sort of intervention, perhaps a new teaching method. You assign learners to one of two groups:

- an 'experimental group' (sometimes called intervention or treatment group) which will receive the intervention.
- the 'control group', who do not receive the intervention.

You will need to test the two groups before (pre-test) and at the end of the intervention (post-test) and compare the change in the scores of the groups.

For example, to test whether a numeracy support intervention for Year 5 learners supports improved outcomes you could carry out quasi-experimental research. The experimental group will be given the intervention (for example, a one-to-one teaching session per week for 20 weeks). The control group will not be given the intervention. Both groups' numeracy test scores will be assessed and compared at the start (pre-test) and end of the 20-week period (post-test). All other factors would remain the same, for example, the learners in both groups would still receive normal numeracy class teaching and would sit the same pre- and post-test at the same time under the same conditions.

As far as possible the control and experimental groups should have the same characteristics; with the only difference between the two groups being that one had the intervention and the other did not. For example; they should be the same age, the same socio-economic status and the same gender mix. Ideally learners would be randomly assigned to the control and experimental groups. This is what happens in 'Randomised Controlled Trials' (RCTs). The NFER book, '*A guide to running randomised controlled trials for educational researchers*' is available from www.nfer.ac.uk/ris.These are trials of particular interventions which can indicate causality – whether the intervention is actually causing the change you are interested in.

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Randomly assigning learners to groups is not always possible however, particularly within a school setting. Some people struggle with the ethics of giving some learners access to additional support and others none. This concern is unfounded as we do not know whether an intervention works at the point of trial and therefore it is not unethical. But, one way to overcome this concern is by offering the learners in the control group the intervention once the experiment (or research) has finished, so that all learners involved in the research will be given the intervention at some point. Offering this also often helps to reassure parents about the research, and can be an important factor in them giving consent for their children to be involved in the research.

3 Designing your research instruments

A research instrument is the tool you use to collect your data. In other words, this is your interview schedule (or set of questions), your questionnaire, or your observation schedule. Designing a good research instrument that will give you the data you want may not be as straightforward as you think. It can be quite time consuming. Ideally, you would test out or pilot your research instruments before using them for your research. This helps to ensure that your questions are understood in the way you intended and that you have suitable response options (for questionnaires) or appropriate follow-up questions or prompts (for interviews). Time and resources mean that piloting is not always possible, however. Table 1, on page 14, summarises the strengths and weaknesses of each research method.

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4 Who is going to be involved in your research and how are you going to decide?

There are various ways to decide who will be involved in your research. This will be determined by your research topic to some extent. However, it is important that your decisions about who you will invite to participate in your research are made explicit, so others know about any potential limitations of your data.

In quantitative research, the choices you make will determine the extent to which the findings can be generalised (remember, findings from qualitative research are not intended to be generalised). The process of choosing who will be invited to participate in your research is called 'sampling'. It is often not practical to send a questionnaire to everyone, so we select which group/s of people we want to be involved in our research ('a sample'). The idea is that your sample is representative of your population. For example, there is not usually a need to engage the whole school in your research – not least because this could be costly and time consuming – instead you could choose to access learners from a particular class/es or year group/s. Taking this example, the whole school would be what we call the 'population' and the sample would be the class or year group you select to participate in the research. In other instances, your overall population might be the year group or class. Your sample would then be the group of learners that you select from that year group or class to take part in the research.

We have outlined some sampling approaches below. Choosing a sampling approach will be defined to some extent by your research question. The first three approaches tend to be used with **qualitative** research methods and the remaining with **quantitative** methods.

Purposive sampling: Here you choose respondents because they have a particular characteristic that you are interested in, for example, gifted and talented learners.

Snowball sampling: Here you ask one person (or participant) to put you in contact with another(s). For example, you may ask a Year 11 learner to put you in contact with his/her parent/carer and invite him/her to be part of the research; that parent/carer may then suggest another parent/carer for you to approach and the process continues.

Convenience sampling: Here you identify people who are available. They may or may not have the characteristics you are interested in. This approach may not be desirable but that will be determined by your research question.

Simple random sampling: This approach means that every person in a given population (e.g. a school or class) has an equal chance of being selected because each participant is selected at random. When this robust

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approach is adopted, the findings can sometimes be generalised to the whole population.

Quota sampling: This approach ensures that the sample includes a certain proportion of respondents from particular group/s, even if that proportion does not reflect their prevalence in the population as a whole. For example, you may be particularly interested in a particular ethnic group and stipulate that the sample should contain a certain percentage of participants from specific ethnic groups.

Stratified sampling: With this approach, the population is split into groups (or strata). For example, schools might be stratified based on their proportion of learners who are eligible for free school meals. Within each group you will randomly select a sample.

Cluster sampling: Here the whole population is divided into smaller groups and then a number of those groups are chosen. Within each group, the population is randomly sampled. For example, ten schools (or classes) might be invited to participate in the research but you would administer the survey to a random sample of students within each of those schools or classes.

5 The technical bit

When undertaking research, there are a few other terms you will need to be aware of and, if possible, consider in relation to your project. We briefly introduce each concept in the figure below.

Figure 5 Common research terms

Validity
This tests whether you are actually measuring what you say you are measuring. This is generally applicable to quantitative research but can be applied to qualitative research too.

Reliability
This is an assessment of whether you would get the same results if you (or someone else) repeated the research with the same group of respondents in the future.

Bias
There is always an element of bias in social research, but researchers must try to be objective. As far as possible you should acknowledge your underlying views and assumptions and try to mitigate against these - for example, by looking for evidence that disproves your own view.

Triangulation
Triangulation involves collecting and analysing data from different sources (be these stakeholder groups, test scores or other information) and seeing the extent to which they match. The more the views coincide, the greater the confidence you can have in what you are being told or what appears to be happening. It is also informative when data sources do not coincide, as this can lead to new understandings.

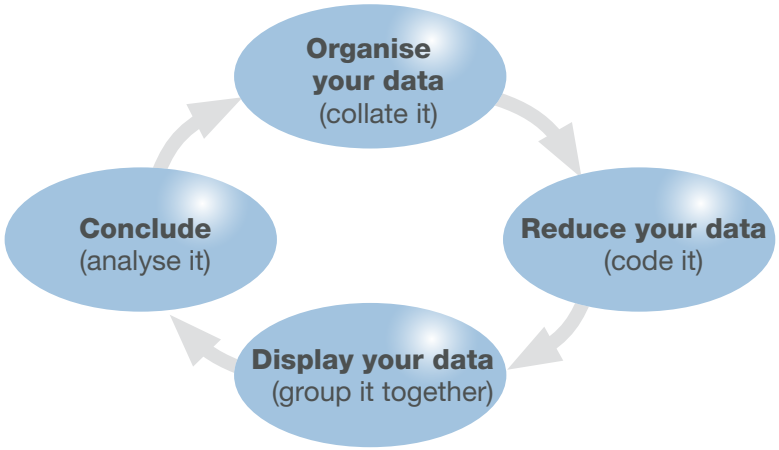
6 Analysing qualitative and quantitative data

You need to think about your analysis when you plan your research. The questions you ask and how you ask them will determine what analysis you can do.

6.1 Analysing qualitative data

There are many approaches you could use to analyse qualitative data. There is a process to follow regardless of which you choose (see Figure 6).

Figure 6 Qualitative data analysis process



6.1.1 Organising the data

You need to revisit the purpose and aims of your research and then decide how to structure your analysis. To start this process, you need to organise it so you have all your data together. If you have done observations in different classes, you will want to collate your notes for each class observation together. You will also need to read through all of your data and familiarise yourself with it before moving on.

6.1.2 Reducing the data

The main technique employed here is 'coding'. You can buy software packages to help you code qualitative data, but these may not be worth the investment for a small dataset.

The purpose of coding is to apply themes and sub-themes to the data. You are aiming to organise the data into manageable 'chunks' so that you can compare relevant responses. The interview notes will contain lots of interesting data, but not all of it will be relevant to your research question; this stage helps to filter out any irrelevant information you have collected. The figure on page 11 shows a process for coding interview data.

It may be that, as you go through the interviews, more codes emerge. This is not a problem, just go back over the interview notes you have already coded and add in the new code. **Remember, only code what is useful to the research!**

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Figure 7 Coding interview data

1	Start by making a list of the particular things that you are interested in and give each one a name – these become your code labels. Alternatively or as well, you may assign each code a colour.
2	Select a code label and go through the interview notes (or transcript) and mark every time it occurs. How you do this is up to you - some people use hard copies, others do it on screen. Repeat this step with the other codes.
3	Repeat step two with all the interview notes.

6.1.3 Displaying the data

The purpose of this phase is to group your data using the themes. You can do this by using mind-maps or spider diagrams; highlighting and colour coding the data (e.g. one colour per theme); cutting up the data and sorting it so all responses relevant to one theme are together; or using 'cut and paste' and highlighting in word processing software. When doing this, you need to ensure each piece of data has its identifier code, otherwise you will not know who has said what.

6.1.4 Developing conclusions

This is where you assess what the data is telling you. You can do this by theme, sub-theme and/or between cases (for example, looking at differences between practice in two classes). All of your conclusions must be firmly and transparently based in the data – beware of bias!

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6.2 Analysing quantitative research

With quantitative research, you will need to design your instrument with your analysis in mind. As well as the questions you ask and how you will ask them, you need to think about how you will compare the data. For example, if you want to analyse the differences in responses between boys and girls, different ethnic groups or year groups, you need to ensure you have this background information

6.2.1 Useful terminology

Before going into more detail about the analysis, there is some terminology which it is useful to define.

You will often hear people talk about variables; these are defined below:

- A variable is simply something that can change.
- An independent variable is identified as the element that causes the effect.
- A dependent variable can be thought of as an 'outcome', and this is what is affected by changes in the independent variable.

For example, if you are studying how gender affects Key Stage 2 literacy scores the independent variable (i.e. what is thought to cause the effect) is gender and the dependent variable (what is affected) is the Key Stage 2 literacy score.

With quantitative research, there are also different types of data. These are outlined below:

Continuous: This is where it is possible to get every number on a scale so it is continuous. For example, an examination score could be anywhere between 0 and 100.

Categorical: This is where the data you collect can only have certain values; the data may not be numerical either. For example, categorical data would be a scale such as 'strongly agree', 'agree', 'neither agree nor disagree', 'disagree' and 'strongly disagree', or where respondents have to select where they fall within a range (or category) (such as age range, i.e. 12-15; 16-18; 18+ etc.).

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6.2.2. Entering your data

Once you have collected your data, you will need to enter it into some sort of spreadsheet or statistical package. To enter your data, follow this process.

- Give each respondent a unique identifying number (UIN); if you are carrying out your research in several classes or schools, you may want to give each class or school its own UIN as well.
- If the data is continuous, just enter the value, for example a test score of 66 per cent.
- If the data is categorical, you will need to code it. This means that you will assign a number to a particular response option and enter the number into your spreadsheet ready for analysis. For example, if you have asked what subject the respondent teaches, you would assign a number to each possible response (i.e. chemistry=1; biology=2 etc.). This makes analysis easier.

Once all the data has been entered, you can use basic statistical techniques to analyse it.

References

Aliaga, M., and Gunderson, B. (2000). *Interactive Statistics*. Saddle River, NJ: Prentice Hall. Cited in: Muijs, D. (2011). *Doing Quantitative Research in Education with SPSS*. Second edn. London: Sage.

Merriam, S. (2009). *Qualitative Research: a Guide to Design and Implementation*. San Francisco, CA: Jossey-Bass.

Muijs, D. (2011). *Doing Quantitative Research in Education with SPSS*. Second edn. London: Sage.

Useful resources

We hope that this short guide to running qualitative and quantitative research has whetted your appetite for carrying out your own research. NFER has published a series of 'How to' guides for practitioners who want to carry out their own research, helping you put your ideas into practice. NFER have research books and training days available as well as free guidance on topics to research and methods of research. Why not get recognition for your achievements in research in your school, college or early years setting by applying for the NFER Research Mark? Visit www.nfer.ac.uk/ris for more information.

Table 1 Summary of research methods' strengths and weaknesses

This table summarises the strengths and weaknesses of each method.

Research method	Strengths and advantages	Weaknesses and disadvantages	Points to consider
Interviews Mainly used in qualitative research.	• Interviews can explore issues in depth. • Questions can be modified during the interview to allow the interviewer to respond to the direction of the discussion and follow up any ambiguous responses. • These may be suitable for exploring sensitive topics. • Interviews gather data using the respondent's voice and language.	• Interviews can be time consuming to conduct and to transcribe and analyse the data. • Interviews are carried out with small samples. • It can be easy for researcher bias to creep in. • There is a need to ensure that the questions are unambiguous and do not lead the respondent. For example, saying 'The CPD on offer in this school is the best I have ever known; don't you agree?' may prompt the respondent to agree with you rather than tell you his/her own view.	• How are you going to conduct the interviews (e.g. by phone, face-to-face, video-calling/webcam)? • Where are you going to conduct the interviews? You will need a quiet place without interruptions. • How will you record your data, e.g. will you audio-record; what sort of notes will you type up? Full transcriptions take time; it can take up to six times as long to type the notes as to conduct the interview. For most research, you can type less detailed notes, supported by transcriptions of quotations or examples. • How will you abide by the legal requirements of protecting your participants' data (i.e. anonymity and confidentiality)?
Focus groups Mainly used in qualitative research.	• Focus groups can offer an efficient way of collecting a range of opinions from groups of people. • Group dynamics can quickly highlight areas where there are consistent or opposing views; and which areas are important to the respondents. • It helps to arrange focus groups if you can tap into pre-existing groups or committees. For example, you could ask the school council to stay for an hour after their meeting to attend your focus group.	• The number of questions you can ask will be limited. • The facilitator needs to manage the discussion so that all voices are heard. • Power struggles can arise between participants. • There may be resource and logistical implications if you need a facilitator and a note-taker. • Focus groups usually last for longer than interviews and between one-and-a-half and two hours (depending on the topic area and age of participants). • You will need to find a large enough room to accommodate your participants. • You may need to provide drinks and snacks. • Transcription and analysis can be complex and time consuming.	• You must ensure confidentiality and anonymity in a group situation. It is useful to set ground rules at the start of the focus group by asking the participants to sign up to a statement of confidentiality whereby everything said within the room will remain confidential to only those participants present. See the NFER *'How to... Run focus groups: Get the most from them'* available from www.nfer.ac.uk/ris

Research method	Strengths and advantages	Weaknesses and disadvantages	Points to consider
Observations Mainly used in qualitative research.	• Observations are very useful for finding out what is going on in a situation, such as a classroom, dining hall or playground. • They are useful for accessing non-verbal data. • They can provide an opportunity to record events or the frequency of specific incidents.	• Observations can be time consuming to arrange, conduct, write up and analyse. • There is a need to mitigate researcher bias, particularly in the case of participant observation. • Be aware that the presence of another person in the setting can alter the way that people behave.	• How are you going to record the observation? • What will your role be; will you be a participant or non-participant? How will you record the data if you are a participant?
Surveys Mainly used in quantitative research, but can sometimes be used qualitatively.	• Surveys are useful for gathering views from a large and broad range of respondents. • Surveys can be anonymous. • Data between individuals and groups is easy to compare. • Surveys collect specific information that can be counted and statistically analysed.	• Data entry can be time consuming for paper-based questionnaires. • Response rates can be low; typically between 20 and 40 per cent for postal and online surveys, so you may need a large sample to get your desired number of participants. With parents, response rates can be as low as 10 to 20 per cent. • There is no chance for following-up or exploring ambiguous responses, or probing the reason behind a specific response. • Questions can be misinterpreted by the participant (piloting can help mitigate this).	• Where and when (if at all) will you pilot the questionnaire? • How will the survey be administered – by post, in person, online, by text message? • How will you remind participants who have not responded to complete the survey by your specified date? • How will you decide on the sample to be surveyed? • How will you obtain the contact details for postal/ online surveys?
Quasi-experimental	• Quasi-experimental research is useful for gathering information on whether something is having an effect (or impact) as it collects data from comparable control and experimental groups. • It can provide robust evidence.	• It can be difficult to obtain comparable groups	• How are you going to assign the control and experimental groups? • There are a number of ethical considerations; if the intervention has a positive effect then is the control group at a disadvantage? How will you mitigate this?

Run qualitative and quantitive research

The NFER 'How to' guides are a quick and easy way to digest different aspects of research.

Written by NFER researchers, these guides will help practitioners run research projects in education. From definitions and benefits, through to potential pitfalls, they will ensure the research is based on professional guidance.

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